



THE MADURA COLLEGE (AUTONOMOUS)

(Affiliated to Madurai Kamaraj University, Reaccredited (3rd cycle) with “A” Grade by NAAC)

TPK Road, Madurai – 625 011, Tamil Nadu

www.maduracollege.edu.in

ACADEMIC COUNCIL

17.06.2021



ESTD : 1889

Learning Shines with Righteousness

BOOK 3 of 3

(Corrected Copy)

(Syllabi Pages: 1573-2109)



THE MADURA COLLEGE (AUTONOMOUS)

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Ordinary Meeting of the Academic Council

Venue : **Online at Google Meet** 
(<https://meet.google.com/igp-iops-gsm>)

Date : **17.06.2021**

Time : **10.30 a.m.**

Members are requested to bring with them this soft copy as well as the copy of the appendices.

Dr.R.Eswaran
Member Secretary

Dr.J.Suresh
Principal & Chairman



THE MADURA COLLEGE (AUTONOMOUS)
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ACADEMIC COUNCIL

MEMBERS IN THE ACADEMIC COUNCIL

Dr.J.Suresh

The Principal & Chairman

Dr.R.Eswaran

Member Secretary

EXTERNAL MEMBERS

Er.N.S.Krishnan,

President,
Madura College Board,
Madurai.

C.A.S.Natanagopal,

Secretary,
Madura College Board,
Madurai.

Sri.N.Anand Srinivasan,

Treasurer,
Madura College Board,
Madurai.

Dr.V.Chinniah,

Professor & Head, Department of Management Studies,
School of Business studies,
Madurai Kamaraj University,
Madurai -625 021.

Dr.R.Sudha,

Professor & Head, Department of French,
School of English and Foreign Languages,
Madurai Kamaraj University,
Madurai -625 021.

Dr.H.Shakila,

Professor & Head
Department of Molecular Microbiology,
School of Biotechnology,
Madurai Kamaraj University,
Madurai -625 021.

Dr.S.Vaidhya Subramanian,

Dean, (Member representing Education)
SASTRA University,
Tirumalai Samudiram,
Thanjavur – 613 401.

Sri.S.Sankaran,

(Member representing Profession)
Director – Madura College Board,
Madurai.

Sri.R.Sridharan,

(Member representing Profession)
Director – Madura College Board,
Madurai.

Sri.K.K.Raman,

(Member representing Industry)
President,
Sundaram Industries (TVS Rubber)
Madurai.

INTERNAL MEMBERS

Boards of Studies Chairmen	-	All Heads/Coordinators of the Department
Members of Academic Council	-	All Permanent Faculty Members
Special invitees	-	Nominated by Chairman
(Teachers on probation/Senior Faculties of SF stream)		



THE MADURA COLLEGE (AUTONOMOUS)

(Reaccredited with “A” Grade by NAAC)

ACADEMIC COUNCIL

AGENDA FOR THE MEETING ON 17.06.2021

1. Prayer
2. Welcome Address : The Chairman, Academic Council
3. Confirmation of the Minutes of the previous Academic Council Meeting held on 26.08.2020 & Resolutions passed by circulation on 22.10.2020
4. Resolutions of Boards of Studies from various Departments
5. Any other subjects brought forward by the Chairman
6. Observation & Remarks by the External Members
7. Vote of Thanks : Member Secretary

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I. CONFORMATION OF MINUTES OF THE PREVIOUS ACADEMIC COUNCIL MEETING HELD ON 26.08.2020.



THE MADURA COLLEGE
(Autonomous, Affiliated to Madurai Kamaraj University, Re-accredited (3rd Cycle) with 'A' Grade by NAAC)
MADUARI -625 011
MEETING OF THE ACADEMIC COUNCIL

Date: 26.08.2020 (Wednesday)

Venue: Online at Google Meet
(<https://meet.google.com/kgj-rjft-pzg>)

Time: 10:00 a.m.

MINUTES OF THE ACADEMIC COUNCIL MEETING

A meeting of the Academic council was held through online mode at Google meet (<https://meet.google.com/kgj-rjft-pzg>) on Wednesday, 26th August 2020.

1. The meeting was called to order by the Principal-cum-Chairman of the Academic council, Dr. J. Suresh and the meeting started with the college prayer. The Chairman, Academic council (here after Chairman) welcomed Sri. N.S. Krishnan, President, Madura College Board (MCB), Sri. S. Natanagopal, Secretary, MCB, Sri. N. Anand Srinivasan, Treasurer, MCB, Sri. S. Sankaran, Director, MCB, Sri. R. Sridharan, Director, MCB, Dr. R. Sudha, Professor and Head, Department of French, School of English and Foreign Languages & University Nominee, Dr. H. Shakila, Professor and Head, School of Biotechnology & University Nominee and all other members of the Academic council to the first meeting of Academic council of the academic year 2020-21. He also gave a prelude about Outcome Based Education (OBE) and its importance in the current scenario of paradigm shift in Higher education. He necessitated the need of OBE adoption by quoting from Darwin's words, "It is not the strongest who survive but the one most response to change". Also highlighted about the want of transparency in Higher education, outcome based shift in curriculum design and excellence of student centric model. He appreciated the sincere efforts taken by the members of OBE committee in the design and implementation of OBE.
2. The Minutes of the previous Academic council meeting, held on 10.07.2019, was confirmed and passed.
3. Resolutions No. **1.1 to 1.4** were moved by **Dr. S. Dhanasamy**, Chairman, Board of Studies (BoS) in Tamil and seconded by **Dr. A. Atheeswari**. Prof. S. Chellapandian suggested to change the title of a certificate course, "Art of Elocution" into "பேச்சுக்கலை". The Chairman, BoS in Tamil agreed to change the title. Then, the motion was put to vote and CARRIED.
4. Resolutions No. **2.1 and 2.2** were moved by **Prof. S. Murali**, Chairman, BoS in Hindi and seconded by **Dr. S. Dinakaran**. Dr. N. Sriman Narayanan, Controller of Examination (CoE) pointed out the unmatched nature of question pattern proposed. He emphasized four sections of questions such as Sections A, B, C & D that is followed in the curriculum of almost all the departments. Prof. S. Murali explained the difficulty in following such uniform question pattern by elucidating the factors such as very fundamental nature of the syllabi, tutoring the subject from very basic level, students' difficulty to cope up with higher objective questions. Sri. S. Natanagopal, Secretary, MCB, queried about the question pattern followed in the other language departments. Members deliberated about the different facets of following uniformity in question pattern for the language courses. The Chairman concluded and emphasized the need of uniformity in curriculum design and implementation. Prof. S. Murali assented to change the question pattern. Then, the motion was put to vote and CARRIED.
5. Resolutions No. **3.1 and 3.2** were moved by **Prof. P. Manikandan**, Chairman, BoS in Sanskrit and seconded by **Prof. S. Murali**. Sri. S. Natanagopal, Secretary, MCB, queried about the difficulty if any in following the uniform question pattern in Sanskrit language courses. Prof. P. Manikandan ascertained that no difficulty in following uniform question pattern. Then, the motion was put to vote and CARRIED.
6. Resolutions No. **4.1 to 4.5** were moved by **Dr. R. Subramony**, Chairman, BoS in English and seconded by **Dr. Sheela P. Karthick**. Sri. S. Natanagopal, Secretary, MCB, highlighted the question pattern with only three sections such as A, B & C in Page number 101. Dr. R. Subramony explained that the consensus arrived at

the BoS meeting after a long discussion. The Chairman intervened and clarified that the syllabi for the Part-II language should be as per Tamil Nadu State Council for Higher Education (TANSCHÉ) norms. Chairman added, "It is mandatory for the colleges of Tamil Nadu to follow the syllabi proposed by TANSCHÉ for Part-II languages, as per recent communication received from TANSCHÉ". He further recapitulated that the syllabi proposed in this meeting was a substitute for the TANSCHÉ syllabi and we may need to follow standard TANSCHÉ syllabi once the orders passed by TANSCHÉ.

Then, the motion was put to vote and CARRIED.

7. Resolutions No. **5.1 to 5.5** were moved by **Dr. S. Theenathayalan**, Chairman, BoS in Economics and seconded by **Dr. S. Karthikeyan**. Dr. S. Theenathayalan requested to read the resolution 5.3 as "*Resolved to introduce common syllabi for Business Economics and International Economics courses for the I year B.Com. Aided and I B.Com. Self-financing (General / Professional Accounting / Banking & Insurance / Capital Markets) for the students to be admitted from the academic year 2020-2021 onwards (pp 204-208; 247-253)*". Sri. S. Natanagopal, Secretary, MCB, suggested to include NITI Aayog in the syllabus. Dr. S. Theenathayalan accepted to incorporate it.

Then, the motion was put to vote and CARRIED.

8. Resolutions No. **6.1 to 6.7** were moved by **Dr. A. Mayilmurugan**, Chairman, BoS in Commerce and seconded by **Dr. S. Selvakumar**. Sri. S. Natanagopal, Secretary, MCB, recommended to add group discussion skills as a part in Unit-V of the course, 17U6KSM6-Soft Skills, in Page number 226. Dr. A. Mayilmurugan agreed for the inclusion.

Then, the motion was put to vote and CARRIED.

9. Resolutions No. **7.1 to 7.3** were moved by **Dr. S. Muthukumar**, Chairman, BoS in Mathematics and seconded by **Dr. I. Sahul Hamid**. Dr. S. Muthukumar requested the members to refer to Page number 321 and read Part I as Part II and vice versa in references column. In resolution 7.2, he asked the members to read "rectification" as "ratification". Dr. S. Karuppasamy, Deputy Controller of Examination (DCoE) questioned whether the syllabi for the certificate courses included in the Academic council book. Dr. S. Muthukumar emphasized that the syllabi would be included in the revised copy of the Academic council book.

Then, the motion was put to vote and CARRIED.

10. Resolutions No. **8.1 to 8.4** were moved by **Dr. S. Muthukumar**, Chairman, BoS in Statistics and seconded by **Dr. I. Sahul Hamid**. Dr. S. Muthukumar requested the members to read resolution 8.1. as "*Resolved to approve the syllabi along with question paper pattern for internal and external examinations for I B.Sc., Statistics from the academic year 2020-2021 onwards*". Dr. N. Sriman Narayanan, CoE, pointed out the discrepancy in credits in overall programme structure and in syllabus of the course in Page numbers 355, 356 and 363. Dr. S. Muthukumar accepted to modify as per the programme structure table in the corrected copy of the Academic council book. He also requested the members to read resolution 8.2. as "*Resolved to approve the syllabus for II M.Sc., Statistics major students who joined the course in July, 2019 onwards with aided stream*". In addition, he requested the members to read the word "rectify" in Resolution 8.3. as "ratify". Dr. S. Karuppasamy, DCoE, pointed out the inclusion of syllabi for the certificate courses in the revised copy of Academic council book. Dr. S. Muthukumar agreed to add the syllabus in the revised copy.

Dr. R. Sudha, University nominee queried the duration of the certificate course and suggested to rename the certificate course as the value added course. The chairman explained that the teaching duration of the certificate course per semester as 30 hours and also agreed to consider the renaming of the certificate courses as value added courses after consulting with Heads of the Departments. Er. J. Rajendran questioned the facilities and the skilled human resources for conducting more specialized certificate courses on computer science such as Visual basic. He opined that the specialized certificate courses on a subject should be run by the department of subjects concerned and not by other departments. Dr. S. Muthukumar highlighted about the need for the mathematics and statistics students to develop skills on computer programs. Further, he added that the choice for the joining of a certificate course was open for the students;

they have a freedom to choose certificate course(s) offered by any department. The chairman recapitulated that the objectives of offering certificate courses are to enrich the students' skill in the applied branches of Science/Arts. Hence, a department can bring certificate courses in related disciplines by considering the need of their students. He also requested the departments to reconcile in bringing the certificate courses. Then, the motion was put to vote and CARRIED.

11. Resolutions No. **9.1 to 9.4** were moved by **Dr. M. Prema Rani**, Chairman, BoS in Physics and seconded by **Prof. V. Meenakshi Sundaram**. Dr. M. Prema Rani requested the members to refer resolutions 9.2. & 9.3 and read "June 2020 onwards" as "academic year 2020-2021 onwards". Then, the motion was put to vote and CARRIED.

12. Resolutions No. **10.1 to 10.3** were moved by **Dr. A. Xavier**, Chairman, BoS in Chemistry and seconded by **Dr. P.S. Harikrishnan**. Dr. A. Xavier asked permission to change the resolution 10.2. The chairman suggested to give it in addendum. Dr. A. Xavier agreed and presented the Addendum as follows:
"Resolved to implement the syllabi for Ancillary Chemistry, evaluation components and question paper pattern for those who join B.Sc. Maths, Physics, Microbiology and Biotechnology in SF stream from the academic year 2020-2021 onwards. The students of Biotechnology and Microbiology will study the Ancillary Chemistry in their first year and the students of Mathematics and Physics will study the Ancillary Chemistry in their second year (pp478; 501-512)".
 Then, the motion was put to vote and CARRIED.

13. Resolutions No. **11.1 to 11.2** were moved by **Prof. S. Chellapandian**, Chairman, BoS in Botany and seconded by **Dr. P. Kannan**. Dr. H. Shakila, University nominee suggested to start certificate course in Horticulture and Herbal Technology. Dr. G. Sivasubramanian also suggested take up green campus initiations. Prof. S. Chellapandian appreciated the suggestions given by members and agreed to start certificate courses in the coming years. He also narrated the steps taken by the department towards Green Campus mission. Then, the motion was put to vote and CARRIED.

14. Resolutions No. **12.1 to 12.3** were moved by **Dr. S. Dinakaran**, Chairman, BoS in Zoology and seconded by **Dr. L.D. Devasree**. Dr. H. Shakila suggested to start Certificate courses in Sericulture, Vermitechnology, Dairy Technology, Animal disease and Health. Dr. S. Dinakaran elucidated the meager facility and space as a constraint for the running a certificate courses. He elated and registered the successful conduct of Certificate and Diploma Course in Medical Lab Technology by the department under the UGC funded programme. The chairman intervened and apprised the approval given by management for the erection of Vermibed in our college campus. Dr. S. Karuppasamy, DCoE, doubted about Resolution 12.3. as the department offer ancillary only to Chemistry students. Dr. S. Dinakaran clarified that Department offers Ancillary papers also to II B.Sc. Botany students. Then, the motion was put to vote and CARRIED.

15. Resolutions No. **13.1 and 13.2** were moved by **Er. J. Rajendran**, Chairman, BoS in Computer Science and seconded by **Prof. R. Umasankari**. Members unanimously agreed the resolutions. Then, the motion was put to vote and CARRIED.

16. Resolutions No. **14.1 and 14.2** were moved by **Prof. K.Rajasaravankumar**, Chairman, BoS in Information Technology and seconded by **Dr. N. Paneerselvam**. Members unanimously agreed the resolutions. Then, the motion was put to vote and CARRIED.

17. Resolutions No. **15.1 and 15.4** were moved by **Dr. N. Paneerselvam**, Chairman, BoS in Microbiology and seconded by **Prof. K.Rajasaravankumar**. Members unanimously agreed the resolutions. Then, the motion was put to vote and CARRIED.

18. Resolutions No. **16.1 and 16.3** were moved by **Dr. N. Paneerselvam**, Chairman, BoS in Microbiology and seconded by **Prof. K.Rajasaravanakumar**. Dr. S. Dinakaran interrogated that the conduct of the certificate course in Medical Lab Technology as it requires following guidelines from medical board and needing of skilled professionals. He recalled the collaboration made with professionals from Rajaji Government Hospitals, Madurai during the conduct of the course in Zoology department. The Chairman requested the department to strictly follow guidelines from government. Then, the motion was put to vote and CARRIED.
19. Resolutions No. **17.1** was moved by **Prof. S. Sivaramakrishnan**, Dean (Academic) and seconded by **Dr. I. Sahul Hamid**, Dean (Planning & Development). Members unanimously agreed the resolution. Then, the motion was put to vote and CARRIED.
20. Resolutions No. **18.1** was moved by **Prof. S. Chella Pandian**, and seconded by **Dr. S. Dinakaran**. Dr. S. Theenathayalan suggested to change the title as Environmental studies instead of Environmental Science. Prof. S. Chellapandian clarified that Environmental Science is a more focused term than Environmental studies. Dr. S. Muthukumar, Dean (Administration) also suggested to change the title as "Environmental studies" as this paper is a common paper to be taught in the Under-graduate courses as per UGC guidelines. Dr. S. Theenathayalan also added that the title, Environmental studies, is followed in many of the colleges under Madurai Kamaraj University (MKU) as per TANSCH to meet UGC standard. Tracing the history and factors for inclusion of this paper, Prof. S. Chellapandian highlighted the importance of scientific approach to the Environment instead of a mere study and thus he insisted to retain it as "Environmental science". Only then, students will have the attitude to preserve and sustain the components of different ecosystems. The chairman cautioned that the title must be relevant with content and he suggested to keep the title as Environmental Science and if needed to change the title then we may have to change the syllabus too. Dr. S. Dinakaran also reiterated that the contents should be more relevant than a use of specific technical jargon. Finally, the Chairman recapitulated that the title of the course can be "Environmental Science". Then, the motion was put to vote and CARRIED.
21. Resolutions No. **19.1** was moved by **Dr. S. Theenathayalan** and seconded by **Dr. A. Mayilmurugan**. Members unanimously agreed the resolution. Then, the motion was put to vote and CARRIED.
22. The chairman requested the Secretary, MCB and University nominees to give their observations and remarks. Dr. R. Sudha appreciated the Academic council for the healthy deliberations. She also suggested to add more practical components in the certificate course. Dr. H. Shakila also praised the college as the first college under MKU conducted the Academic council meeting in online mode and appreciated the entire team for the successful conduct of the academic council meeting. She also suggested to start more value added courses. The chairman agreed to the suggestions and also envisioned that two certificate courses from a department per year now will result to have 5 or 6 certificate courses in each department after three years.

The member Secretary, Dr. R. Eswaran proposed vote of Thanks.

The Chairman adjourned the meeting of the Academic council after singing of the National Anthem by all.



Dr.R.Eswaran
Member Secretary



Dr.J.Suresh
Principal & Chairman

I. CONFORMATION OF RESOLUTIONS PASSED BY CIRCULATION ON 22.10.2020

1) FROM BOTANY DEPARTMENT

Prof.S.Chellapandian, Chairman, Board of Studies in Botany, brought the resolution and seconded by **Dr.P.Kannan**.

- Resolved to ratify the syllabi for the certificate course “ETIQUETTE” for the UG students of The Madura College.

2) FROM CONTROLLER OF EXAMINATIONS

Dr.V.Sriman Narayanan, Controller of Examination (CoE), brought the resolution and seconded by **Dr.S.Karuppusamy**, Deputy Controller of Examination (DCoE).

- Resolved to ratify the conduct of final semester UG and PG April 2020 examinations in online mode, from 21-09-2020 to 28-09-2020, as per UGC-Guidelines and State Government order vide no: 111 and 125 dated 27-07-2020 and 26-08-2020.
- Resolved to ratify the procedure for processing the results of students in the 2nd Semester and 4th semester as per UGC-Guidelines and the orders of Department of Higher Education, Government of Tamilnadu, for April 2020 semester examinations.

Dr.R.Eswaran
Member Secretary

Dr.J.Suresh
Principal & Chairman

II. BUSINESS BROUGHT FORWARD BY THE CHAIRMAN

- Resolved that students of B.Sc. Physics who join the programme from the Academic year 2021-22 will study Chemistry as their first Ancillary subject and Mathematics as their second ancillary subject.

III. RESOLUTIONS BROUGHT FORWARD BY HEAD OF VARIOUS DEPARTMENTS

1) FROM THE BOARD OF STUDIES OF TAMIL DEPARTMENT

Dr.S.Dhanasamy, Chairman, Board of Studies in Tamil, shall move and **Dr.A.Atheeswari** shall second the following resolutions, passed in the Board of Studies meeting held on 22.04.2021.

- 1.1. Resolved to pass the revised syllabi for Part -I Tamil, for the II year B.A./ B.Sc. of Semesters III & IV, offered to students who joined in the Academic year 2020-21 and onwards **(pp 1-11, 25-32)**.
- 1.2. Resolved to pass the syllabi for II year B.A. Tamil to be offered to students who joined B.A. Tamil in the Academic year 2020-21 and onwards **(pp 46-115)**.
- 1.3. Resolved to pass the Programme structure of M.A. Tamil and syllabi of I year i.e., I and II Semesters, for students who join the programme in the Academic year 2021– 22 and onwards **(pp 150-244)**.
- 1.4. Resolved to introduce add-on courses in the II year of B.A. Tamil programme students who joined in the Academic year 2020-21 and onwards **(pp 116-120)**.
- 1.5. Resolved to introduce self-study course for Advanced Learners in B.A. Tamil programme students who joined in the Academic year 2020-21 and onwards **(pp 121-122)**.
- 1.6. Resolved to ratify and approve the syllabi for the following papers offered to students who joined in the Academic year 2020– 21 and onwards **(pp 130-145)**.

20U2TMC3 - அற இலக்கியம்

20U2TAC2 - சிற்றிலக்கியம்

- 1.7. Resolved to ratify and approve the K-levels, blue print for Internal and external examinations, for courses offered in I year B.A. Tamil programme, for students who joined in the Academic year 2020-21 and onwards **(pp 146-148)**.

- 1.8. Resolved to pass the syllabi of the certificate courses for students to be admitted in the Academic year 2021-22 and onwards **(pp 127-129)**.
- 1.9. Resolved to ratify the syllabi of Certificate courses for students who admitted in the Academic year 2020-21 and onwards **(pp 123-126)**.
- 1.10. Resolved to ratify the nature of course, rationale and activities having direct bearing on nature of course offered to I year B.A. Tamil course, for students who joined in the Academic year 2020-21 and onwards **(P 149)**.
- 1.11 Resolved to introduce the revised syllabus for the following NME courses offered to those students who did not study Tamil as Part-I subject in the School education **(pp 12-17, 33-37)**.

20U3TNMB1 - அடிப்படைத் தமிழ் - 1

20U4TNMB2 - அடிப்படைத் தமிழ் - 2

- 1.12. Resolved to introduce the revised syllabus for the following NME courses offered to those students who did not study Tamil as Part-I subject during collegiate Education **(pp 18-24, 38-45)**.

20U3TNMA1 - சிறப்புத் தமிழ் - 1

20U4TNMA2 - சிறப்புத் தமிழ் - 2

2) FROM THE BOARD OF STUDIES OF HINDI DEPARTMENT

Prof.S.Murali, Chairman, Board of Studies in Hindi, shall move and **Dr.S.Dinakaran** shall second the following resolutions, passed in the Board of Studies meeting held on 22.04.2021.

- 2.1. Resolved to pass the revised syllabi for Part –I HINDI for II year B.A./B.Sc. of Semesters III &IV for students who joined the programme in the Academic year 2020-21 and onwards **(pp 245-253)**.
- 2.2. Resolved to pass the syllabi of certificate courses for students to be admitted in the Academic year 2021-22 and onwards **(P 254)**.

3) FROM THE BOARD OF STUDIES OF SANSKRIT DEPARTMENT

Prof.P.Manikandan, Chairman, Board of Studies in Sanskrit, shall move and **Prof.S.Murali** shall second the following resolutions, passed in the Board of Studies meeting held on 22.04.2021.

- 3.1. Resolved to pass the revised syllabi for Part –I SANSKRIT for II year B.A/ B.Sc. of Semesters III & IV for students who joined the programme in the Academic year 2020-21 and onwards (**pp 255-270**).
- 3.2. Resolved to pass the syllabus of certificate course for students to be admitted in the Academic year 2021-22 and onwards (**pp 271-272**).

4) FROM THE BOARD OF STUDIES OF ENGLISH DEPARTMENT

Dr.R.Subramony, Chairman, Board of Studies in English, shall move and **Dr.Sheela P.Karthick** shall second the following resolutions, passed in the Board of Studies meeting held on 22.04.2021.

- 4.1. Resolved to ratify the syllabi for part -II English for students who joined the B.A. /B.Sc. of Semesters I & II and B.Com. of Semester I Programme in the Academic year 2020-21 and onwards (**pp 273-293**).
- 4.2. Resolved to pass the revised syllabi for Part -II English for students who joined II year B.A/ B.Sc. of Semesters III & IV and B.Com. of Semester IV programme in the Academic year 2020-21 and onwards (**pp 294-309**).
- 4.3. Resolved to pass the Programme structure of M.A. English and syllabi of I year i.e., I and II Semesters, for students who join the programme in the Academic year 2021– 22 and onwards (**pp 389-442**).
- 4.4. Resolved to pass the syllabi for II year B.A. English to be offered to students who joined B.A. English in the Academic year 2020-21 and onwards (**pp 310-375**).
- 4.5. Resolved to introduce add-on courses in the II year of B.A. English programme students in the Academic year 2020-21 and onwards (**pp 378-380**).
- 4.6. Resolved to ratify add-on course in the III year of B.Sc. / B.A./B.Com. programme for students in the Academic year 2020-21 and onwards (**pp 376-377**).
- 4.7. Resolved to introduce Self-Study course for Advanced Learners in B.A. programme for students who joined the programme in the Academic year 2020-21 and onwards (**P 381**).
- 4.8. Resolved to pass the syllabus of certificate course for students to be admitted in the Academic year 2021-22 and onwards (**P 382**).

- 4.9. Resolved to ratify the syllabi of Certificate courses for students admitted in the Academic year 2020-21 and onwards **(pp 383-387)**.
- 4.10. Resolved to ratify the nature of course, rationale and activities having direct bearing on nature of course offered to I year B.A. English course for students who joined in the Academic year 2020-21 and onwards **(P 388)**.

5) FROM THE BOARD OF STUDIES OF ECONOMICS DEPARTMENT

Dr.S.Theenathayalan, Chairman, Board of Studies in Economics, shall move and **Dr.P.Kannan** shall second the following resolutions, passed in the Board of Studies meeting held on 22.04.2021.

- 5.1. Resolved to pass the syllabi for II year B.A. Economics Programme for students who joined in the Academic year 2020-21 and onwards **(pp 446-492)**.
- 5.2. Resolved to introduce add-on courses in the II year B.A. Economics Programme for students who joined in the Academic year 2020-21 and onwards **(pp 493-495)**.
- 5.3. Resolved to introduce Self-Study courses for Advanced Learners in II B.A. Economics programme for the students who joined the programme in the Academic year 2020-21 and onwards **(pp 495-496)**.
- 5.4. Resolved to pass the syllabus for the certificate course in Salesmanship for the students to be admitted in the Academic year 2020-21 and onwards **(P 497)**.
- 5.5. Resolved to Ratify the nature of course, rationale and activities having direct bearing on nature of course offered to I year B.A. Economics courses for the students who joined the programmes in the Academic year 2020-21 and onwards **(pp 498-499)**.
- 5.6. Resolved to pass the Programme structure of M.A. Economics and syllabi of I year i.e., I and II Semesters, for students who join the programme in the Academic year 2021– 22 and onwards **(pp 500-568)**.

6) FROM THE BOARD OF STUDIES OF COMMERCE DEPARTMENT

Dr.A.Mayil Murugan, Chairman, Board of Studies in Commerce, shall move and **Dr.S.Selvakumar** shall second the following resolutions, passed in the Board of studies meeting held on 22.04.2021.

- 6.1. Resolved to replace the course on ‘Business Mathematics and Statistics’ offered in II semester of B.com. “(General, PA, B&I, CM) with ‘Business Statistics’, for those who join in the Academic year 2021-22 onwards **(pp 569-573)**.
- 6.2. Resolved to pass revised syllabi for II Year B.Com (General) for the students who joined in the Academic year 2020– 21 and onwards **(pp 574-688)**.

- 6.3. Resolved to pass revised syllabi for II Year B Com., (Professional Accounting) for the students who joined in the Academic year 2020– 21 and onwards (**pp 574-688**).
- 6.4. Resolved to pass revised syllabi for II Year B .Com (Banking and Insurance) for the students who joined in the Academic year 2020– 21 and onwards (**pp 574-688**).
- 6.5. Resolved to pass revised syllabi for II Year B.Com (Capital Markets) for the students who joined in the Academic year 2020– 21 and onwards (**pp 574-688**).
- 6.6. Resolved to pass revised syllabi on ‘Basics of Accounting’ and ‘Marketing and Salesmanship’ as NME papers during the III and IV semesters for the students who joined in the Academic year 2020– 21 and onwards (**pp 628-632, 681-685**).
- 6.7. As suggested by subject experts, resolved to introduce Add-on course on ‘Principles of Co-operation’ for B.Com (General, PA, B&I, CM) in the III semester for students who joined in the Academic year 2020-21 and onwards (**P 687**).
- 6.8. Resolved to introduce Add-on course on ‘Business Mathematics’ during the II semester for B.Com (General, PA, B&I, CM) I year students who join in the Academic year 2021-22 and onwards, further this course enable the students to appear in the competitive exams and professional courses viz., CA & CMA (**P 686**).
- 6.9. Resolved to introduce self-learning course for advanced learners on ‘Indian Constitution’ during the IV semester for B.Com (General, PA, B&I, CM) II year students who joined in the Academic year 2020-21 and onwards (**P 688**).
- 6.10. Resolved to pass the Programme Structure of M.Com and syllabi of I year i.e., I and II Semesters, for students who join the programme in the Academic year 2021– 22 and onwards (**pp 709-803**).
- 6.11. Resolved to approve inter-disciplinary course ‘Financial Accounting’ in III Semester and ‘Business Statistics’ in IV semester for II Year B.Sc. (Information Technology) students who joined in the Academic year 2020– 21 and onwards (**pp 694-703**).
- 6.12. Resolved to approve inter-disciplinary course ‘Financial and Management Accounting’ in III semester for II Year B.A (Economics) students who joined in the Academic year 2020– 21 and onwards (**pp 704-708**).
- 6.13. Resolved to ratify and approve syllabi for the certificate courses offered during the academic year 2020-21 and onwards for students of all disciplines (**pp 689-693**).
- 6.14. Resolved to pass, two online certificate courses on ‘Derivative Market’ and ‘Foreign Exchange and Currency Markets’ in III semester. Further four certificate courses on ‘Capital

Market Operations', 'Back Office' , 'Depository Operations & Clearing' and 'Settlement & Risk Management' in the IV semester offered by National Stock Exchange (NSE) Academy for the B.Com (Capitam Marketing) students who joined in the Academic year 2020– 21 and onwards

- 6.15. Resolved to have two certificate courses on '**Fundamental Analysis and Technical Analysis**' at the end of II year. This course is offered as workshop outside the syllabi at the end of II Year B.Com (CM) for the students who joined in the Academic year 2020– 21 and onwards.
- 6.16. Resolved to follow the eligibility norms for admission into B.Com (Professional Accounting), B.Com (Banking & Insurance) and B.Com (Capital Markets) programmes, as prescribed by Government of Tamil Nadu for admission into B.Com.

7) FROM THE BOARD OF STUDIES OF MATHEMATICS DEPARTMENT

Dr.S.Muthukumar, Chairman, Board of Studies in Mathematics, shall move and **Dr.C.Thangapandi** shall second the following resolutions, passed in the Board of studies meeting held on 22.04.2021.

- 7.1. Resolved to pass the revised syllabi for II year B.Sc. Mathematics Programme for students who joined the programme in the Academic year 2020-21 and onwards (**pp 804-859**).
- 7.2. Resolved to pass the Programme structure of M.Sc. Mathematics and syllabi of I year i.e., I and II Semesters, for students who join the programme in the Academic year 2021– 22 and onwards (**pp 885-956**).
- 7.3. Resolved to pass the revised syllabi for Allied Courses to be offered to students who joined B.Sc. (chemistry) in the Academic year 2020-21 and onwards (**pp 864-877**).
- 7.4. Resolved to introduce add-on courses in the II year of B.Sc. Mathematics programme for the Students who joined in the Academic year 2020-21 and onwards (**pp 860-862**).
- 7.5. Resolved to introduce Self-Study courses for Advanced Learners in B.Sc. Mathematics Programme for the students who joined in the Academic year 2020-21 and onwards (**pp 862-863**).
- 7.6. Resolved to approve the syllabi of certificate courses for the students to be admitted in the Academic year 2021-22 and onwards (**pp 878-881**).
- 7.7. Resolved to ratify the syllabi of Certificate courses offered to the students who joined in the Academic year 2020-21 and onwards (**P 882**).

- 7.8. Resolved to ratify the nature of course, rationale and activities having direct bearing on Nature of course offered to I year B.Sc. students who joined in the Academic year 2020-21 (**pp 883-884**).

8) FROM THE BOARD OF STUDIES OF STATISTICS DEPARTMENT

Dr.S.Muthukumar, Chairman, Board of Studies in Statistics, shall move and **Dr.C.Thangapandi** shall second the following resolutions, passed in the Board of studies meeting held on 22.04.2021.

- 8.1. Resolved to pass the Programme structure of M.Sc. Statistics and syllabi of I year i.e., I and II Semesters, for students who join the programme in the Academic year 2021– 22 and onwards (**pp 957-1045**).
- 8.2. Resolved to pass the syllabi of certificate courses for students to be admitted in the Academic year 2021-22 and onwards (**pp 1046-1047**).
- 8.3. Resolved to ratify the nature of course, rationale and activities having direct bearing on nature of course offered to I year B.Sc. Statistics course for students who joined in the Academic year 2020-21 and onwards (**pp 1048-1049**).

9) FROM THE BOARD OF STUDIES OF PHYSICS DEPARTMENT

Dr.R.Saravanan, Chairman, Board of Studies in Physics, shall move and **Dr.M.Prema Rani** shall second the following resolutions, passed in the Board of studies meeting held on 22.04.2021.

- 9.1. Resolved to ratify the revised programme structure for B.Sc. programme for students who joined in the academic year 2020-2021 onwards (**pp 1050-1052**).
- 9.2. Resolved to pass the revised syllabi for II year B.Sc. Physics programme for students who joined in the academic year 2020-2021 onwards (**pp 1053-1086**).
- 9.3. Resolved to pass the Programme structure of M.Sc. Physics and syllabi of I year i.e., I and II Semesters, for students who join the programme in the Academic year 2021– 22 and onwards (**pp 1098-1169**).
- 9.4. Resolved to introduce Add-on courses in the II year of B.Sc. Physics programme for students who joined in the academic year 2020-21 and onwards (**pp 1087-1090**).
- 9.5. Resolved to introduce Self-Study courses for Advanced Learners in B.Sc. Physics programme for students who joined in the academic year 2020-21 and onwards (**pp 1090-1091**).

- 9.6. Resolved to pass the syllabi of Certificate courses for students to be admitted in the academic year 2021-22 and onwards (**pp 1092-1094**).
- 9.7. Resolved to ratify the syllabi of Certificate Courses for students offered in the Academic year 2020-21 and onwards (**P 1095**).
- 9.8. Resolved to ratify the nature of course, rationale and activities having direct bearing on nature of course offered to I year B.Sc. Physics programme for students who joined in the Academic year 2020-21 and onwards (**pp 1096-1097**).

10) FROM THE BOARD OF STUDIES OF CHEMISTRY DEPARTMENT

Dr.A.Xavier, Chairman, Board of Studies in Chemistry, shall move and **Dr.P.S.Harikrishnan** shall second the following resolutions, passed in the Board of studies meeting held on 22.04.2021.

- 10.1. Resolved to ratify the revised programme structure for students who joined the B.Sc. Chemistry programme in the Academic year 2020-21 and onwards (**pp 1170-1181**).
- 10.2. Resolved to pass the revised syllabi for II year B.Sc. Chemistry programme for students who joined the programme in the Academic year 2020-21 and onwards (**pp 1182-1222**).
- 10.3. Resolved to pass the Programme structure of M.Sc. Chemistry and syllabi of I year i.e., I and II Semesters, for students who join the programme in the Academic year 2021– 22 and onwards (**pp 1252-1335**).
- 10.4. Resolved to pass the revised syllabi for allied courses to be offered to students who joined B.Sc. Mathematics & B.Sc. Physics programme in the Academic year 2020-21 and onwards (**pp 1223-1241**).
- 10.5. Resolved to introduce add-on courses in II year of B.Sc. Chemistry programme for students who joined in the Academic year 2020-21 and onwards (**pp 1242-1244**).
- 10.6. Resolved to introduce self-study course for advanced learners in B.Sc. Chemistry programme for students who joined the programme in the Academic year 2020-21 and onwards (**pp 1242, 1245**).
- 10.7. Resolved to pass the syllabi of certificate courses for students to be admitted in the Academic year 2021-22 and onwards (**pp 1246-1247**).
- 10.8. Resolved to ratify the syllabi of Certificate courses for students admitted from the academic year 2019-20 (**pp 1248**).

- 10.9. Resolved to ratify the nature of course, rationale and activities having direct bearing on nature of course offered to I year B. Sc. Chemistry for students who joined in the Academic year 2020-21 and onwards (**pp 1249-1251**).

11) FROM THE BOARD OF STUDIES OF BOTANY DEPARTMENT

Prof.S.Chellapandian, Chairman, Board of Studies in Botany, shall move and **Dr.P.Kannan** shall second the following resolutions, passed in the Board of studies meeting held on 22.04.2021.

- 11.1. Resolved to ratify the revised programme structure for students who joined the B.Sc. Botany Programme in the Academic year 2020-21 and onwards (**pp 1336-1342**).
- 11.2. Resolved to pass the revised syllabi for II year B.Sc. Botany Programme for students who joined the programme in the Academic year 2020-21 and onwards (**pp 1343-1390**).
- 11.3. Resolved to pass the Programme structure of M.Sc. Botany and syllabi of I year i.e., I and II Semesters, for students who join the programme in the Academic year 2021– 22 and onwards (**pp 1418-1485**).
- 11.4. Resolved to introduce add-on courses, Crop varieties and Industrial Botany, in the II year of B.Sc. Botany programme for students who joined in the Academic year 2020-21 and onwards (**pp 1391-1392**).
- 11.5. Resolved to introduce Self-Study paper on ‘Secondary metabolites’ for Advanced Learners in B.Sc. Botany programme for students who joined the programme in the Academic year 2020-21 and onwards (**P 1393**).
- 11.6. Resolved to pass the syllabi of Diploma course on “Gardening” for students to be admitted in the Academic year 2021-22 and onwards (**pp 1394-1403**).
- 11.7. Resolved to pass the syllabi of certificate courses for students to be admitted in the Academic year 2021-22 and onwards (**pp 1404-1408**).
- 11.8. Resolved to ratify the nature of course, Course Learning Outcomes (CLOs), rationale and activities having direct bearing on nature of course offered to I year B.Sc. Botany courses for students who joined in the Academic year 2020-21 and onwards (**pp 1409-1417**).

12) FROM THE BOARD OF STUDIES OF ZOOLOGY DEPARTMENT

Dr.S.Dinakaran, Chairman, Board of Studies in Zoology, shall move and **Dr.L.D.Devasree** shall second the following resolutions, passed in the Board of studies meeting held on 22.04.2021.

- 12.1. Resolved to ratify the revised programme structure for students who joined the B.Sc. Zoology Programme in the Academic year 2020-21 and onwards (**pp 1486-1489**).
- 12.2. Resolved to pass the revised syllabi for II year B.Sc. Zoology Programme for students who joined the programme in the Academic year 2020-21 and onwards (**pp 1490-1523, 1544-1555**).
- 12.3. Resolved to pass the revised syllabi for Allied Courses to be offered to students who Joined B.Sc. Botany in the Academic year 2020-21 and onwards (**pp 1524-1543**).
- 12.4. Resolved to introduce add-on courses in the II year of B.Sc. Zoology programme for students who joined in the Academic year 2020-21 and onwards (**pp 1556-1558**).
- 12.5. Resolved to introduce Self-Study courses for Advanced Learners in B.Sc. Zoology programme for students who joined the programme in the Academic year 2020-21 and onwards (**P 1559**).
- 12.6. Resolved to pass the syllabi of certificate courses for students to be admitted in the Academic year 2021-22 and onwards (**pp 1560-1561**).
- 12.7. Resolved to ratify the nature of course, rationale and activities having direct bearing on nature of course offered to I year B.Sc. Zoology courses for students who joined in the Academic year 2020-21 and onwards (**pp 1562-1572**).

13) FROM THE BOARD OF STUDIES OF COMPUTER SCIENCE DEPARTMENT

Er.J.Rajendran, Chairman, Board of Studies in Computer Science, shall move and **Prof.R.Umasankari** shall second the following resolutions, passed in the Board of studies meeting held on 22.04.2021.

- 13.1. Resolved to Ratify the revised programme structure for the students those who joined in B.Sc. Computer Science Programme of both Aided and self-finance stream in the Academic year 2020-21 and onwards (**pp 1573-1580**).
- 13.2. Resolved to pass the revised syllabi of II year B.Sc. Computer Science Programme (III and IV semesters) for students who joined the programme in both aided and self-finance stream in the Academic year 2020-21 and onwards (**pp 1581-1632**).
- 13.3. Resolved to pass the revised syllabi for Allied Courses to be offered to students who joined in B.Sc. Computer Science in the Academic year 2020-21 and onwards (**pp 1592-1597**).

- 13.4. Resolved to introduce add-on courses in the II year of B.Sc. Computer science programme for the students those who joined in the Academic year 2020-21 and onwards (**pp 1604-1605, 1631-1632**).
- 13.5. Resolved to introduce Self-Study courses for Advanced Learners in B.Sc. Computer science programme for the students who joined in the programme in the Academic year 2020-21 and onwards (**P 1606**).
- 13.6. Resolved to Ratify the nature of course, rationale and activities having direct bearing on nature of course offered to I year B.Sc. Computer science course for students who joined in the Academic year 2020-21 and onwards (**pp 1633-1634**).

14) FROM THE BOARD OF STUDIES OF INFORMATION TECHNOLOGY DEPARTMENT

Prof.K.Rajasaravanakumar, Chairman, Board of Studies in Information Technology, shall move and **Dr.N.Paneerselvam** shall second the following resolutions, passed in the Board of studies meeting held on 22.04.2021.

- 14.1. Resolved to ratify the revised programme structure for students who joined the B.Sc. Information Technology (I.T) Programme in the Academic year 2020-21 and onwards (**pp 1635-1637**).
- 14.2. Resolved to pass the revised syllabi for II year B.Sc. (I.T) Programme for students who joined the programme in the Academic year 2020-21 and onwards (**pp 1638-1679**).
- 14.3. Resolved to pass the Programme structure of M.Sc. Computer Science and syllabi of I year i.e., I and II Semesters, for students who join the programme in the Academic year 2021– 22 and onwards (**pp 1690-1784**).
- 14.4. Resolved to introduce add-on courses in the II year of B.Sc. (I.T) programme for students who join in the Academic year 2020-21 and onwards (**pp 1680-1683**).
- 14.5. Resolved to introduce Self-study Courses for Advanced Learners in B.Sc. (I.T) programme for students who join the programme in the Academic year 2020-21 and onwards (**pp 1684-1685**).
- 14.6. Resolved to pass the syllabi of certificate courses for students to be admitted in the Academic year 2021-22 and onwards (**pp 1686-1689**).
- 14.7. Resolved to ratify the programme structure, nature of course, rationale, activities having direct bearing on nature of course, and K-levels in course content, Formative & Summative Question Patterns, offered to I year B.Sc. (I.T) programme for students who joined in the Academic year 2020-21 and onwards (**pp 1785-1833**).

15) FROM THE BOARD OF STUDIES OF MICROBIOLOGY DEPARTMENT

Dr.N.Paneerselvam, Chairman, Board of Studies in Microbiology, shall move and **Prof.K.Rajasaravanakumar** shall second the following resolutions, passed in the Board of studies meeting held on 22.04.2021.

- 15.1. Resolved to ratify the revised programme structure for students who joined the B.Sc. Microbiology Programme in the Academic year 2020-21 and onwards **(pp 1834-1842)**.
- 15.2. Resolved to introduce the revised syllabi for II year B.Sc. Microbiology Programme (semester III and IV) for students who joined the programme in the Academic year 2020-21 and onwards **(pp 1843-1882)**.
- 15.3. Resolved to ratify the revised syllabi for Allied Courses for students who joined B.Sc. Biotechnology in the Academic year 2020-21 and onwards **(pp 1897-1916)**.
- 15.4. Resolved to pass the Programme structure of M.Sc. Microbiology and syllabi of I year i.e., I and II Semesters, for students who join the programme in the Academic year 2021–22 and onwards **(pp 1921-2003)**.
- 15.5. Resolved to introduce syllabi and the evaluation pattern for add-on courses in the II year of B.Sc. Microbiology programme for students who joined in the Academic year 2020-21 and onwards **(pp 1883-1886)**.
- 15.6. Resolved to introduce syllabus and the evaluation pattern for Self-Study courses for Advanced Learners in the B.Sc. Microbiology programme for students who joined the programme in the Academic year 2020-21 and onwards **(pp 1889-1890)**.
- 15.7. Resolved to introduce the certificate courses for students of Under-graduate science programmes admitted from the Academic year 2020-21 and onwards **(pp 1887-1888)**.
- 15.8. Resolved to ratify the evaluation component and question pattern for Certificate courses conducted during the Academic year 2020-2021.
- 15.9. Resolved to ratify the nature of course, rationale and activities having direct bearing on nature of course offered to I year B.Sc. Microbiology course for students who joined in the Academic Year 2020-21 and onwards **(pp 1891-1896, 1917-1920)**.

16) FROM THE BOARD OF STUDIES OF BIOTECHNOLOGY DEPARTMENT

Dr.N.Panneerselvam, Chairman, Board of studies of Biotechnology, shall move and **Prof. K.Rajasaravanakumar**, shall second the following resolutions, passed in the meeting of the Board of studies in Biotechnology held on 22.04.2021.

- 16.1. Resolved to ratify the revised programme structure for students who joined the B.Sc. Biotechnology Programme in the Academic year 2020-21 and onwards **(pp 2004-2010)**.
- 16.2. Resolved to introduce the revised syllabi for II year B.Sc., Biotechnology Programme (Semester III and IV) for students who joined the programme in the Academic year 2020-21 and onwards **(pp 2011-2048)**.
- 16.3. Resolved to introduce new syllabi for Allied Courses to be offered to students who join B.Sc. Microbiology in the Academic year 2020-21 and onwards **(pp 2049-2064)**.
- 16.4. Resolved to introduce syllabi and the evaluation pattern for add-on courses in the II year of B.Sc. Biotechnology programme for students who join in the Academic year 2020-21 and onwards **(pp 2067-2069)**.
- 16.5. Resolved to introduce syllabi and the evaluation pattern for Self-Study courses for Advanced Learners in the B.Sc. Biotechnology programme for students who join the programme in the Academic year 2020-21 and onwards **(pp 2067, 2070-2071)**.
- 16.6. Resolved to introduce the syllabi for certificate courses for students to be admitted in the Academic year 2020-21 and onwards **(pp 2065-2066)**.
- 16.7. Resolved to ratify the evaluation component and question pattern for Certificate courses for all UG/PG students admitted in the Academic year 2020-2021 and onwards.
- 16.8. Resolved to ratify the nature of course, rationale and activities having direct bearing on nature of course offered to I year B.Sc. Biotechnology programme for students who joined in the Academic year 2020-21 and onwards **(pp 2072-2076)**.

FROM THE BOARD OF STUDIES OF PART V ACTIVITIES

17) FROM THE BOARD OF STUDIES IN NATIONAL CADET CORPS (NCC)

Dr.S.V.Karthikeyan, Chairman, Board of studies in NCC, shall move and **Dr.K.Kathirvelpandian**, shall second the following resolution passed in the meeting of the Board of studies in NCC held on 06.05.2021.

- 17.1. Resolved to ratify and approve the syllabi for Part-V NCC for students who joined in the academic year 2020-21 and onwards **(pp 2077-2085)**.

18) FROM THE BOARD OF STUDIES IN NATIONAL SERVICE SCHEME (NSS)

Dr.M.Malarvizhi, Chairman, Board of studies in NSS, shall move and **Dr.Y.Natarajan**, shall second the following resolution passed in the meeting of the Board of studies in NSS held on 06.05.2021.

- 18.1. Resolved to ratify and approve the syllabi for Part-V NSS for students who joined in the academic year 2020–21 and onwards (**pp 2086-2093**).

19) FROM THE BOARD OF STUDIES IN YOUTH RED CROSS (YRC)

Dr.S.Selvakumar, Chairman, Board of studies in YRC, shall move and **Dr.D.Gandhimathi**, shall second the following resolution passed in the meeting of the Board of studies in YRC held on 06.05.2021.

- 19.1. Resolved to ratify and approve the syllabi for Part-V YRC for students who joined in the academic year 2020–21 and onwards (**pp 2094-2101**).

20) FROM THE BOARD OF STUDIES IN PHYSICAL EDUCATION

Dr.K. Kathirvelpandian, Chairman, Board of studies in Physical Education, shall move and **Dr.S.V.Karthikeyan**, shall second the following resolution passed in the meeting of the Board of studies in Physical Education held on 06.05.2021.

- 20.1. Resolved to ratify and approve the syllabi for Part-V Physical education for students who joined in the academic year 2020–21 and onwards (**pp 2102-2109**).

21) FROM CONTROLLER OF EXAMINATIONS

Dr.V.Sriman Narayanan, Controller of Examinations (CoE), shall move and **Dr.S.Karuppusamy**, Deputy Controller of Examinations (DCoE), shall second the following resolutions:

- 21.1. Resolved to award “FIRST CLASS WITH DISTINCTION” as a class in all post-graduate programmes for students who joined the PG programmes from the academic year 2021–22 and obtain passing grades in all courses in first attempt and secure at least 75% marks or more.
- 21.2. Resolved to ratify the conduct of November 2020 and April 2021 semester examinations in online mode as per directions of Higher Education Department, Government of Tamilnadu following the guidelines of UGC

22) FROM DEAN (ACDEMICS)

Prof.S.Sivaramakrishnan, Dean (Academics), shall move and **Dr.I. Sahul Hamid**, (Dean (Planning and Development), shall second the following resolution:

22.1. Resolved that students may be allowed to transfer credits earned from Swayam against elective courses following the guidelines of UGC from the Academic year 2020-21.

IV. Any Other Subjects



Dr. R. Eswaran
Member Secretary



Dr. J. Suresh
Principal & Chairman

Department of Computer Science

Revised Curriculum

(Choice Based Credit system with Outcome Based Education)

Academic Year 2020-2021 onwards

III and IV Semester (B.Sc. Computer Science)

(Aided & SF stream)

Department of Computer science

Course Structure under CBCS & OBE Pattern with effect from the Academic Year 2020-21 Onwards.

SEMESTER-I

Part	category	Sub.code	Title of the paper	No of hours	credits	Int. marks	Ext. marks	Total marks
I	Language-1		Tamil / Hindi / Sanskrit	6	3	25	75	100
II	English-1		English-1	6	3	25	75	100
III	core-1	20U1DMC1	Programming in C	3	2	25	75	100
III	core-2	20U1DMC2	Digital computer fundamentals	3	2	25	75	100
III	Allied-1	20U1DAT1	Discrete mathematics	6	5	25	75	100
III	Practical-1	20U1DMCP1	C programming lab.	3	2	40	60	100
IV	VE & PE	20U1DVE1	Value education	3	3	25	75	100
			TOTAL	30	20			

SEMESTER - II

Part	category	Sub.code	Title of the paper	No of hours	credits	Int. marks	Ext. marks	Total marks
I	Language-2		Tamil/Hindi/Sanskrit	6	3	25	75	100
II	English2		English-1	6	3	25	75	100
III	core-3	20U2DMC3	Data structures and algorithms	3	2	25	75	100
III	core-4	20U2DMC4	Computer organization and architecture	3	2	25	75	100
III	Allied-2	20U2DAT2	Microprocessors 8086/88	6	5	25	25	100
III	Practical2	20U2DMCP2	Data structures lab using c	3	2	40	60	100
IV	EVS	20U2DES1	Environmental studies	3	3	25	75	100
			TOTAL	30	20			

SEMESTER - III

Part	category	Sub.code	Title of the paper	No of hours	credits	Int. marks	Ext. marks	Total marks
I	Language-3		Tamil /Hindi /Sanskrit	6	3	25	75	100
II	English-3		English-3	6	3	25	75	100
III	Core-5	20U3DMC5	Operating systems	5	5	25	75	100
III	SBE-1	20U3DSE1	Visual programming	2	2	25	75	100
III	Allied-3	20U3DAT3	Numerical methods	6	5	25	75	100
III	NME-1	20U3DNM1	Computer fundamentals	2	2	25	75	100
III	Core Practical-3	20U3DMCP3	Visual programming lab	3	2	40	60	100
III	Add-on course		Statistics with R Programming	2	2	50	50	100
	Self-study paper		Aptitude and Reasoning	--	2		100	100
			TOTAL	30	22			

SEMESTER - IV

Part	category	Sub.code	Title of the paper	No of hours.	credits	Int. marks	Ext. marks	Total marks
I	Language-4		Tamil/Hindi/Sanskrit	6	3	25	75	100
II	English-4		English-4 (SS)	6	3	25	75	100
III	Core-6	20U4DMC6	Linux & shell programming	5	5	25	75	100
III	SBE-2	20U4DSE2	Office automation	2	2	25	75	100
III	Allied- 4	20U4DAT4	Resource management techniques	6	5	25	75	100
III	NME-2	20U4DNM2	Introduction to Internet	2	2	25	75	100
III	Major Practical-4	20U4DMCP4	LINUX lab	3	2	40	60	100
III	Add-on course		Database Design using Microsoft Access	2	2	50	50	100
			Extension activity	---	1			
			TOTAL	30	23			

SEMESTER - V

Part	Category	Sub.code	Title of the paper	No of hours	Credits	Int. marks	Ext. marks	Total marks
III	Core-7	20U5DMC7	Programming in JAVA	5	5	25	75	100
III	Core-8	20U5DMC8	RDBMS	5	5	25	75	100
III	Core-9	20U5DMC9	Computer networks	5	5	25	75	100
III	Elective-1	20U5DME1	Data mining and data warehouse / E.Commerce Technology /computer graphics	4	3	25	75	100
III	Elective-2	20U5DME2	Programming in ASP/client server computing/Object oriented programming using C++	3	2	25	75	100
III	SBE-3	20U5DSE3	Android programming	2	2	25	75	100
III	Practical5	20U5DMCP5	Programming in JAVA lab	3	2	40	60	100
III	Practical6	20U5DMCP6	SQL & PL/SQL lab	3	2	40	60	100
			TOTAL	30	26			

SEMESTER-VI

Part	category	Sub. Code	Title of the paper	No of hours	Credits	Int. marks	Ext. marks	Total marks
III	Core-10	20U6DMC10	Web technology	5	5	25	75	100
III	Core-11	20U6DMC11	Software engineering	5	5	25	75	100
III	Core-12	20U6DMC12	Open source technology	5	5	25	75	100
III	Elective-3	20U6DME3	Multimedia systems /programming in PHP /Information security	4	3	25	75	100
III	Elective-4	20U6DME4	Programming in python/ software testing / Internet programming	3	2	25	75	100
III	SBE-4	20U6DSE4	Distributed Computing	2	2	25	75	100
III	Practical-7	20U6DMP7	Web technology lab	3	2	40	60	100
III	Practical8	20U6DMP8	Open source technology lab	3	2	40	60	100
III	Add-on course	20U6DMPRO	Project & viva-voce	2	2	50	50	100
			TOTAL	30	26	26		
			GRAND TOTAL	180	141			

List of Elective Papers:

<u>Elective-1:</u> A. Data mining and data warehouse B. E-commerce Technology C. Computer graphics	<u>Elective-2 :</u> D. Programming in ASP E. client server computing F. Object oriented programming using C++
<u>Elective -3:</u> G. Multimedia systems H. Programming in PHP I. Information security	<u>Elective-4:</u> J. Programming in python K. Software testing L. Internet programming

Blue print for the CIA(Internal) test

**Learning Outcome Based Education (LOBE) & Assessment
Formative – Blue Print**

Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO x	Up to K2/K3	2	K1 & K2	2	K1,K2	2 (K2&K2)	1(K2/K3)
2	CLO y	Up to K3/K4	2	K1 & K2	1	K2	2 (K3&K3)	2 (K3, K3/K4)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		2		2	2
Marks for each question			1		2		5	10
Total Marks for each section			4		6		10	20

Blue print for Summative Examinations
Learning Outcome Based Education (LOBE) & Assessment
Summative Examination – Blue Print
Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A		Section B		Section C (Open Choice)	Section D (Optional)
			Short Answers		(Either/or Choice)			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K2	1	K2	2	2 (K3&K3)	K3	-
2	CLO 2	Up to K3	1	K2	2	2 (K3&K3)	K3	1(K6)
3	CLO 3	Up to K4	1	K2	2	2 (K4&K4)	K4	-
4	CLO 4	Up to K4	1	K2	2	2 (K3&K3)	K4	-
5	CLO 5	Up to K5/K6	1	K2	2	2 (K5&K5)	K5	-
No. of Questions to be asked			5			10	5	1
No. of Questions to be answered			5			5	3	10
Marks for each question			2			7	10	10
Total Marks for each section			10			35	30	10

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented –Solving Problems

K4-Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	SectionC (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	--	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Evaluation Pattern Theory subjects:

	Components	Marks	Total Marks
Internal [Formative]	Test	10	25
	Assignment	5	
	Attendance/Quiz	5	
	Quiz/ Documentation/ Case lets/ ICT based assignments/ Mini Projects	5	
External [Summative]		75	75
Total Marks			100

Question Paper pattern for External examination - Theory (75 marks)

Section		Marks
A	Multiple Choice Questions (10 X 1 mark)	10
B	Short Answer questions (5 X 2 marks)	10
C	Either or Choice questions (5 X 5 marks)	25
D	Open Choice questions – 3 out of 5 (3 X 10 Marks)	30
	Total	75

Practical Subjects:

A candidate has to prepare an Algorithm / Procedure for the questions given during the examination.

The following list of parameters is taken into account for the evaluation of practical examination. *Total*

Marks: 100 (Internal: 40 marks, External: 60 Marks)

Parameters:**For Internal Marks:**

i. Average of two tests: -----	25
ii. Record Work: -----	10
iii. Seminar / Quiz: -----	5
Total:	40

For External Marks:

i. Aim, Procedure / Algorithm & Program: -----	15
ii. Coding & Compilation :-----	10
iii. Debugging :-----	15
iv. Results : -----	10
v. Viva: -----	10
Total:	60

Add-on courses

Evaluation pattern for Add-on courses:

Internal evaluation : 50 % marks
External evaluation : 50 %marks

Continuous Internal Assessment components	Marks
Assignment (3nos)/mini project	20 %
Paper presentation/seminar	15 %
Quiz	15 %
Total	50%

External examination duration: 2 hours

Question paper pattern

Part-A Multiple choice type 10 x 1 = 10 marks
Part- B Descriptive type [4 out of 7] 4 x 10 = 40 marks

Project Work:

The combined project shall be considered as an Add-On course and to be undertaken by all the students as an individual or as a team of two. Project work can be offered during the final semester of the student. It should be done in the Department computer laboratory under the supervision of their faculty guides.

The following list of parameters is taken into account for the evaluation of Project work and Viva-voce.
Total Marks: 100 (Internal: 50 marks, External: 50 Marks)

Parameters:

For Internal Marks:

Two review meetings : 2 x 15 = 30 Marks
Overall Performance : = 20 Marks

For External Marks:

Project Report : = 20 Marks
Project Demo & Presentation : = 15 Marks
Viva-Voce : = 15 Marks

Self-study paper :

This paper can be offered by all students of second year (III semester & IV semester) identified as an advanced learners on the basis of the marks obtained in the entrance test conducted during admission in the first year. The maximum marks for this course is 100 marks.

The various parameters is taken into account for the evaluation of this self study paper are:

*Assignment -25%, * project (or) innovative experiment -25%
*Viva-voce , paper presentation – 25% *Internal Test – 25 %

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II B.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Core-5	20U3DMC5	Operating system	5	5	25	75	100

Nature of Course			
Knowledge and skill	✓		Employability oriented
Skill oriented			Entrepreneurship oriented

COURSE OBJECTIVES :

This course is designed

- To familiarize with basic knowledge of computer operating Systems
- To learn about its Structure, functions and resource management.

Units	Operating Systems	Total Hours: 75	K-Level
Unit1	Introduction - History of operating system- Different kinds of operating system – Operating system concepts - System calls-Operating system structure.	15 hrs	Up to K2
Unit2	Processes and Threads: Processes - threads - thread model and usage - inter process communication.	15 hrs	Up to K3
Unit3	Scheduling - Memory Management: Memory Abstraction - Virtual Memory - Page replacement algorithms.	15 hrs	Up to K3
Unit4	Deadlocks: Resources- introduction to deadlocks - deadlock detection and recovery - deadlocks avoidance - deadlock prevention. Multiple processor system: multiprocessors - multi computers.	15 hrs	Up to K3
Unit5	Input / Output: principles of I/O hardware - principles of I/O software. Files systems: Files - directories - files systems implementation - File System Management and Optimization.	15 hrs	Up to K4

Books for Study:

1. Andrew S. Tanenbaum, "Modern Operating Systems", 2nd Edition, PHI private Limited, New Delhi, 2008.

Books for Reference :

1. William Stallings, "Operating Systems - Internals & Design Principles", 5th Edition, Prentice - Hall of India private Ltd, New Delhi, 2004.
2. Sridhar Vaidyanathan, "Operating System", 1st Edition, Vijay Nicole Publications, 2014.

Web resources:

1. <http://williamstallings.com/Extras/OS-Notes/notes.html>
2. https://www.tutorialspoint.com/operating_system/operating_system_tutorial.pdf
3. <https://lecturenotes.in/subject/56/operating-systems-os>

Rationale for Nature of the course:

In the recent days learning operating systems is essential to know the working functions of computers, to become a computer programmer and to ensure the designed programs that work to the strengths of a particular operating system. The theoretical knowledge helps to understand the concepts and working functions of an operating systems.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Seminar
- Assignment preparation
- Presentation with ICT tools □ Physical demonstrations.

Pedagogy:

The teaching methods includes Chalk and talk, PowerPoint, demonstrations, assignments and group discussions.

Lecture schedule:

Unit	Topics	Hrs	Mode
Unit I	Introduction - History of operating system	3	Chalk and talk, Quiz and assignment
	Different kinds of operating system –	4	
	Operating system concepts - System calls	4	
	Operating system structure.	4	
Unit II	Processes - threads -	5	Chalk and talk, Group discussion
	thread model and usage	5	
	- inter process communication.	5	
Unit III	Scheduling	5	Chalk and talk, Quiz and assignment
	Memory Management: Memory Abstraction	5	
	Virtual Memory - Page replacement algorithms.	5	
Unit IV	Deadlocks: Resources- introduction to deadlocks	3	PPT, Chalk and talk, Quiz and assignment
	deadlock detection and recovery	5	
	deadlocks avoidance - deadlock prevention	4	
	Multiple processor system: multiprocessors - multi computers.	3	
Unit V	Input / Output: principles of I/O hardware - principles of I/O software	5	PPT, Chalk and talk, Quiz and assignment
	Files systems: Files - directories - files systems implementation	5	
	File System Management and Optimization.	5	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Operating systems
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)
BLUE PRINT FOR INTERNAL ASSESSMENT – I

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

BLUE PRINT FOR INTERNAL ASSESSMENT – II

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K- Level		
1.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2	1(K4)
2.	CLO 4	Up to K 3	2	K1 & K2	1	K1	2	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

Learning Outcome Based Education & Assessment (LOBE)

Blue Print – Operating systems

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K-2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K-3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
3	CLO 3	Up to K-3	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4	CLO 4	Up to K-3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
5	CLO 5	Up to K-4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K2 Level)
		2 Questions from Unit-II (K3 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K2 Level)	1Question from Unit-IV (K3 Level)
		2 Questions from Unit-V (K4 Level)	1Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

COURSE OUTCOMES:

On the completion of the course the students will be able to

CLOs	COURSE OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CO-1	Understand the basic structures of Modern operating system and its functions and applications.	Up to K2
CO-2	Understand the concepts of Multi-process ,multiprogramming, threads and scheduling methods	Up to K3
CO-3	Acquire the knowledge of synchronization, dead lock and prevention methods.	Up to K3
CO-4	Demonstrate the design and management concepts of main memory, virtual memory along with issues and challenges.	Up to K4
CO-5	Understand the various types of I/O management and resource management techniques.	Up to K3

MAPPING OF COs WITH PSOs:

Course Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CO-1	3	1	1	2	1	1
CO-2	2	3	2	1	1	1
CO-3	2	3	1	1	1	2
CO-4	3	2	2	1	2	1
CO-5	2	2	2	3	2	1

3- Advanced Application

2- Intermediate

1- Introductory

Course Designer(s):

1. Er.J.Rajendran

2. Prof.J.Mayajothi

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II B.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	SBE-1	20U3DSE1	Visual Programming	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

COURSE OBJECTIVES:

The course is designed

- To impart the knowledge of computer programming with Visual GUI approach
- To learn the concept and controls of a front-end tool.

Units	TOPICS	Total Hours : 30	K-levels
Unit -1	Introduction Overview of the IDE - Managing forms in Visual Basic - The Visual Basic Language: Declaring Constants, Variables – Selecting variable types- Converting between data types - setting variable scope- verifying data types – declaring arrays & Dynamic arrays – Declaring Subroutines – Declaring functions – Handling strings – Converting strings to numbers and back again – Handling operators & operator precedence – Using if-else statements- Using select case –Looping – Handling higher math- Handling Dates and Times.	6 hrs	Up to K2
Unit-2	Controls Text Boxes and Rich text Boxes- command buttons – checkboxes & option buttons – list boxes and combo boxes – picture boxes and image controls – The timer control – The frame control – the label control – the shape control.	6 hrs	Up to K3
Unit-3	Menus & Toolbars Visual Basic Menus: adding a menu to a form – modifying & deleting menu items – creating sub menus – using Visual Basic predefined menus- Handling MDI forms & MDI child menus creating & displaying popup menus – Adding & deleting menu items at runtime— Toolbars, status bars, progress bars and cool bars.	6 hrs	Up to K3
Unit-4	Files & Data Base Concepts File handling and File Controls – Using DAO,RDO and ADO : Creating and managing databases with the visual data manager – creating a table - Adding a Data control – opening a database with the data control, Remote data control, ADO data control – connecting a databases using controls- working with database objects in code.	6 hrs	Up to K4

Unit-5	Active-x controls & Documents Creating an Active-x control – Designing Active-x control- Adding controls to an Active-x control- Registering an Active-x control – Creating an Active-x Document – Active-x Document dll vs EXEs – Testing an Active-x Document.	6 hrs	Up to K4

Books for Study:

Steven Holzner – “Visual Basic 6 Programming Black Book” - 16th Reprint Edition –Dream tech Press Publications

Books for Reference :

1. Petroutsos.E – “ Mastering Visual Basic 6” – Fifth edition, BPB Publications
2. Jerke .N - “ Visual Basic 6.0 – The Complete reference” – Nineteenth Reprint 2004, TataMcGraw Hill Publishing.
3. Gary Cornell- “VB 6 from the Ground up” – Second Reprint 1999-Tata-McGraw Hill Private Ltd.

Web resources:

1. <https://lecturenotes.in/m/17698-note-of-visual-basic-by-mageshkid?reading=true&continue=2&materialId=17698-note-of-visual-basic-by-magesh-kid>
2. https://www.csus.edu/indiv/s/scanland/mis15/index_htm_files/ch1.pdf

Rationale for Nature of the course:

This language allows programmers to create software interface and codes in an easy to use graphical environment. Visual Basic is the combination of different components that are used on forms having various parameters or components. On the one hand it allows programmers to develop windows based applications. So, learning this type of GUI oriented language will be more useful while establishing an opportunity for employment.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Seminar
- Assignment preparation
- Developing simple program segments
- Thinking and analysis on theoretical concepts

Pedagogy:

The teaching methods includes Chalk and talk, PowerPoint, demonstrations, assignments and group discussions.

Lecture schedule:

Unit	Topics	Hrs	Mode
Unit I	Overview of the IDE - Managing forms in Visual Basic - The Visual Basic Language: Declaring Constants, Variables – Selecting variable types-Converting between data types	1	Chalk and talk, Quiz and assignment
	setting variable scope- verifying data types – declaring arrays & Dynamic arrays – Declaring Subroutines – Declaring functions	2	
	Handling strings – Converting strings to numbers and back again – Handling operators & operator precedence	1	
	Using if-else statements- Using select case –Looping – Handling higher math- Handling Dates and Times.	2	
Unit II	Text Boxes and Rich text Boxes- command buttons – checkboxes & option buttons –	2	Chalk and talk, Group discussion
	– list boxes and combo boxes – picture boxes and image controls	2	
	The timer control – The frame control – the label control – the shape control.	2	
Unit III	Visual Basic Menus: adding a menu to a form – modifying & deleting menu items	2	Chalk and talk, Quiz and assignment
	– creating sub menus – using Visual Basic predefined menus- Handling MDI forms & MDI child menus	1	
	creating & displaying popup menus	1	
	Adding & deleting menu items at runtime-	1	
	Toolbars, status bars, progress bars and cool bars.	1	
Unit IV	File handling and File Controls – Using DAO,RDO and ADO : Creating and managing databases with the visual data manager –	2	PPT, Chalk and talk, Quiz and assignment
	creating a table - Adding a Data control – opening a database with the data control,	1	
	Remote data control, ADO data control	1	
	connecting a databases using controls- working with database objects in code.	2	
Unit V	Creating an Active-x control – Designing Active-x control- Adding controls to an Active-x control-	2	PPT, Chalk and talk, Quiz and assignment
	Registering an Active-x control – Creating an Active-x Document	2	
	Active-x Document dll vs EXEs – Testing an Active-x Document.	2	

Learning Outcome Based Education & Assessment (LOBE)

Blue Print – Visual programming

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

BLUE PRINT FOR INTERNAL ASSESSMENT – I

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K- Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

BLUE PRINT FOR INTERNAL ASSESSMENT – II

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K- Level		
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Visual programming
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K- Level		
1	CLO 1	Up to K-2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K-3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
3	CLO 3	Up to K-4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4	CLO 4	Up to K-3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
5	CLO 5	Up to K-4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K2 Level)
		2 Questions from Unit-II (K3 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K2 Level)	1Question from Unit-IV (K3 Level)
		2 Questions from Unit-V (K4 Level)	1Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

COURSE OUTCOMES:

On the completion of the course the students will be able to

CLOs	COURSE OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CO-1	Understand the basic concept of visual and front-end tool application	Up to K2
CO-2	Understand the concepts of MDI forms , Menu and frame controls	Up to K2
CO-3	Acquire the knowledge and creation of tool bars and its properties.	Up to K4
CO-4	Demonstrate the design and management of tables with ADO – DAO data controls.	Up to K4
CO-5	Understand the concepts and usage of Active-X ,its controls and testing of Active-x documents.	Up to K3

MAPPING OF COs WITH PSOs:

	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CO-1	3	1	1	2	1	1
CO-2	2	3	2	1	1	1
CO-3	2	3	1	1	1	2
CO-4	3	2	2	1	2	1
CO-5	2	2	2	3	2	1

3- Advanced Application

2- Intermediate

1- Introductory

Course Designer(s):

- 1. Prof. R.Umasankari**
- 2. Prof. P.Sridevi**
- 3. Prof. J.Mayajothi**

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II B.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Allied-3	20U3DAT3	Numerical methods	5	6	25	75	100

Nature of Course			
Knowledge and skill	✓		Employability oriented
Skill oriented			Entrepreneurship oriented

COURSE OBJECTIVES :

This course is designed

- * To impart the knowledge of computer arithmetic operations and
- * To learn various numerical computational method

Units	Numerical methods	Total Hours: 90	K-levels
Unit -I	Algebraic and Transcendental Equations: Errors in numerical computation Iteration method-Bisection method-Regula-Falsi method-Newton-Raphson method-Horner's method.	18 hrs	Up to K2
Unit-2	Simultaneous Equations: Introduction-Simultaneous equations-Back substitution-Gauss Elimination method-Gauss –Jordan Elimination method Calculation of Inverse of a matrix- Iterative methods-Gauss Jacobi Iteration method-Gauss seidal Iteration method	18 hrs	Up to K3
Unit-3	Interpolation & Introduction: Newton's interpolation Formulae Central difference Interpolation formulae-Gauss forward, Gauss backward, Lagrange's interpolation formulae- Divided differences Newton's divided difference formula-Inverse Interpolation.	18 hrs	Up to K3
Unit-4	Numerical Differentiation and Integration: Introduction-Derivates using Newton's forward difference formula-Derivates using Newton's backward difference formula- Numerical Integration- Simpson's 1/3 rd rule-Simpson's 3/8 th rule.	18 hrs	Up to K4
Unit-5	Numerical Solution of Ordinary Differential Equations: Introduction-Taylor series method-Picard's method-Euler's method Range-kutta method of second, third, fourth order.	18 hrs	Up to K4

Books for Study:

1.Numerical Methods, Second Edition, S.Arumugam, A.Thangapandi Issac, A.Somasundaram, SCITECH publications, 2009.

Unit I : Chapter-3

Unit II : Chapter-4 (excluding Relation method and its related problems)

Unit III : Chapter-7 (Sections: 7.0, 7.1, 7.2((i), (ii) and related problems); 7.3,7.4,7.5,7.6) Unit IV : Chapter-8 (Sections: 8.0,8.1,8.2 related problems, 8.5 (excluding Weddles rule, Booles rule, Romberg's method and related problems))
Unit V : Chapter-10 (Sections : 10.0,10.1,10.2,10.3(excluding modified Euler's method & its related problems) 10.4,10.5,10.6)

Books for Reference :

1. Mathews J.H. Numerical Method for Maths, Science and Engineering; PHI, New Delhi, 2001.
2. Iqbal H. Khan & Q. Hassan Numerical Methods for Engineers and Scientist - Galgotia Publications (P) Ltd., New Delhi - 1997.
3. M.K. Jain, S.R.K. Iyengar & R.K. Jain - Numerical Methods for Scientific and Engineering Computation - New Age International(P) Ltd., New Delhi - 1996

Web resources:

1. <https://www.math.ust.hk/~machas/numerical-methods.pdf>
2. <http://www.mi.sanu.ac.rs/~gvm/Teze/Numerical%20methods%20In%20Computational%20Engineering.pdf>

Rationale for Nature of the course:

This course Numerical methods is needed to solve mathematical problems that lead to equations that cannot be solved analytically with simple formulas. Examples are solutions of large systems of algebraic equations, evaluation of integrals, and **solution** of differential equations. Knowledge gained with this course may be very useful to learn datamining techniques with AI.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Seminar
- Assignment preparation
- Thinking and analysis on theoretical concepts

Pedagogy:

The teaching methods includes Chalk and talk, PowerPoint, demonstrations, assignments and solving many assignment problems.

Lecture schedule:

Unit	Topics	Hrs	Mode
Unit I	Algebraic and Transcendental Equations: Errors in numerical computation Iteration method	6	Chalk and talk, Quiz and assignment
	Bisection method-Regula-Falsi method	6	
	Newton-Raphson method-Horner's method.	6	
Unit II	Simultaneous Equations: Introduction-Simultaneous equations-Back substitution-Gauss Elimination methodGauss	6	Chalk and talk, Group discussion
	Jordan Elimination method Calculation of Inverse of a matrix- Iterative methods	6	
	Gauss Jacobi Iteration method-Gauss seidal Iteration method	6	
Unit III	Interpolation & Introduction: Newton's interpolation Formulae-Central difference Interpolation formulae- -	6	Chalk and talk, Quiz and assignment
	Gauss forward, Gauss backward, Lagrange's interpolation formulae	5	
	Divided differences-Newton's divided difference formulaInverse Interpolation.	6	
Unit IV	Numerical Differentiation and Integration: Introduction- Derivates using Newton's forward difference formula- -	6	PPT, Chalk and talk, Quiz and assignment
	Derivates using Newton's backward difference formula- Numerical Integration-	6	
	Simpson's $1/3^{\text{rd}}$ rule-Simpson's $3/8^{\text{th}}$ rule.	6	
Unit V	Numerical Solution of Ordinary Differential Equations: Introduction	6	PPT, Chalk and talk, Quiz and assignment
	Taylor series method-Picard's method-Euler's method	6	
	Range-kutta method of second, third, fourth order.	6	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Numerical methods
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

BLUE PRINT FOR INTERNAL ASSESSMENT – I

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K- Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2(K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

BLUE PRINT FOR INTERNAL ASSESSMENT – II

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K- Level		
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

Learning Outcome Based Education & Assessment (LOBE)

Blue Print – Numerical methods

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K-2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K-3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
3	CLO 3	Up to K-4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4	CLO 4	Up to K-3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
5	CLO 5	Up to K-4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K2 Level)
		2 Questions from Unit-II (K3 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K2 Level)	1Question from Unit-IV (K3 Level)
		2 Questions from Unit-V (K4 Level)	1Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

COURSE OUTCOMES:

On the completion of the course the students will be able to

COs	COURSE OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CO-1	Understand the ideas related with computer arithmetic using numerical method concepts.	Up to K2
CO-2	Understand the concepts of iterative method and algorithm	Up to K3
CO-3	Demonstrate the concepts of interpolation and regression	Up to K3
CO-4	Demonstrate the concepts of Simpson's rule and integration formulae	Up to K4
CO-5	Acquire the knowledge related with numerical differentiation and integration.	Up to K3

MAPPING OF COs WITH PSOs:

Course Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CO-1	1	1	1	2	1	1
CO-2	2	3	2	1	1	1
CO-3	2	3	1	1	1	2
CO-4	3	2	2	1	2	1
CO-5	2	2	2	3	2	1

3- Advanced Application

2- Intermediate

1- Introductory

Course Designer(s):

1. Prof.P.Sridevi

2. Prof.J.Mayajothi

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II UG				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	NME-1	20U3DNM1	Computer fundamentals	2	2	25	75	100

Nature of Course			
Knowledge and skill	✓		Employability oriented
Skill oriented			Entrepreneurship oriented

COURSE OBJECTIVES:

Units	TOPICS	Total Hours: 30	K-Levels
Unit -1	Characteristics of Computers Block Diagram - Problem Solving Using Computers - Classification of Computers - Computing Models.	6 hrs	Up to K2
Unit-2	Internal Representation Representation of Characters, Integers & Fractions in Computers	6 hrs	Up to K2
Unit-3	Number conversions Hexadecimal Binary – Octal - Decimal - Programming Languages.	6 hrs	Up to K2
Unit-4	Components Functional Components of Computers - Input - Output Units	6 hrs	Up to K2
Unit-5	Components - Memory – CPU.	6 hrs	Up to K2

Books for Study:

V. Raja Raman - “Fundamentals of Computers”- II Edition – PHI – 1998.

Books for Reference :

1. Basantra – “Computers Today” - Galgotia Publications.
2. Roger-Hunt – “Computers & Commonsense “ – BPB pub.

Web resources:

1. file:///C:/Users/cs/Downloads/FundamentalsofComputerStudies.pdf
2. https://www.tutorialspoint.com/computer_fundamentals/computer_fundamentals_tutorial.pdf

Rationale for Nature of the course:

This course deals with basic understanding of computers and software and it has an easier procedures for solving problems they may have encountered. For example, someone with experience of getting an error while logging in may realize the exact reasons and can solve it by an individual.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Seminar
- Assignment preparation
- Discussion with on-hand training.

Pedagogy:

The teaching methods includes Chalk and talk, PowerPoint, demonstrations, assignments and on-hand training.

Lecture schedule:

Unit	Topic	Hrs	Mode
Unit I	Block Diagram	1	Chalk and talk, Quiz and assignment
	Problem Solving Using Computers	2	
	Classification of Computers	1	
	Computing Models	2	
Unit II	Representation of Characters,	3	Chalk and talk, Group discussion
	Integers & Fractions in Computers	3	
Unit III	Hexadecimal Binary	2	Chalk and talk, Quiz and assignment
	Octal - Decimal	2	
	Programming Languages	2	
Unit IV	Functional Components of Computers	3	Chalk and talk, Quiz and
	Input - Output Units	3	
Unit V	Memory	3	Chalk and talk, Quiz and
	CPU.	3	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Computer fundamentals (CIA-I & II)
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

CLOs	K- Level	Section A		Section B		Section C	
		Short Answers		(Either/or Choice)		(Open Choice)	
		No. of Questions	K- Level	No. of Questions	K- Level	No. of Questions	K- Level
CLO x	Up to K2	1	K1	1	K2/K2	1	K1
CLO y	Up to K2	2	K1	1	K2/K2	2	K1
No. of Questions to be asked		3		2		3	
No. of Questions to be answered		3		2		2	
Marks for each question		2		7		10	
Total Marks for each section		6		14		20	

Distribution of Section-wise Marks with K Levels (CIA I & II)

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	6	-	30	-	36	56.25	100
K2	-	28	-	-	28	43.75	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	6	14	30	-	64	100.00	100%

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Computer fundamentals
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Un its	CLOs	K-Level	Section – A		Section – B		Section – C	
			Short Answers		(Either / or Choice)		(Open Choice)	
			No. of Questions	K- Level	No. of Questions	K- Level	No. of Questions	K- Level
1	CLO 1	Up to K2	1	K1	1	K2/K2	1	K1
2	CLO 2	Up to K2	1	K1	1	K2/K2	1	K1
3	CLO 3	Up to K2	1	K1	1	K2/K2	1	K1
4	CLO 4	Up to K2	1	K1	1	K2/K2	1	K1
5	CLO 5	Up to K2	1	K1	1	K2/K2	1	K1
No. of Questions to be asked			5		5		5	
No. of Questions to be answered			5		5		3	
Marks for each question			2		7		10	
Total Marks for each section			10		35		30	

Distribution of Section-Wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (No Choice)	Section D (No Choice)	Total Marks	% of Marks (without choice)	Consolidated
K1	10	-	50	-	60	46.15	100
K2	-	70	-	-	70	53.85	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	10	35	50	-	130	100.00	100

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

COURSE OUTCOMES:

On the completion of the course the students will be able to

COs	COURSE OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CO-1	To learn the function of computer using block diagram	K1
CO-2	To know the various types of computer models and its usage	Up to K2
CO-3	Learn the techniques of problem solving using computers	Up to K2
CO-4	Learn number systems and its conversion methods	Up to K4
CO-5	Know about various primary and secondary components of computers.	Up to K3
CO-6	Know about the types of memory and functions of CPU	Up to K3

MAPPING OF COs WITH PSOs:

Course Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CO-1	3	3	3	2	3	2
CO-2	1	2	2	1	2	1
CO-3	3	3	3	3	3	2
CO-4	2	2	3	1	2	3
CO-5	2	2	3	2	2	3
CO-6	3	3	3	2	3	2

3- Advanced Application

2- Intermediate

1- Introductory

Course Designer(s):

1. Prof. R.Umasankari

2. Prof.P.Sridevi.

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II B.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	practical-3	20U3DMCP3	Visual programming Lab	2	3	40	60	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

COURSE OBJECTIVES :

- To impart computer programming knowledge using Visual Basic language with objectoriented programming technique.
- To teach how to deign, code, debug and test the programs using Visual basic.

List of Programmes.

1. Write a Program to demonstrate the cut, copy & paste operations.
2. Write a Program to demonstrate the find & replace operations.
3. Write a Program to create MDI forms.
4. Write a Program to open a file using file, dir& drive list boxes.
5. Write a Program to expand & shrink the picture at runtime.
6. Write a Program to demonstrate Scrollbar.
7. Write a Program to demonstrate Checkbox & Option button.
8. Write a Program to animate a picture.
9. Write a Program to add items to menu editor at runtime.
10. Write a program to demonstrate toolbar, cool bar & status bar.
11. Write a Program to demonstrate progress bar.
12. Write a Program to simulate the calculator.
13. Write a Program to process student mark list using data control.
14. Write a Program to generate a data report.
15. Write a Program to encrypting and decrypting a file.

COURSE OUTCOMES:

On the completion of the course the students will be able to

COs	COURSE OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CO-1	Construct the logic using algorithms for a given problem and develop programs using the commands and available functions in VB	Up to K2
CO-2	Develop programs to demonstrate the creation of status bar, tool bar and progress bar	Up to K4
CO-3	Construct programs to process specific application programs using data control	Up to K3
CO-4	Compose programs to generate reports using report writer	Up to K4
CO-5	Develop programs to perform file related operations.	Up to K3

MAPPING OF COs WITH PSOs:

Course Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CO-1	3	1	2	1	1	1
CO-2	2	3	2	1	1	1
CO-3	2	2	2	1	1	2
CO-4	2	2	2	1	1	1
CO-5	2	1	2	3	2	1

3- Advanced Application

2- Intermediate

1- Introductory

Course Designer(s):

1. Prof.P.Sridevi

2. Prof.J.Mayajothi

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II B.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Add-on course		Statistics with R Programming	2	2	50	50	100

Nature of Course			
Knowledge and skill	✓		Employability oriented
Skill oriented			Entrepreneurship oriented

COURSE OBJECTIVES :

- To impart computer programming knowledge using R programming language with object oriented programming technique.
- To teach how to apply the R programming from a statistical perspective.

Units	TOPICS	Total Hours: 30
Unit -1	Introduction-How to run R- R Sessions- and Functions- Basic Math- Variables- Data Types- Vectors- Conclusion- Advanced Data Structures- Data Frames- Lists- Matrices- Arrays- Classes.	6 hrs
Unit-2	R Programming Structures- Control Statements- Loops- – Looping Over Nonvector Sets-- If-Else- Arithmetic- and Boolean Operators and values- Default Values for Argument- Return Values- Deciding Whether to explicitly call return- Returning Complex Objects- Functions are Objective- Recursion- A Quicksort Implementation-Extended Extended Example: A Binary Search Tree.	6 hrs
Unit-3	Doing Math and Simulation in R- Math Function- Extended Example Calculating Probability- Cumulative Sums and Products-Minima and Maxima- Calculus- Functions for Statistical Distribution- Sorting	6 hrs
Unit-4	Linear Algebra Operation on Vectors and Matrices- Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains- Set Operation- Input /out put- Accessing the Keyboard and Monitor- Reading and writer File	6 hrs
Unit-5	Graphics- Creating Graphs- The Workhorse of R Base Graphics- the plot() Function – Customizing Graphs- Saving Graphs to Files.	6 hrs

TEXT BOOKS:

- 1) The Art of R Programming- A K Verma- Cengage Learning.
- 2) R for Everyone- Lander- Pearson
- 3) The Art of R Programming- Norman Matloff- No starch Press.

REFERENCE BOOKS:

- 1) R Cookbook- Paul Teetor- Oreilly.
- 2) R in Action- Rob Kabacoff- Manning

COURSE OUTCOMES:

On the completion of the course the students will be able to

COs	COURSE OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CO-1	Understand the logic and basic functions and sessions of R programming	Up to K2
CO-2	Develop programs to demonstrate the creation of complex objects, Recursion and binary search algorithm.	Up to K3
CO-3	Construct programs to process specific application programs using functions of R programming using statistical distribution	Up to K3
CO-4	Compose programs to generate vector cross products and distribution of Markov chains.	Up to K4
CO-5	Develop programs to generate graphs and customising graphs.	Up to K3

MAPPING OF COs WITH PSOs:

Course Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CO-1	2	2	2	1	1	1
CO-2	2	2	2	1	1	2
CO-3	2	2	2	1	1	2
CO-4	2	2	2	1	1	2
CO-5	2	1	2	3	2	1

3- Advanced Application

2- Intermediate

1- Introductory

Course Designer(s):

1.Prof.R.Umasankari

2.Dr.T.Sree Ram kumr

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II B.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III & IV	Self Study Paper		Aptitude and Reasoning	2	2	50	50	100

COURSE OBJECTIVES :

This course is designed

- To improve the talents and knowledge to offer an efficient ,objective comparisons while attending the competitive examinations.
- To prepare the students for Having high reasoning skills which will help them in education, workand to maintain interpersonal relationships.

Units	TOPICS	Total Hours: 30 hrs.
Unit -I	Numbers: Classification of numbers – Test of divisibility – Unit digit – HCF and LCM –Progression – Simplification – Averages	6 hrs
Unit-2	Simple interest and compound interest – Problems related to permutation and combination - Percentage	6 hrs
Unit-3	Time and work – Time, Speed and distance – Profit or loss	6 hrs
Unit-4	Reasoning (Analytical and logical): Odd man out – Word series – Number series – Direction test – Blood relationship – Coding and decoding – Seating arrangements	6 hrs
Unit-5	Data sufficiency - Data interpretation	6 hrs

Books for Reference:

1. Dinesh Khattar-The Pearson guide to quantitative aptitude for competitive examinations.
2. Dr. Agarwal.R.S – Quantitative Aptitude for Competitive Examinations, S.Chand and Company Limited
3. Dr. Agarwal.R.S - A ModernApproach to Logical Reasoning, S Chand & Co,
4. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata Mcgraw Hill, 4th Edition

Web Resources:

1. <http://fw.freshersworld.com/placementweek/papers.asp>
2. <https://www.youtube.com/watch?v=UceRXH7PXGE&list=PLXjJ5c4vskp6yidDJsNttEQwng8tu6Lo>
3. <https://www.youtube.com/watch?v=5O6ZnVoqwl4&list=PLG4bwc5fqzgfMh4YFDnv7fttM0RIKiUQ>

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II B.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Core -6	20U4DMC6	Linux & shell programming	5	5	25	75	100

Nature of Course			
Knowledge and skill	✓		Employability oriented
Skill oriented			Entrepreneurship oriented

COURSE OBJECTIVES :

This course is designed

- To understand and make effective use of Linux utilities and
- Shell scripting language (bash) to solve problems.

Units	TOPICS	Total Hours:75	K-Levels
Unit -1	Introduction to Linux : operating system and Linux - History of Linux and Unix - Linux overview - Linux Distributions - Vi editors.	15 hrs	Up to K2
Unit-2	Shell - comparison of Shells - working in the shell - Learning Basic Commands - Compiler and interpreter differences - various directories - Drilling deep into process management, job control and Automation.	15 hrs	Up to K3
Unit-3	Text processing - Text filtering Tools - working with commands. - Logical operators. - local variables and its scope - working with arrays	15 hrs	Up to K3
Unit-4	Tricks with shell scripting - interactive shell scripts - The here document and << operator - sort command - WC command - file handling - Debugging -	15 hrs	Up to K3
Unit-5	Automating Decision - Making in scripts - Automating repetitive tasks - working with Functions.	15 hrs	Up to K4

Books for Study:

1. The Complete Reference LINUX - Richard L. Petersen, McGraw Hill,
2. LINUX shell scripting by Ganesh Naik, Packt Publishing Ltd.,

Books for Reference :

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.
3. UNIX Network Programming, W.R. Stevens, PHI.
4. UNIX for Programmers and Users, 3rd Edition, Graham Glass, King Ables, Pearson Education

Web resources:

1. https://www.kau.edu.sa/files/830/files/60761_linux.pdf
2. http://www.crectirupati.com/sites/default/files/lecture_notes/LINUX%20FINAL%20NOTESconverted.pdf

Rationale for Nature of the course:

Now a days LINUX is one of the most widely used operating system. Knowledge of LINUX operating system is essential as it provides many features such as multitasking, multiuser, security etc. These features are mainly used in both server and workstation systems. So, this course will enable the students to inculcate the basics of LINUX operating system, writing shell scripts.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Seminar
- Assignment preparation
- Scientific discussion
- Thinking and analysis on theoretical concepts

Pedagogy:

The teaching methods includes Chalk and talk, PowerPoint, demonstrations, assignments and group discussions.

Lecture schedule:

Unit	Topics	Hrs	Mode
Unit I	Introduction to Linux : operating system and Linux	3	Chalk and talk, Quiz and assignment
	History of Linux and Unix	2	
	- Linux overview - Linux Distributions	5	
	- Vi editors.	5	
Unit II	Shell - comparison of Shells - working in the shell	3	Chalk and talk, Group discussion
	- Learning Basic Commands	3	
	Compiler and interpreter differences - various directories	3	
	- Drilling deep into process management	3	
	job control and Automation	3	
Unit III	Text processing - Text filtering Tools	5	Chalk and talk, Quiz and assignment
	working with commands. - Logical operators	5	
	- local variables and its scope	2	
	working with arrays	3	
Unit IV	Tricks with shell scripting - interactive shell scripts	5	PPT, Chalk and talk, Quiz and assignment
	The here document and << operator - sort command	5	
	WC command - file handling - Debugging	5	
Unit V	Automating Decision - Making in scripts	5	PPT, Chalk and talk, Quiz and assignment
	Automating repetitive tasks	5	
	working with Functions	5	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – LINUX & shell programming
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)
BLUE PRINT FOR INTERNAL ASSESSMENT – I

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

BLUE PRINT FOR INTERNAL ASSESSMENT – II

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
2.	CLO 4	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – LINUX & shell programming
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K-2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K-3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
3	CLO 3	Up to K-3	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4	CLO 4	Up to K-3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
5	CLO 5	Up to K-4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K2 Level)
		2 Questions from Unit-II (K3 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K2 Level)	1Question from Unit-IV (K3 Level)
		2 Questions from Unit-V (K4 Level)	1Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

COURSE OUTCOMES:

On the completion of the course the students will be able to

COs	COURSE OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CO-1	Understand the structure of LINUX operating system and the editors used for developing shell programs.	Up to K2
CO-2	Understand the concepts of shell process and management, control of compiler and interpreters.	Up to K3
CO-3	Demonstrate the development of text formatting and filtering tools related programs.	Up to K3
CO-4	Demonstrate the debugging and file handling operations of Linux OS.	Up to K4
CO-5	Acquire the knowledge related with functions ,control loops etc.	Up to K3

MAPPING OF COs WITH PSOs:

Course Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CO-1	1	1	1	2	1	1
CO-2	2	3	2	1	1	1
CO-3	2	3	1	1	1	2
CO-4	3	2	2	1	2	1
CO-5	2	2	2	3	2	1

3- Advanced Application

2- Intermediate

1- Introductory

Course Designer(s):

1. Er.J.Rajendran

2. Dr.T.Sree ram kumar

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II B.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	SBE-2	20U4DSE2	Office Automation	2	2	25	75	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented			Entrepreneurship oriented	

COURSE OBJECTIVES:

This course is designed

- To learn the basic concepts of Word processing tool
- To learn commands and its usage with syntax.

Units	TOPICS	Total Hours: 30 hrs.	K-Levels
Unit -I	MS Word: Introduction to Microsoft Office 2007-Word Processing & Microsoft Word-Introduction to Word Processing-Some Important Terms of Word Processing Starting WordMicrosoft Word Screen-	6 hrs	Up to K2
Unit-2	MS Word : File Menu-Edit Menu-View Menu-Insert Menu Format Menu Tools MenuTable Menu-Window Menu-Help Menu-Formatting the Text- Alignment of Text-Appling FontsSize of Text-Font of the Text-Color of the Text.	6 hrs	Up to K3
Unit-3	MS Excel: Working with Spreadsheets- opening, Saving files, setting Margins, Converting files to different formats(importing, exporting, sending files to others), Spread sheet addressing - Rows, Columns & Cells, Referring Cells & Selecting Cells – Shortcut Keys. Entering & Deleting Data- Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, Highlighting values,	6 hrs	Up to K3
Unit-4	MS Excel: Find, Search & replace, Inserting Data, Insert Cells, Column, rows & sheets, Symbols, Formatting Spreadsheets- Labelling columns & rows, Formatting- Cell, row, column & Sheet, Category - Alignment, Font, Border & Shading, Hiding/ Locking Cells,. Working with sheets – Sorting, Filtering, Validation, Consolidation, and Subtotal. Creating Charts - Drawing.	6 hrs	Up to K4

Unit-5	MS Power point: Introduction to presentation – Opening new presentation, Different presentation templates, Setting backgrounds, Selecting presentation layouts. Creating a presentation - Setting Presentation style, Adding text to the Presentation. Formatting a Presentation - Adding style, Color, Adding Header & Footer, Slide Background, Slide layout. Adding Effects to the Presentation- Setting Animation & transition effect.	6 hrs	Up to K4

Books for Study:

1. Vikas Gupta “IT Tools and Applications”- -Dreamtech Press-First edition-2003.

Books for Reference :

1. Microsoft Office 2019 For Dummies by Wallece Wang- Wiley publication.
2. Office 2016 All-in-One For Dummies by Peter Weverka , A Wiley Publisher.

Web resources:

1. http://www.tndte.gov.in/site/wp-content/uploads/2016/07/COA_SYLLABUS.pdf
2. <https://www.msuniv.ac.in/images/econtent/6.Computer%20%20Fundamentals%20and%20Office%20Automation.pdf>

Rationale for Nature of the course:

Usage of office automation system reduces manual effort and store a large amount of data in a small space. They not only streamline day-to-day tasks but also speed up information storage and retrieval. So, this course will help the learners to be more familiarize in DTP related work.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Seminar
- Assignment preparation
- Thinking and analysis on theoretical concepts

Pedagogy:

The teaching methods includes Chalk and talk, PowerPoint, demonstrations, assignments and group discussions.

Lecture schedule:

Unit	Topic	Hrs	Mode
Unit I	Introduction to Microsoft Office 2007-Word Processing	1	Chalk and talk, Quiz and assignment
	Microsoft Word-Introduction to Word Processing	2	
	Some Important Terms of Word Processing Starting Word	2	
	Microsoft Word Screen	1	
Unit II	File Menu-Edit Menu-View Menu-Insert Menu Format Menu Tools	2	Chalk and talk, Group discussion
	Menu Table Menu-Window Menu-Help Menu	1	
	Formatting the Text- Alignment of Text	1	
	Applying Fonts-Size of Text-Font of the Text	1	
	Color of the Text	1	
Unit III	Working with Spreadsheets- opening, Saving files, setting Margins,	2	Chalk and talk, Quiz and assignment
	Converting files to different formats(importing, exporting, sending files to others), Spread sheet addressing - Rows, Columns & Cells,	2	
	Referring Cells & Selecting Cells – Shortcut Keys. Entering & Deleting Data-	1	
	Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, Highlighting values,	1	
Unit IV	Find, Search & replace, Inserting Data, Insert Cells, Column, rows & sheets, Symbols, Formatting Spreadsheets- —	2	PPT, Chalk and talk, Quiz and assignment
	Labelling columns & rows, Formatting- Cell, row, column & Sheet, Category	2	
	Alignment, Font, Border & Shading, Hiding/ Locking Cells. Working with sheets	1	
	Sorting, Filtering, Validation, Consolidation, and Subtotal. Creating Charts - Drawing.	1	
Unit V	Introduction to presentation – Opening new presentation, Different presentation templates, Setting backgrounds, Selecting presentation layouts.	2	PPT, Chalk and talk, Quiz and assignment
	Creating a presentation - Setting Presentation style, Adding text to the Presentation.	1	
	Formatting a Presentation - Adding style, Color, Adding Header & Footer, Slide Background, Slide layout.	2	
	Adding Effects to the Presentation- Setting Animation & transition effect.	1	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Office automation
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)
BLUE PRINT FOR INTERNAL ASSESSMENT – I

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

BLUE PRINT FOR INTERNAL ASSESSMENT – II

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
2.	CLO 4	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

Learning Outcome Based Education & Assessment (LOBE)

Blue Print – Office Automation

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K-2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K-3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
3	CLO 3	Up to K-4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4	CLO 4	Up to K-3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
5	CLO 5	Up to K-4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K2 Level)
		2 Questions from Unit-II (K3 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K2 Level)	1Question from Unit-IV (K3 Level)
		2 Questions from Unit-V (K4 Level)	1Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

COURSE OUTCOMES:

On the completion of the course the students will be able to

COs	COURSE OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CO-1	Understand the concepts of word processing and related software platform	Up to K2
CO-2	Explore the commands related with formatting text ,exporting and importing messages into the word document	Up to K4
CO-3	Know the procedures to use the various fonts and change the font colours.	Up to K3
CO-4	Understand the concepts of spread sheet and related menus and command used for creating various sheets.	Up to K4
CO-5	Know the procedures to format the cells and cell related operations	Up to K3
CO-6	Understand the procedures to create the PowerPoint slides and its related functions and animated picture insertion	Up to K3

MAPPING OF COs WITH PSOs:

Course Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CO-1	3	3	3	2	3	2
CO-2	1	2	2	1	2	1
CO-3	3	3	3	3	3	2
CO-4	2	2	3	1	2	3
CO-5	2	2	3	2	2	3
CO-6	3	3	3	2	3	2

3- Advanced Application

2- Intermediate

1- Introductory

Course Designer(s):

1. Er.J.Rajendran

2. Prof.P.Sridevi

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II B.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Allied-4	20U4DAT4	Resource Management techniques	5	6	25	75	100

Nature of Course			
Knowledge and skill	✓		Employability oriented
Skill oriented			Entrepreneurship oriented

COURSE OBJECTIVES :

- To impart the knowledge of Linear programming, integer programs and queueing models.
- Learning the various problems and methods to solve mathematical models that represents real-world problems.

Units	Topics	Total Hours: 90 hrs.	K-Levels
Unit -I	Linear Programming Problem – I Mathematical Formulation of the problem – Graphical Solution – Introduction- Graphical Solution Method – Some exceptional cases- General L.P.P. – Canonical and Standard forms of L.P.P.	18 hours	Up to K2
Unit-2	Linear Programming Problem – II Simplex Method – Introduction – Fundamental Properties of Solutions – The computational procedure – Use of Artificial Variable.	18 hours	Up to K3
Unit-3	Transportation and Assignment problem Transportation Problem – Introduction – General Transportation Problem – The transportation table – Solution of a Transportation problem – Finding an initial basic feasible solution – Test for optimality – Transportation Algorithm (MODI method). Assignment Problem – Introduction – Mathematical formulation of the problem – The assignment method – Special cases in assignment problems – A typical assignment problem – The traveling salesman problem.	18 hours	Up to K4
Unit-4	Game Theory Introduction – Two-person zero-sum games – Some basic terms – The MaxminMinimax principle – Games without Saddle points-mixed strategies – Graphic solution of 2 x n and m x 2 games – Dominance property.	18 hours	Up to K3
Unit-5	Network Scheduling Introduction Network and basic components – Logical sequencing – Rules of network Construction – Critical path analysis – Distinction between PERT and CPM.	18 hours	Up to K3

Books for Study:

Kanti Swarup, P.K. Gupta, Man Mohan – “Operations Research” – 18th edition, Sultan Chand & Sons Educational Publishers, New Delhi. **Chapters:**

Unit – I : 2.1 – 2.3, 3.1-3.5

Unit – II : 4.1-4.4

Unit – III: 10.1, 10.2, 10.5, 10.8-10.10, 10.13, 11.1-11.5, 11.7.

Unit – IV : 7.1-7.7.

Unit – V : 25.1-25.4, 25.6, 25.8.

Books for Reference :

1. Hamdy A. Taha – “Operations Research an Introduction” – PHI, 8th edition.

2. S.D. Sharma – “Operations Research” – 12th edition, Kedar Nath Ram Nath & Co Publishers, Meerut.

Web resources:

1. [https://drive.google.com/file/d/13l4Cd61gbhx_fWpyizZfDHI9mEEQ-](https://drive.google.com/file/d/13l4Cd61gbhx_fWpyizZfDHI9mEEQ-Btd/view2)

[Btd/view2.https://web.itu.edu.tr/topcuil/ya/OR.pdf](https://web.itu.edu.tr/topcuil/ya/OR.pdf)

Rationale for Nature of the course:

Resource management technique is the process of planning, scheduling, and allocating organizational and project **resources** in the best possible way. By Learning this course learners will gain the knowledge to solve the various problems and methods of mathematical models that represents real-world problems.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Seminar
- Assignment preparation
- Thinking and analysis on theoretical concepts

Pedagogy:

The teaching methods includes Chalk and talk, PowerPoint, demonstrations, assignments and group discussions on the theoretical topics.

Lecture schedule:

Unit	Topics	Hrs	Mode
Unit I	Mathematical Formulation of the problem – Graphical Solution – Introduction	4	Chalk and talk, Quiz and assignment
	Graphical Solution Method – Some exceptional cases	4	
	General L.P.P.	4	
	Canonical and Standard forms of L.P.P.	6	
Unit II	Simplex Method – Introduction	2	Chalk and talk, Group discussion
	Fundamental Properties of Solutions – The computational procedure	5	
	Use of Artificial Variable.	3	
	The assignment method – Special cases in assignment problems	4	
	A typical assignment problem – The traveling salesman problem.	4	
Unit III	Transportation Problem – Introduction – General Transportation Problem – The transportation table	4	Chalk and talk, Quiz and assignment
	Solution of a Transportation problem – Finding an initial basic feasible solution – Test for optimality	4	
	Transportation Algorithm (MODI method). Assignment Problem – Introduction – Mathematical formulation of the problem	4	
	The assignment method – Special cases in assignment problems	3	
	A typical assignment problem – The traveling salesman problem.	3	
Unit IV	Introduction – Two-person zero-sum games	4	PPT, Chalk and talk, Quiz and assignment
	Some basic terms – The Maxmin-Minimax principle	5	
	Games without Saddle points-mixed strategies	4	
	Graphic solution of $2 \times n$ and $m \times 2$ games – Dominance property.	5	
Unit V	Introduction – Network and basic components	6	PPT, Chalk and talk, Quiz and assignment
	Logical sequencing – Rules of network Construction	6	
	Critical path analysis – Distinction between PERT and CPM.	6	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Resource Management techniques
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)
BLUE PRINT FOR INTERNAL ASSESSMENT – I

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

BLUE PRINT FOR INTERNAL ASSESSMENT – II

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
2.	CLO 4	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Resource Management Techniques
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K-2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K-3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
3	CLO 3	Up to K-4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4	CLO 4	Up to K-3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
5	CLO 5	Up to K-3	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K2 Level)
		2 Questions from Unit-II (K3 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K2 Level)	1Question from Unit-IV (K3 Level)
		2 Questions from Unit-V (K4 Level)	1Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

COURSE OUTCOMES:

On the completion of the course the students will be able to

COs	COURSE OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CO-1	Understand the theoretical workings of the simple method for linear programming	Up to K2
CO-2	Know the relationship between a linear program and its dual, including strong duality and complementary slackness	Up to K2
CO-3	Solve specialized linear programming problems like the transportation and assignment problems	Up to K3
CO-4	Solve network models like the shortest path, minimum spanning tree, and maximum flow problems	Up to K4
CO-5	Understand the applications of, basic methods for, and challenges in integer programming	Up to K2

MAPPING OF COs WITH PSOs:

Course Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CO-1	3	1	1	2	1	1
CO-2	2	3	2	1	1	1
CO-3	2	3	1	1	1	2
CO-4	3	2	2	1	2	1
CO-5	2	2	2	3	2	1

3- Advanced Application 2- Intermediate 1- Introductory **Course Designer(s):**

1. Prof.P.Sridevi

2. Prof.J.Mayajothi

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II B.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	NME-2	20U4DNM2	Introduction to Internet	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

COURSE OBJECTIVES :

➤ This course is designed to explore a complete knowledge about the Internet ,search engines and its components .

Units	Introduction to Internet	Total Hours: 30 hrs	K-Levels
Unit -I	Introduction : Internet- Growth of Internet and Arpanet - Owners of the Internet - Anatomy of Internet – History of WWW - Basic Internet Terminologies – Net etiquette - Internet Applications - Commerce on the Internet – Governance on the Internet - Impact of Internet on Society.	6 hrs	Up to K2
Unit-2	Browsers and Search engines: Browsers – browser- Introduction – Parts of a browser window Running a browser - working with a Browser. Search engines: What is search engine? - Types of search engines - Search and Meta search engines.	6 hrs	Up to K2
Unit-3	E-mail : E-mail - E-mail Networks and Servers - E-mail Protocols - Structure of E-mail - Attachments – E-mail Clients - E-mail Clients - web based E-mail-Address book – Signature File.	6 hrs	Up to K2
Unit-4	HTML Programming Basics : Introduction to HTML – HTML browsers - Different versions of HTML-HTML tags - Document overview - Header elements - Section headings	6hrs	Up to K2
Unit-5	HTML Programming Basics : Block headings - Lists-Inline elements – Images - working with Tables, Forms, Frames.	6 hrs	Up to K2

Books for Study:

Internet Technology and Web design, Ramesh Bangia, Firewall Media, (An imprint of Lakshmi Publications Pvt. Ltd.), Third Edition, 2011.

Unit 1: Chapter 1.2

Unit 2: Chapter 3 & Chapter 4

Unit 3: Chapter 5(5.6), Chapter 8(8.11 &8.13)

Unit 4: Chapter 5 (5.1) & Chapter 6

Unit 5: Chapter 9

Books for Reference :

1.The Internet Book, Douglas E. Comer, Fourth Edition, PHI Learning Pvt. Ltd. , New Delhi, 2009.

2.Using the Internet the Easy Way, Young Kai Seng, Minerva Publications, First Edition, 2000.

3.Fundamentals of Information Technology By Alexis Leon and Mathews Leon, Vikas Publishing House Pvt. Ltd., Revised Edition.

Web resources:

1. <https://www.just.edu.jo/~mqais/cis99/PDF/Internet.pdf>

2. <https://jdgsmahilacollege.files.wordpress.com/2014/01/ch3.pdf>

Rationale for Nature of the course:

Internet, the most useful technology of modern times which helps us not only in our daily lives but also in professional lives. For educational purposes, it is widely used to gather information and to do research or add to the knowledge of various subjects. Internet plays a very vital role in education. Through the Internet, people can share information and communicate from anywhere with an Internet connection. So, learning the basics of internet will be more helpful to the learners to know the facts and figures, information and knowledge for personal, social and economic development.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Seminar
- Assignment preparation
- Scientific discussion
- Sharing the practical knowledge on theoretical concepts

Pedagogy:

The teaching methods includes Chalk and talk, PowerPoint, demonstrations, assignments and group discussions.

Lecture schedule:

Unit	Topics	Hours	Mode
Unit I	Internet- Growth of Internet and Arpanet - Owners of the Internet -Anatomy of Internet – History of WWW - Basic Internet Terminologies	2 hrs	Chalk and talk, Quiz and assignment
	Anatomy of Internet – History of WWW - Basic Internet Terminologies	2 hrs	
	Net etiquette - Internet Applications - Commerce on the Internet	1 hr.	
	Governance on the Internet - Impact of Internet on Society.	1 hr.	
Unit II	Browsers – browser- Introduction – Parts of a browser window - Running a browser	2 hrs	Chalk and talk, Group discussion
	working with a Browser. Search engines: Introduction	2 hrs	
	Types of search engines	1 hr	
	Search and Meta search engines.	1 hr	
Unit III	E-mail - E-mail Networks and Servers - E-mail Protocols -	2 hrs	Chalk and talk, Quiz and assignment
	Structure of E-mail - Attachments – E-mail Clients	2 hrs	
	E-mail Clients - web based E-mail	1 hr	
	Address book – Signature File.	1 hr	
Unit IV	Introduction to HTML – HTML browsers - - Document overview -	2 hrs	PPT, Chalk and talk, Quiz and assignment
	Different versions of HTML-HTML tags	2 hrs	
	Header elements - Section headings	2 hrs	
Unit V	Block headings - Lists-Inline elements	2 hrs	PPT, Chalk and talk, Quiz and assignment
	Images - working with Tables,	2 hrs	
	Forms, Frames	2 hrs	

Learning Outcome Based Education & Assessment (LOBE)

Blue Print – Introduction to Internet (CIA-I & II)

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

CLOs	K- Level	Section A		Section B		Section C	
		Short Answers		(Either/or Choice)		(Open Choice)	
		No. of Questions	K- Level	No. of Questions	K- Level	No. of Questions	K- Level
CLO x	Up to K2	1	K1	1	K2/K2	1	K1
CLO y	Up to K2	2	K1	1	K2/K2	2	K1
No. of Questions to be asked		3		2		3	
No. of Questions to be answered		3		2		2	
Marks for each question		2		7		10	
Total Marks for each section		6		14		20	

Distribution of Section-wise Marks with K Levels (CIA I & II)

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	6	-	30	-	36	56.25	100
K2	-	28	-	-	28	43.75	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	6	14	30	-	64	100.00	100%

Learning Outcome Based Education & Assessment (LOBE)

Blue Print – Introduction to Internet

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K-Level	Section – A		Section – B		Section – C	
			Short Answers		(Either / or Choice)		(Open Choice)	
			No. of Questions	K-Level	No. of Questions	K-Level	No. of Questions	K-Level
1	CLO 1	Up to K2	1	K1	1	K2/K2	1	K1
2	CLO 2	Up to K2	1	K1	1	K2/K2	1	K1
3	CLO 3	Up to K2	1	K1	1	K2/K2	1	K1
4	CLO 4	Up to K2	1	K1	1	K2/K2	1	K1
5	CLO 5	Up to K2	1	K1	1	K2/K2	1	K1
No. of Questions to be asked			5		5		5	
No. of Questions to be answered			5		5		3	
Marks for each question			2		7		10	
Total Marks for each section			10		35		30	

Distribution of Section-Wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (No Choice)	Section D (No Choice)	Total Marks	% of Marks (without choice)	Consolidated
K1	10	-	50	-	60	46.15	100
K2	-	70	-	-	70	53.85	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	10	35	50	-	130	100.00	100

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

COURSE OUTCOMES:

On the completion of the course the students will be able to

COs	COURSE OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CO-1	Understand the theoretical workings of the simple method for linear programming	Up to K2
CO-2	Know the relationship between a linear program and its dual, including strong duality and complementary slackness	Up to K3
CO-3	Solve specialized linear programming problems like the transportation and assignment problems	Up to K4
CO-4	Solve network models like the shortest path, minimum spanning tree, and maximum flow problems	Up to K4
CO-5	Understand the applications of, basic methods for, and challenges in integer programming	Up to K3

MAPPING OF COs WITH PSOs:

Course Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CO-1	3	1	1	2	1	1
CO-2	2	3	2	1	1	1
CO-3	2	3	1	1	1	2
CO-4	3	2	2	1	2	1
CO-5	2	2	2	3	2	1

3- Advanced Application 2- Intermediate 1- Introductory **Course Designer(s):**

1. Prof.R.Umasankari

2. Prof.J.Mayajothi

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II B.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Practical4	20U4DMCP4	Linux Lab	2	3	40	60	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

COURSE OBJECTIVES :

- Course designed to impart the knowledge of LINUX OS and its architecture and
- creating Development skill in the design of shell programming for various applications.

Program list:

1. Write a shell program to implement a four function calculator using case
2. Write a shell program to demonstrate the usage of trap command
3. Write a shell program to demonstrate grep command
4. Write a shell program to demonstrate a) set command b) shift command
5. Write a shell program to check whether a given number is prime
6. Write a shell program to display only the files in the current directory
7. Write a shell program to find the biggest if 3 given numbers
8. Write a shell function to find the factorial of a given number. Call the function from your script.
9. Write a C Program to copy a file using low level file access system calls
10. Write a C program to copy a file using the standard IO Library
11. Write a C Program to demonstrate fork()
12. Write a C Program using signals to implement an alarm clock
13. Write a C Program using pipes to communicate between parent and child processes
14. Use Shared Memory to communicate between two programs 15. Use Message Queues to communicate between two programs.

COURSE OUTCOMES:

On the completion of the course the students will be able to

COs	COURSE OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CO-1	Know the algorithms to develop shell program using the LINUX commands and procedure.	Up to K2
CO-2	Develop programs to demonstrate the usage of various set and built-in function commands.	Up to K3
CO-3	Construct the shell program to provide the solution for various applications.	Up to K4
CO-4	Know the concept of shells and its kernel operations by developing various logical algorithms.	Up to K3
CO-5	Develop programs to perform file related operations.	Up to K3

MAPPING OF COs WITH PSOs:

Course Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CO-1	3	1	1	2	1	1
CO-2	2	3	2	1	1	1
CO-3	2	3	1	1	1	2
CO-4	3	2	2	1	2	1
CO-5	2	2	2	3	2	1

3- Advanced Application

2- Intermediate

1- Introductory

Course Designer(s):

1. Er.J.Rajendran

2. Dr.T.Sree ram kumar

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II B.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Add-on course		Database Design using Microsoft Access	2	2	50	50	100

COURSE OBJECTIVES :

- Course designed to impart the knowledge of Creating Database using MS-Access software
- Creating Development skill in the design of DB tables with Relations and Query applications.

Units	Database Design using Microsoft Access	Total Hours: 30 hrs	K-Levels
Unit -I	An introduction to Database Development: The Database Terminology of Access – Relational Databases – Access Database Objects – A Five-Step Design Method	6 hrs	Up to K2
Unit-2	Creating Access Tables: Getting Started with Access – Creating a Database – The Access 2010 Environment – Creating a New Table – Designing Tables: Using the Design Tab – Working with Fields – Assigning Field Data types – Changing a Table Design	6 hrs	Up to K3
Unit-3	Setting the Primary Key – Printing a Table Design – Saving the completed Table – Adding records to a Database Table	6 hrs	Up to K3
Unit-4	Selecting Data with Queries: Introducing Queries – Creating a Query – Adding Fields – Displaying the Recordset – Working with Fields – Changing the Sort Order – Displaying only the selected records – Saving a Query	6hrs	Up to K4
Unit-5	Using Operators and Expressions in Access: Introducing Operators – Using Operators and Expressions in Queries – Entering Single Value Field Criteria – Using Multiple Criteria in a Query – Entering Criteria in Multiple Fields – Working with Datasheet View	6 hrs	Up to K4

Textbook:

Microsoft Access 2010 Bible, Michael. R. Groh,, Wiley Publishing Inc, 2010.

Books for Reference:

Access Solutions Tips, Tricks and Secrets from Microsoft Access MVPs, Arvin Meyer, Douglas J. Steele

Microsoft Access 2010 Inside Out, [Jeff Conrad](#), [John L. Viescas](#), 1 st edition, The Microsoft Press Store, 2010

Access Data Analysis Cookbook, Ken Bluttman, Wayne S Freeze, O'Reilly Media Inc, 2007.

Access Essentials, Humphrey M L, 2020.

Web Resources:

<https://www.pdfdrive.com/download-ms-access-tutorial-pdf-version-e33405612.html><https://www.youtube.com/watch?v=57jBdK3YVJo><https://www.tutorialspoint.com/ms-access/index.htm><https://www.youtube.com/watch?v=1XTXv1V3-ag><https://www.guru99.com/ms-access-tutorial.html>

Course Designer(s):

1. Dr.T.Sree ram kumar
2. Prof.P.Sridevi

I year UG Ratifications

Course Code	Course Title	Nature of the course	Rationale	Activities having direct bearing on Skill development / Employability /Entrepreneurship
20U1DMC1	Programming in C	Knowledge & Skill oriented	The purpose of programming is to find a sequence of instructions that will automate the performance of a task on a computer, often for solving a given problem. C is a computer programming language. C is a general purpose procedural computer programming language supporting structured programming. This course will enable the students to be familiar on middle-level language.	Individual experimental activity to the students. Hands on training . Group discussions
20U1DMC2	Digital computer fundamentals	Knowledge & Skill	In the present scenario most of the electronic equipments like computers, mobiles, ATM, etc. are based on digital circuits. The knowledge of basic logic gates, combinational & sequential logic circuits will enable the students to handle , work and implement few circuits. After completion of the course, students will be able to develop digital circuit based applications.	Assignment preparation Seminar presentation Problem solving and Group discussions.
20U1DAT1	Discrete mathematics	Knowledge & Skill	Discrete Mathematics is the backbone of Computer Science Concepts and notations. Discrete mathematics are useful in all branches of computer science, such as computer algorithms, programming languages, cryptography, automated theorem proving, and software development. So, this course will enable the students to inculcate the basic mathematical concepts which will be more useful while learning advanced topics in computer science.	Practising to solve the mathematical problems. Analysis and interpretation of results. Assignment preparation
20U1DMCP1	C programming lab.	Knowledge & Skill oriented	The purpose of this lab is to give some experience with the syntax and basic features of the C programming language. Learning C will help the students to understand a lot of the underlying architecture of the operating system, and as a whole demystify how programs run.	Practising to solve the problem by writing programmes. Writing algorithm for various programmes for solving. Hands on training.

Course Code	Course Title	Nature of the course	Rationale	Activities having direct bearing on Skill development / Employability /Entrepreneurship
20U2DMC3	Data structures and algorithms	Knowledge & Skill	Data structure is a logical & mathematical model of storing and organizing data in a specific way in a computer. After learning this subject student will be able to identify the problems and choose most appropriate data structure to represent the data.	Experiment based activities Assignment writing Seminar presentation with ICT tools.
20U2DMC4	Computer organization and architecture	Knowledge & Skill Skill Oriented	Computer Organization and Architecture is the study of internal working, structuring and implementation of a computer system. Computer Architecture helps us to understand the functionalities of a system. Computer Organization tells us how exactly all the units in the system are arranged and interconnected. So, this course will help the learners to explore the structures and functions of computers.	Experiment based activities Assignment writing Seminar presentation with ICT tools.
20U2DAT2	Microprocessors 8086/88	Knowledge & Skill	Microprocessor is the main component of computer where 8086 is the base of all recent processors. This course will cover the basics of 8086 and its architectures along with instruction set, ALP with effective use of procedure and macros. This course will enable the students to inculcate ALP concepts and methodology to solve problems.	Working with the microprocessor kit for developing ALP Writing assignments Experiment based activities
20U2DMCP2	Data structures lab using c	Knowledge & Skill oriented	The main goals of doing data structures lab is to acquire skills and knowledge in implementation of data structures as arrays, stacks, queues, lists etc. While practicing the lab programs, that helps the students to design their own algorithms.	Practicing to solve the problem by writing programs. Writing algorithm for various programs for solving. Hands on training.

DEPARTMENT OF INFORMATION TECHNOLOGY

(Choice Based Credit System with Outcome Based Education Model)
(Academic Year 2020-2021 Onwards)

III and IV Semesters (II B.Sc. Information Technology)
I and II Semesters (I M.Sc. Computer Science)
Certificate Courses

I and II Semesters (I B.Sc. Information Technology) -Ratifications

The Madura College (Autonomous), Madurai-625011
(Self Financed Stream)
Department of Information Technology
Curriculum Structure for B.Sc. Information Technology
(with Mathematics & Commerce ancillaries)

Sem.	Course Type	Subject Code	Course title	Contact hours/ week	Credits
I	Part -I : Lang-I	20U1T/S/HLA1	Tamil-I/Sanskrit-I/Hindi-I	6	3
	Part - II : English –I	20U1NEN1	English –I	6	3
	VE &PE	20U1VEN1	Value Education & Professional Ethics	3	3
	Part III: Allied –I / I	20U1FAC1	Discrete Mathematics	6	5
	Major Core -1	20U1FMC1	C Programming	3	3
	Major Core- 2	20U1FMC2	Principles of Information Technology	3	3
	Major Core Practical-1	20U1FMP1	C Programming – Lab	3	2
	Total			30	22
II	Part - I : Lang-II	20U2T/S/HLA2	Tamil-II/Sanskrit-II/Hindi-II	6	3
	Part - II : English-II	20U2NEN2	English-II	6	3
	E & G S	20U2EVS1	Environmental Science & Gender studies	3	3
	Part III :Allied-I / II	20U2FAC2	Resource Management Techniques	6	5
	Major Core -3	20U2FMC3	Object Oriented Programming with C++	3	3
	Major Core- 4	20U2FMC4	Digital Principles and Applications	3	3
	Major Core Practical-2	20U2FMP2	OOPs with C++ - Lab	3	2
	Extension Activities			--	1
	Total			30	23
III	Part -I : Lang-III	20U3T/S/HLA3	Tamil-III/Sanskrit-III/Hindi-III	6	3
	Part - II : English-III	20U3NEN3	English-III	6	3
	Non Major Elective –I	20U3FNM1	PC Software	2	2
	Skill based Elective –I	20U3FSM1	Office Automation	2	2
	Part III: Allied-II / I	20U3FAC3	Financial Accounting	6	5
	Major Core -5	20U3FMC5	Data Structures and Algorithms	5	5
	Major Core Practical-3	20U3FMP3	Data Structures and Algorithms – Lab	3	2
	Total			30	22

IV	Part- I : Lang –IV	20U4T/S/HLA4	Tamil-IV/Sanskrit-IV/Hindi-IV	6	3
	Part - II : English-IV	20U4NEN4	English-IV	6	3
	Non-Major Elective – II	20U4FNM2	Introduction to Internet	2	2
	Skill Based Elective –II	20U4FSM2	Visual Programming	2	2
	Part III: Allied –II / II	20U4FAC4	Business Statistics	6	5
	Major Core -6	20U4FMC6	Java Programming	5	5
	Major Core Practical-4	20U4FMP4	Java Programming – Lab	3	2
	Total			30	22
V	Skill Based Elective-III	20U5FSM3	Web Technologies	2	2
	Major Core -7	20U5FMC7	Dot Net Technologies	5	5
	Major Core- 8	20U5FMC8	Relational Database Management System	5	5
	Major Core -9	20U5FMC9	Data Communication and Computer Network	5	5
	Major Core Practical-5	20U5FMP5	Dot Net Technologies – Lab	3	2
	Major Core Practical-6	20U5FMP6	RDBMS – Lab	3	2
	Major Elective –I	20U5FME1	Computer Graphics / Microprocessor / Linux Programming / Multimedia Technologies	4	3
	Major Elective –II	20U5FME2	Compiler Design / Client-Server Computing / E-Commerce / Digital Image Processing	3	2
	Total			30	26
VI	Skill Based Elective -IV	20U6FSM4	Desktop Publishing	2	2
	Major Core -10	20U6FMC10	Programming in PHP	5	5
	Major Core- 11	20U6FMC11	Operating System	5	5
	Major Core -12	20U6FMC12	Software Engineering	5	5
	Major Core Practical-7	20U6FMP7	Programming in PHP – Lab	3	2
	Major Core Practical-8	20U6FMP8	Project & Viva-voce – Lab	3	2
	Major Elective –III	20U6FME3	Python Programming / Android Programming / Block chain Technologies / Software Testing	4	3
	Major Elective –IV	20U6FME4	Data Mining / Network Security / Mobile Computing / Cloud Computing	3	2
	Total			30	26

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: II UG				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	NME-I	20U3FNM1	PC Software	2	2	25	75	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To acquire knowledge on the basics of MS Office package.
2. To enable the user, to create and edit documents.
3. To manipulate numeric data, formulas and functions.
4. To impart the knowledge of worksheet.
5. To visualize the concept of power point presentation.

UNIT	CONTENT	Hrs	K-Level	CLO
I	Introduction to MS Office 2010: Getting started with office: Introduction - Starting an office program. Creating a Document with Word: Viewing the Word Window – Changing Document Views – Setting Up the Page – Setting Up the Page Margins – Selecting Text – Checking Spelling and Grammar – Adding Header and Footers.	6	Up to K2	1
II	Formatting & Enhancing Document with Word : Formatting a Document with Word: Formatting Text for Emphasis – Finding and Replacing -Formatting – Changing Paragraph Alignment – Changing line spacing – Displaying Rulers – Setting Paragraph Tabs – Creating Bulleted and Numbered Lists. Enhancing a Document with Word: Creating a Table – Entering Text in a Table – Modifying a Table – Adjusting Table Cells – Calculating a Value in a Table – Addressing Envelops and labels – Creating a Form Letter- Creating Labels.	6	Up to K2	2
III	Worksheet with Excel: Creating a Worksheet with Excel: Viewing the Excel Window – Selecting Cells – Moving Around the Workbook – Entering the values on a Worksheet – Entering Values Quickly with AutoFill – Editing Cell Contents – Clearing cell content – inserting and deleting cell contents – Selecting Rows, Columns and Special Ranges .	6	Up to K2	3

IV	Building a Worksheet with Excel: Understanding Formulas – Understanding Cell Referencing – Creating a Simple formula - Create a Formula Using Formula AutoComplete – Editing a Formula – Naming Cells and Ranges – Simplifying a Formula with Ranges – Calculating Totals with AutoSum – Correcting Formulas – Sorting and Filtering.	6	Up to K2	4
V	Presentation with PowerPoint : Creating Presentation with PowerPoint: Viewing the PowerPoint Window – Creating New and Consistent Slides – Working with Objects – Entering and Editing Text – Adding background Style Delivering a Presentation with PowerPoint: Adding Animation – Creating Slide Transitions – Inserting Videos and Audio- Creating a Custom Slide Show – Starting a Slide Show	6	Up to K2	5

Book for Study

“Microsoft Office 2010 On Demand” First Edition by Steve Johnson, Perspection, Inc, Published by Pearson Education.

Chapters

Unit - I: Chapter 1& 6
 Unit - II: Chapter 7 & 8
 Unit - III: Chapter 9
 Unit - IV: Chapter 10
 Unit - V: Chapter 12 & 13

Books for Reference

1. “Learning Computer Fundamentals, MS Office and Internet & Web Technology” by Dinesh Maidasani, Third Edition, Firewall Media.
2. “Working with MS Office 2000” by Content Development Group. Tata McGraw-Hill Publishing Company Limited.
3. “PC Software for Windows 98 Made Simple” by R.K. Taxali - Tata McGraw-Hill Publishing Company Limited.

Web Resources

1. <https://www.howtogeek.com/445170/how-to-align-text-vertically-or-horizontally-in-microsoft-word/>
2. <https://www.excelcampus.com/functions/formula-editing-tips/>
3. <https://24slides.com/presentbetter/add-animations-powerpoint/>

Rationale for Nature of the course

- It is used to digitally create, store, manipulate rely office information and data needed for accumulation basic tasks and goals.

Activity on Skill Development

- Formal Letter Writing
- Resume Writing
- Presentation Design

Activities on Employability

- Data Entry operations
- Knowledge Processing Operations

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Mr. N. Radha Krishnan
2. Mrs. R. TamilSelvi

Lesson Plan

Unit	Topics	Hours	Mode
I	Introduction to MS – Office 2010, Create and View the Word Window	2	Lecture & PPT
	Setting Up the Page and Page Margins, Selecting Text,	2	Lecture & PPT
	Spelling and Grammar, Header and Footers	2	Lecture & PPT
II	Formatting Text, Finding and Replacing, Changing Paragraph Alignment and line spacing, Displaying Rulers, Setting Paragraph Tabs.	2	Lecture & PPT
	Creating Bulleted and Numbered Lists. Creating a Table, Entering Text in a Table, Modifying a Table, Adjusting Table Cells, Calculating a Value in a Table.	2	Lecture & PPT
	Addressing Envelops and labels, Creating a Form Letter, Creating Labels.	2	Lecture & PPT
III	Creating a Worksheet with Excel , Viewing the Excel Window, Selecting Cells, Moving Around the Workbook, Entering the values on a Worksheet.	3	Lecture & PPT
	Entering Values Quickly with AutoFill, Editing Cell Contents, Clearing cell content, inserting and deleting cell contents, Selecting Rows, Columns and Special Ranges	3	Group Discussion
IV	Understanding Formulas, Cell Referencing, Create a Formula Using Formula AutoComplete, Editing a Formula, Naming Cells and Ranges, Formula with Ranges.	3	Lecture & PPT
	Calculating Totals with AutoSum, Correcting Formulas, Sorting and filtering	3	Quiz

V	Viewing PowerPoint Window, Creating New, Consistent Slides, Working with Objects, Editing Text.	3	Assignment
	Adding background Style, Animation, Slide Transitions, Inserting Videos and Audio, Custom Slide Show, Slides Show.	3	Lecture, PPT

Course Learning Outcomes

On the completion of the course the student will be able to

CLOs	Course Learning Outcomes	K - Level
CLO 1	Express basic documents	Up to K2
CLO 2	Represent documents with formatting and use mail merge options	Up to K2
CLO 3	Demonstrate worksheets and organize data in Microsoft Excel	Up to K2
CLO 4	Trace the techniques of sorting and filtering	Up to K2
CLO 5	Demonstrate basic objects and design elements to presentations.	Up to K2

Mapping of CLOs with POs

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO 1	3	1	2	1	3
CLO 2	3	2	3	2	3
CLO 3	3	2	2	3	3
CLO 4	3	3	3	3	3
CLO 5	3	3	2	3	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Learning Outcome Based Education & Assessment (LOBE)

Blue Print for Formative – PC Software

Articulation Mapping - K Levels with Course Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C (Open Choice)
			Short Answers		(Either/or Choice)		
			No. of Questions	K- Level	No. of Questions	K- Level	
1	CLO X	Up to K2	2	K1	2	K2&K2	2 (K1)
2	CLO Y	Up to K2	1	K1	2	K2&K2	1 (K1)
No. of Questions to be asked			3			4	3
No. of Questions to be answered			3			2	2
Marks for each question			2			7	10
Total Marks for each section			6			14	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels (CIA I & II)

K - Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Total Marks	% of Marks without choice	Consolidated %
K1	6	-	30	36	56.25	100
K2	-	28	-	28	43.75	
Total Marks	6	28	30	64	100.00	100%

Learning Outcome Based Education & Assessment (LOBE)

Blue Print for Summative Examination – PC Software

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Sl.No	CLOs	K- Level	Section A		Section B		Section C (Open Choice)
			Short Answers		(Either/or Choice)		
			No of Questions	K - Level	No of Questions	K - Level	
1	CLO 1	Up to K2	1	K1	1	K2 & K2	1(K1)
2	CLO 2	Up to K2	1	K1	1	K2 & K2	1(K1)
3	CLO 3	Up to K2	1	K1	1	K2 & K2	1(K1)
4	CLO 4	Up to K2	1	K1	1	K2 & K2	1(K1)
5	CLO 5	Up to K2	1	K1	1	K2 & K2	1(K1)
No. of Questions to be asked			5		10		5
No. of Questions to be answered			5		5		3
Marks for each question			2		7		10
Total Marks for each section			10		35		30

- K1- Remembering and recalling facts with specific answers.
- K2- Basic understanding of facts and stating main ideas with general answers.

Distribution of Section – wise Marks with K Levels

K	Section A	Section B	Section C	Total	% of Marks	Consolidated
K1	10	-	50	60	46.15	100
K2	-	70	-	70	53.85	
Total	10	70	50	130	100	100%

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: II B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	SBE – I	20U3FSM1	Office Automation	2	2	25	75	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To enable the user, to create, formatting and enhancing documents.
2. To develop a spreadsheet application.
3. To impart the knowledge of building worksheet with EXCEL.
4. To learn the concepts of creating a database with Ms-Access.
5. To learn the manipulation of data with Ms-Access.

UNIT	CONTENT	Hrs	K-Level	CLO
I	MS WORD 2010: Creating a Document with Word: Viewing the Word Window – Moving around in a Document - Changing Document Views – Setting Up the Page – Setting Up the Page Margins – Selecting Text – Adding Header and Footers – Inserting Page Numbers and the Date and Time – Creating a Blog Posting on the Web. Formatting a Document with Word: Finding and Replacing - Formatting – Changing Paragraph Alignment – Changing Line Spacing – Displaying Rulers – Setting Paragraph Tabs – Setting Paragraph Indents – Changing Character Spacing – Creating Bulleted and Numbered Lists.	6	Up to K3	1
II	Creating a Worksheet with Excel: Viewing the Excel Window – Selecting Cells – Moving Around the Workbook – Entering Labels on a Worksheet - Entering values on a Worksheet – Entering Values Quickly with AutoFill – Editing Cell Contents – Clearing Cell Content – Inserting And Deleting Cell Contents – Selecting Rows, Columns and Special Ranges – Selecting and Naming a Worksheet – Inserting and Deleting a Worksheet – Moving and Copying a Worksheet – Adjusting Column Width and Row Height.	6	Up to K3	2
III	Building a Worksheet with Excel: Understanding Formulas – Understanding Cell Referencing – Creating a Simple formula - Create a Formula Using Formula AutoComplete – Editing a Formula – Naming Cells and Ranges – Simplifying a Formula with Ranges – Calculating Totals with AutoSum – Correcting Formulas – Creating Function – Creating Function using the Library.	6	Up to K4	3

IV	Creating a Database with Access: Understanding How Database Store Data – Creating a Database – Viewing the Access Window- Changing Database Display Options – Viewing Database Objects- Working with Database Objects-Planning Tables- Creating a Table by Entering Data-Creating An Application Part Using A Template- Creating A Table Using SharePoint	6	Up to K2	4
V	Locating, Managing Data With Access: Working With A Table- Importing Data Into Tables- Working With A Table In Design View- Working With Fields-Specifying Data Types And Field Properties- Creating Field Properties-Creating Input Masks- Creating A Lookup Field-Planning Table Relationships-Defining Table Relationships- Ensuring Referential Integrity-Sorting Records-Filtering Out Records.	6	Up to K3	5

Book for Study

“Microsoft Office 2010 on Demand” First Edition by Steve Johnson, Perspection, Inc, Published by Pearson Education, 2012.

Chapters

Unit I : 6,7

Unit II : 9

Unit III : 10

Unit IV : 14

Unit V : 14,15

Books for Reference

1. “Learning Computer Fundamentals, MS Office and Internet & Web Technology” by Dinesh Maidasani, Third Edition, Firewall Media ,
2. “Working with MS Office 2000” by Content Development Group. Tata McGraw-Hill Publishing Company Limited.
3. “PC Software for Windows 98 Made Simple”- Tata McGraw-Hill Publishing Company Limited.

Web Resources

1. <https://vignan.ac.in/subjectsnew/BC111.pdf>
2. <http://www.guru99.com/inroduction-to-microsoft-excel.html>
3. <http://www.tutorialspoint.com/powerpoint/index.html>

Rationale for Nature of the course

- It is used to digitally create, store, manipulate rely office information and data needed for accumulation basic tasks and goals.

Activity on Skill Development

- Formal Letter Writing
- Resume Writing
- Presentation Design
- Bill Calculations
- Report Generation

Activities on Employability

- Data Entry operations
- Performance Reporting
- Office Administration

Course Designer(s) Name

- 1.Mrs. R.Lakshpriya
2. Ms. S.Saranya

Pedagogy

Chalk and Talk, PPT, Assignment ,Projector, Demonstration, Practical Session.

Lesson Plan

Unit	Topic	Hours	Mode
I	MS WORD 2010: Creating a Document with Word: Viewing the Word Window – Moving around in a Document - Changing Document Views – Setting Up the Page – Setting Up the Page Margins – Selecting Text –Adding Header and Footers – Inserting Page Numbers and the Date and Time – Creating a Blog Posting on the Web.	3	Chalk and Talk, Demo Session
	Formatting & Enhancing Document with Word: Formatting a Document with Word: Finding and Replacing Formatting – Changing Paragraph Alignment – Changing line spacing – Displaying Rulers – Setting Paragraph Tabs – Setting Paragraph Indents – Changing Character Spacing – Creating Bulleted and Numbered Lists.	3	Demo Session
II	Creating a Worksheet with Excel: Creating a Worksheet with Excel: Viewing the Excel Window – Selecting Cells – Moving Around the Workbook – Entering Labels on a Worksheet - Entering values on a Worksheet – Entering Values Quickly with AutoFill.	3	Demo Session
	Edition Cell Contents – Clearing cell content – inserting and deleting cell contents – Selecting Rows, Columns and Special Ranges – Selecting and Naming a Worksheet – Inserting and Deleting a Worksheet – Moving and Copying a Worksheet – Adjusting Column Width and Row Height	3	PPT
III	Building a Worksheet with Excel: Building a Worksheet with Excel: Understanding Formulas – Understanding Cell Referencing – Creating a Simple formula - Create a Formula Using Formula AutoComplete – Editing a Formula – Naming Cells and Range.	3	Demo Session
	Simplifying a Formula with Ranges – Calculating Totals with AutoSum – Correcting Formulas – Creating Function – Creating Function using the Library.	3	PPT

IV	Creating a Database with Access: Understanding How Database Store Data – Creating a Database – Viewing the Access Window- Changing Database Display Options – Viewing Database Objects- Working with Database Objects-Planning Tables- Creating a Table by Entering Data-Creating An Application Part Using A Template- Creating A Table Using SharePoint-	4	Demo Session
		2	Practical Session
V	Creating A Database With Access: Working With A Table-Importing Data Into Tables- Working With A Table In Design View-Working With Fields-Specifying Data Types And Field Properties- Creating Field Properties Creating Input Masks- Creating A Lookup Field-Planning Table Relationships-Defining Table Relationships- Ensuring Referential Integrity-Sorting Records-Filtering Out Records.	3	Demo Session
		3	Practical Session Assignment

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	K - Levels
CLO 1	Learn the concepts of Formatting & Enhancing Document using Microsoft Word	Up to K3
CLO 2	Design and Create a Worksheet using Microsoft Excel	Up to K3
CLO 3	Perform various calculation using formulae.	Up to K4
CLO 4	Examine database concepts and explore the Ms-Access environment.	Up to K2
CLO 5	Build a new database with related tables and to create records.	Up to K3

Mapping of CLOs with PSOs

CLOs/PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO 1	3	-	2	-	1	1
CLO 2	3	1	2	2	1	2
CLO 3	3	-	1	-	1	2
CLO 4	3	1	2	3	2	1
CLO 5	3	2	3	3	3	1

(3 – Advanced Applications, 2 – Intermediate Level, 1 – Basic Level)

Mapping of CLOs with POs

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO 1	3	1	1	-	1
CLO 2	3	3	3	2	2
CLO 3	3	2	3	-	1
CLO 4	3	1	1	1	2
CLO 5	3	2	2	-	3

(3 – Advanced Applications, 2 – Intermediate Level, 1 – Basic Level)

Learning Outcome Based Education & Assessment (LOBE)

Formative Exam – Blue Print – Office Automation (CIA I & II)

Articulation Mapping - K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
CIA I	CLO 1	Up to K3	2	K1& K2	1	K1	2(K3&K3)	1(K3)
	CLO 2	Up to K3	2	K1& K2	2	K2	2(K2&K2)	2(K3)
CIA II	CLO 3	Up to K4	2	K1 & K2	1	K2	2(K4&K4)	1(K4)
	CLO 4	Up to K2	2	K1 & K2	2	K2	2(K1 & K1)	2 K2)
Question Pattern (CIA I & II)	No. of Questions to be asked		4		3		4	3
	No. of Questions to be answered		4		3		2	2
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	2	2	-	-	4	6.67	33
K2	2	4	10	-	16	26.67	
K3	-	-	10	30	40	66.66	67
K4	-	-	-	-	-	-	-
Total Marks	4	6	20	30	60	100.00	100%
K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	-	10	-	12	20	67
K2	2	6	-	20	28	46.66	
K3	-	-	-	-	-	-	-
K4	-	-	10	10	20	33.34	33
Total Marks	4	6	20	30	60	100.00	100%

Learning Outcome Based Education & Assessment (LOBE)

Blue Print for Summative Examination – Office Automation Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S.No	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No Of Questions	K - Level	No Of Questions	K - Level		
1	CLO 1	Up to K3	2	K1& K2	1	K1	2(K3&K3)	1(K3)
2	CLO 2	Up to K3	2	K1& K2	1	K2	2(K2&K2)	1(K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K2	2(K4&K4)	1(K4)
4	CLO 4	Up to K2	2	K1 & K2	1	K2	2(K1 & K1)	1(K2)
5	CLO 5	Up to K3	2	K1 & K2	1	K1	2(K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100	100%

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: II B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Major Core - 5	20U3FMC5	Data Structures and Algorithms	5	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To demonstrate various methods of organizing large amount of data.
2. To get familiarity with the concepts of trees and its variants.
3. To develop the program using linked lists, trees and graphs.
4. To implement operations like searching and sorting using divide and conquer technique.
5. To apply a greedy technique to solve a specific problem.

UNIT	CONTENT	Hrs	K-Level	CLO
I	Stacks and Queues Introduction: Introduction of algorithms, Basics of C++, Data Abstraction and Encapsulation, Arrays: Representation of Arrays and Polynomials Stacks and Queues: The Stack & Queue abstract data types – Evaluation of Expressions. Linked Lists: Singly Linked Lists – Doubly Linked List - Circular list- Linked Stacks and Queues – Polynomials.	15	Up to K2	1
II	Trees: Basic Terminology – Binary Trees- Properties - Representations - Binary Tree Traversal – Additional Binary Tree operations-Threaded Binary Trees - Binary Search Tree.	15	Up to K3	2
III	Graphs: Definitions and Representations – Elementary Graph operations-Minimum Cost Spanning Trees – Shortest Path and Transitive Closure – Activity Networks.	15	Up to K4	3
IV	Divide and Conquer: The General Method – Binary Search – Finding the Maximum and Minimum – Merge Sort – Quick Sort – Selection Sort.	15	Up to K4	4
V	The Greedy Method: The General Method – Knapsack problem- job sequencing with deadlines- Optimal storage on tapes-Optimal merge patterns-Single source shortest path.	15	Up to K3	5

Books for Study

1. “Fundamentals of Data structures in C++” by Ellis Horowitz, Sartaj Sahni & Dinesh Mehta — 2nd Edition - Universities Press 2007.
2. “Fundamentals Of Computer Algorithms” by Ellis Horowitz , Sartaj Sahni & Sanguthevar Rajasekaran - 2nd Edition- Universities Press 2007.

Chapters

Book 1

Unit I: 1.2,1.3,1.4, 2.3, 2.5, 3.2, 3.3, 3.6, 4.1, 4.4, 4.6, 4.7

Unit II: 5.1.1, 5.2, 5.3.1, 5.3.2, 5.3.3, 5.3.4, 5.4, 5.5, 5.7

Unit III: 6.1, 6.2, 6.3, 6.4, 6.5

Book 2

Unit IV: 3.1 – 3.6

Unit V: 4.1 – 4.4, 4.6 – 4.8

Books for Reference

1. “Data structures using C “ by Yedidyah langsam, Moshe J.Augenstein and Aaron M. Tenenbaum - PHI.
2. “Data Structures” by Seymour Lipschutz - TataMcGrawhill – Year 2006.
3. “An Introduction to Data structure with Application” by Jean Paul Tremblay and Paul G Sorenson – THM, II Edition – 1991.

Web Resources

1. <https://www.geeksforgeeks.org/data-structures/>
2. https://www.tutorialspoint.com/data_structures_algorithms/greedy_algorithms.htm
3. https://www.tutorialspoint.com/data_structures_algorithms/pdf/greedy_algorithms.pdf
4. <https://www.javatpoint.com/divide-and-conquer-introduction>

Rationale for Nature of the course

- Helps the students in developing logic and structured programs and to storing and organizing data in a particular way in a computer.

Activities on Knowledge and Skill Development

- Analyze the applicability of algorithms in various fields.
- Compare the efficacy of various data structure.

Pedagogy

Chalk and talk, Materials, PPT, Assignment , Seminar , Problem solving , Group discussion , Interaction and Demonstration.

Course Designer(s) Name

1. Mrs.R. LakshaPriya
2. Mr.M. Ashok Kumar

Lesson Plan

Unit	Topics	Hours	Mode
I	Introduction of algorithms Basics of C++, Data Abstraction and Encapsulation, Representation of Arrays and Polynomials	5	Lecture Lecture, GD Lecture
	Stacks and Queues The Stack abstract data type – The Queue abstract data type	3	
	Evaluation of Expressions	7	
	Linked List – Singly – Double – Circular linked list		
II	Trees Basic Terminology – Binary Trees- Properties – Representations	5	Lecture Lecture, Lecture, PPT
	Binary Tree Traversal Additional Binary tree operations-Threaded Binary Trees – Binary Search Trees	5	
III	Graphs Definitions and Representations – Elementary Graph operations	5	Lecture, case studies Lecture
	Minimum Cost Spanning Trees – Shortest Path and Transitive Closure – Activity Networks.	10	
IV	Divide and Conquer Binary Search	2	Lecture, case studies Lecture Lecture, GD
	Finding the Maximum and Minimum	2	
	Merge Sort – Quick Sort – Selection Sort.	11	
V	The Greedy Method Introduction - Knapsack problem -job sequencing with deadlines	7	Lecture, Assignment Lecture, PPT
	Optimal storage on tapes-optimal merge patterns-single source shortest path.	8	

Course Learning outcomes

On the completion of the course the student will be able to

CLOs	Course Learning Outcomes	K - Levels
CLO 1	Describe how stacks, queues and linked structures are represented in memory and their applications.	Up to K2
CLO 2	Demonstrate the representation of trees and its variants.	Up to K3
CLO 3	Analyze the various applications using Graph operations.	Up to K4
CLO 4	Discuss the computational efficiency of the divide and conquer algorithms for sorting and searching.	Up to K4
CLO 5	Implement various applications of greedy method.	Up to K3

Mapping of CLOs with PSOs

CLOs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO 1	3	3	2	2	2	1
CLO 2	3	3	3	2	2	3
CLO 3	3	3	2	1	2	3
CLO 4	3	3	3	3	2	2
CLO 5	3	3	3	2	2	1

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Mapping of CLOs with POs

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO 1	3	2	3	3	2
CLO 2	3	3	3	2	2
CLO 3	3	2	2	1	3
CLO 4	3	3	1	3	3
CLO 5	3	2	1	3	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Learning Outcome Based Education & Assessment (LOBE)

Formative Exam – Blue Print - Data Structures and Algorithms (CIA I & II)

Articulation Mapping - K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
CIA I	CLO 1	Up to K2	2	K1& K2	1	K1	2(K1&K1)	1(K2)
	CLO 2	Up to K3	2	K1& K2	2	K2	2(K2&K2)	2(K3)
CIA II	CLO 3	Up to K4	2	K1 & K2	1	K2	2(K4&K4)	1(K3)
	CLO 4	Up to K4	2	K1 & K2	2	K2	2(K3&K3)	2(K4)
Question Pattern (CIA I & II)	No. of Questions to be asked		4		3		4	3
	No. of Questions to be answered		4		3		2	2
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	2	2	10	-	14	23.33	67
K2	2	4	10	10	26	43.33	
K3	-	-	-	20	20	33.33	33
K4	-	-	-	-	-	-	-
Total Marks	4	6	20	30	60	100.00	100%
K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	-	-	-	2	3.33	17
K2	2	6	-	-	8	13.33	
K3	-	-	10	10	20	33.33	33
K4	-	-	10	20	30	50.00	50
Total Marks	4	6	20	30	60	100.00	100%

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination -Data Structures and Algorithms
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S.NO	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No Of Questions	K - Level	No Of Questions	K - Level		
1	CLO 1	Up to K2	2	K1& K2	1	K1	2(K1&K1)	1(K2)
2	CLO 2	Up to K3	2	K1& K2	1	K2	2(K2&K2)	1(K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K2	2(K4&K4)	1(K3)
4	CLO 4	Up to K4	2	K1 & K2	1	K2	2(K3&K3)	1(K4)
5	CLO 5	Up to K3	2	K1 & K2	1	K1	2(K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100	100%

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: II B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Major Core Practical-3	20U3FMP3	Data Structures and Algorithms Lab	2	3	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To develop skills to design and analyze simple linear and non linear data structures.
2. To Strengthen the ability to identify and apply the suitable data structure for the given real-world problem.
3. To Gain knowledge in practical applications of data structures.
4. To develop the skill of applying algorithm of sorting and searching.
5. To apply a greedy technique to solve a specific problem.

UNIT	CONTENT	Hrs	K-Level	CLO
I	Stacks and Queues : 1. Write a C++ program to check the balancing of parentheses in a given expression. 2. Write a C++ program to evaluate postfix expression. 3. Write a C++ program to implement Circular Queue. 4. Write a C++ program to implement Singly Linked List. 5. Write a C++ program to implement Doubly Linked List. 6. Write a C++ program to implement Stack using linked list.	15	Up to K2	1
II	7. Write a C++ program to construct an Expression Tree and perform Tree Traversals. 8. Write a C++ program to construct a Binary Search Tree and print it.	12	Up to K3	2
III	9. Write a C++ program to implement BFS on graph. 10. Write a C++ program to implement DFS on graph.	6	Up to K3	3
IV	11. Write a C++ program to check whether the given number is present or not using binary search techniques. 12. Write a C++ program to implement Selection Sort Algorithm. 13. Write a C++ program to implement Merge Sort Algorithm. 14. Write a C++ program to find the minimum and maximum number of given array.	9	Up to K4	4
V	15. Write a C++ Program to Solve Knapsack Problem.	3	Up to K2	5

Books for Study

1. “Fundamentals of Data structures in C++” by Ellis Horowitz, Sartaj Sahni & Dinesh Mehta — 2nd Edition - Universities Press 2007.
2. “Fundamentals Of Computer Algorithms” by Ellis Horowitz , Sartaj Sahni & Sanguthevar Rajasekaran - 2nd Edition- Universities Press 2007.

Books for Reference

1. “Data structures using C “ by Yedidyah langsam, Moshe J.Augenstein and Aaron M. Tenenbaum - PHI.
2. “Data Structures” by Seymour Lipschutz - TataMcGrawhill – Year 2006.
3. “An Introduction to Data structure with Application” by Jean Paul Tremblay and Paul G Sorenson – THM, II Edition – 1991.

Web Resources

1. <https://www.tutorialspoint.com/cplusplus-program-to-implement-stack-using-linked-list>
2. <https://www.w3resource.com/cpp-exercises/sorting-and-searching/index.php>
3. <https://www.tutorialspoint.com/cplusplus-program-to-solve-knapsack-problem-using-dynamic-programming>

Rationale for Nature of the course

- Helps the students in developing logic and structured programs and to storing and organizing data in a particular way in a computer.

Activities on Skill Development

- Analyze the applicability of algorithms in various fields.
- Compare the efficacy of various data structure.

Pedagogy: Projector, Demonstration and Practical Session.

Course Designer(s) Name

1. Mrs.R. LakshaPriya
2. Mr.M. Ashok Kumar

Lesson Plan

Unit	Topics	Hrs	Mode
I	Write a C++ program to check the balancing of parentheses in a given expression.	3	Demo & Practical Session
	Write a C++ program to evaluate postfix expression.	3	
	Write a C++ program to implement Circular Queue.	3	
	Write a C++ program to implement Singly Linked List.	3	
	Write a C++ program to implement Doubly Linked List.	3	
	Write a C++ program to implement Stack using linked list.	3	
II	Write a C++ program to construct an Expression Tree and perform Tree Traversals.	3	Demo & Practical Session
	Write a C++ program to construct a Binary Search Tree and print it	3	
III	Write a C++ program to implement BFS on graph.	3	Demo & Practical Session
	Write a C++ program to implement DFS on graph.	3	
IV	Write a C++ program to check whether the given number is present or not using binary search techniques.	3	Demo & Practical Session
	Write a C++ program to implement Selection Sort Algorithm.	3	
	Write a C++ program to implement Merge Sort Algorithm.	2	
	Write a C++ program to find the minimum and maximum number of given array.	1	
V	Write a C++ Program to Solve Knapsack Problem.	3	Demo & Practical Session

Course Learning outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	K - Levels
CLO 1	Implement and Analyze the performance of stack, queue, single and double linked list	Up to K2
CLO 2	Understand the concept of tree and its operation.	Up to K3
CLO 3	Gain knowledge to differentiate various operations on graphs.	Up to K3
CLO 4	Build and compare various sorting techniques.	Up to K4
CLO 5	Ability to identify the appropriate data structure for given problem.	Up to K2

Mapping of CLOs with PSOs

CLOs/PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO 1	3	3	2	2	2	1
CLO 2	3	3	3	2	2	3
CLO 3	3	3	2	1	2	3
CLO 4	3	3	3	3	2	2
CLO 5	3	3	3	2	2	1

(3 – Advanced Application, 2 – Intermediate Level , 1- Basic Level)

Mapping of CLOs with POs

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO 1	3	2	3	3	2
CLO 2	3	3	3	2	2
CLO 3	3	2	2	1	3
CLO 4	3	3	1	3	3
CLO 5	3	2	1	3	3

(3 – Advanced Application, 2 – Intermediate Level , 1- Basic Level)

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: II UG				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	NME-II	20U4FNM2	Introduction to Internet	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	✓

Course Objectives

1. To learn the basic concepts and essential knowledge on the application and technology of the Internet and World Wide Web.
2. To understand how to access the Internet and the use of Web browser.
3. To familiarize the concept of using E-Mail.
4. To analyze a web page and identify its elements and attributes.
5. Ability to design basic web pages with HTML.

UNIT	CONTENT	Hrs	K-Level	CLO
I	Introduction to Internet: Internet- Growth of Internet and ARPANET-Anatomy of Internet – History of WWW - Basic Internet Terminologies – Net Etiquette - Internet Applications - Commerce and Governance on the Internet - Impact of Internet on Society-Internet Protocols	6	Up to K2	1
II	Browsers and Search engines: Browsers – browser- Introduction – Parts of a browser window -Running a browser - working with a Browser. Search engines: What is search engine? - Types of search engines - Search and Meta search engines	6	Up to K2	2
III	E-mail: E-mail - E-mail Networks and Servers - E-mail Protocols - Structure of E-mail - Attachments – E-mail Clients - Web based E-mail-Address book – Signature File.	6	Up to K2	3
IV	HTML Programming Basics: Introduction to HTML – HTML browsers - Different versions of HTML-HTML tags - Document Overview - Header Elements - Section headings (Optional VBScripts, Difference between XML and HTML)	6	Up to K2	4
V	HTML Programming Basics: Block headings – Lists-Inline elements – Images - working with Tables, Forms, and Frames.	6	Up to K2	5

Book for Study

Internet Technology and Web Design, by Ramesh Bangia, Third Edition, Firewall Media (An Imprint of Lakshmi Publications Pvt. Ltd.), 2011.

Chapter:

Unit I: 1.1, 1.2, 1.4 – 1.11, 2.2

Unit II: 8

Unit III: 6.1 – 6.5, 6.8, 6.10, 6.11

Unit IV: 9.1 – 9.7

Unit V: 9.8 – 9.14

Books for Reference

1. The Internet Book by Douglas E.Comer, Fourth Edition, PHI Learning Pvt. Ltd. New Delhi, 2009.
2. Introduction to Internet, Scott D.James, Third Edition, PrenticeHall,2000
3. Fundamentals of Information Technology By Alexis Loen and Mathews Leon, Vikas Publishing House Pvt. Ltd., Revised Edition.

Web Resources

1. https://www.tutorialspoint.com/computer_concepts/computer_concepts_introduction_to_internet__www_web_browsers.htm
2. <https://byjus.com/govt-exams/web-browser/>
3. https://www.tutorialspoint.com/internet_technologies/e_mail_overview.htm

Rationale for Nature of the course

- It helps to get a chance to showcase their skills and capabilities in an interactive and advanced environment

Activity on Knowledge and Skill Development

- Assignment
- Quiz
- Group Discussion

Activity on Entrepreneurship

- Creating models on topology.
- Implementing Wired LAN.

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction, and Demonstration.

Course Designer(s) Name

1. Mr. M. Ashok Kumar
2. Mrs.S.Brindha

Lesson Plan

Unit	Topics	Hours	Mode
1	Internet- Growth of Internet and ARPANET -Anatomy of Internet – History of WWW.	2	Lecture, PPT
	Basic Internet Terminologies – Net etiquette - Internet Applications - Commerce and Governance on the Internet - Impact of Internet on Society- Internet Protocols	4	Lecture, PPT,GD
2	Browsers – browser- Introduction – Parts of a browser window - Running a browser - working with a Browser	3	Lecture
	Search engines: What is search engine? - Types of search engines - Search and Meta search engines.	3	Lecture, PPT, Seminar
3	E-mail - E-mail Networks and Servers - E-mail Protocols - Structure of E-mail - Attachments.	3	Lecture
	E-mail Clients - web based E-mail-Address book – Signature File.	3	Quiz
4	Introduction to HTML – HTML browsers - Different versions of HTML-HTML tags.	4	Lecture, chalk and talk, Lecture
	Document Overview - Header Elements - Section headings	2	
5	Block headings - Lists-Inline elements – Images	3	Assignment
	Working with Tables, Forms, and Frames	3	Lecture, Interaction & Demonstration

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	K - Levels
CLO 1	Describe the important features of the Internet and WWW. Discuss net etiquette.	Up to K2
CLO 2	Discuss how web browser software displays web pages and use web search engines effectively.	Up to K2
CLO 3	Elaborate the main features of e-mail and its protocols.	Up to K2
CLO 4	Express HTML and understand how it works. Examine various tags used to create HTML documents.	Up to K2
CLO 5	Outline images, tables, forms and frames in an HTML document.	Up to K2

Mapping of CLOs with POs:

CLOs/Pos	PO1	PO2	PO3	PO4	PO5
CLO 1	3	-	1	-	1
CLO 2	3	1	2	-	2
CLO 3	3	-	3	-	3
CLO 4	3	2	3	-	3
CLO 5	3	2	2	-	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Learning Outcome Based Education & Assessment (LOBE)

Blue Print for Formative – Introduction to Internet Articulation Mapping - K Levels with Course Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C (Open Choice)
			Short Answers		(Either/or Choice)		
			No. of Questions	K- Level	No. of Questions	K- Level	
1	CLO X	Up to K2	2	K1	2	K2&K2	2 (K1)
2	CLO Y	Up to K2	1	K1	2	K2&K2	1 (K1)
No. of Questions to be asked			3			4	3
No. of Questions to be answered			3			2	2
Marks for each question			2			7	10
Total Marks for each section			6			14	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels (CIA I & II)

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Total Marks	% of Marks without choice	Consolidated %
K1	6	-	30	36	56.25	100
K2	-	28	-	28	43.75	
Total Marks	6	28	30	64	100.00	100%

Learning Outcome Based Education & Assessment (LOBE)

Blue Print for Summative Examination –Introduction to Internet Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl.No	CLOs	K- Level	Section A		Section B		Section C (Open Choice)
			Short Answers		(Either/or Choice)		
			No Of Questions	K - Level	No Of Questions	K - Level	
1	CLO 1	Up to K2	1	K1	1	K2 & K2	1(K1)
2	CLO 2	Up to K2	1	K1	1	K2 & K2	1(K1)
3	CLO 3	Up to K2	1	K1	1	K2 & K2	1(K1)
4	CLO 4	Up to K2	1	K1	1	K2 & K2	1(K1)
5	CLO 5	Up to K2	1	K1	1	K2 & K2	1(K1)
No. of Questions to be asked			5		10		5
No. of Questions to be answered			5		5		3
Marks for each question			2		7		10
Total Marks for each section			10		35		30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No choice)	Section B (Either/or)	Section C (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	10	-	50	60	46.15	100
K2	-	70	-	70	53.8	
Total Marks	10	70	50	130	100	100%

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: II B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	SBE-II	20U4FSM2	Visual Programming	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To acquire knowledge on the basics of visual programming.
2. To impart the knowledge of Functions and subroutines.
3. Be familiar with the visual basic controls.
4. To learn the concept of Decision making and looping.
5. To understand the concepts of Menus and MDI forms.

UNIT	CONTENT	Hrs	K-Level	CLO
I	Introduction: Overview of the IDE - Managing forms in Visual Basic - The Visual Basic Language: Declaring Constants, Variables – Selecting variable types-Converting between data types - setting variable scope-verifying data types – declaring arrays & Dynamic arrays	6	Up to K2	1
II	Functions and Subroutines: Declaring Subroutines – Declaring functions – Handling strings – Converting strings to numbers and back again – Handling operators & operator precedence - Handling higher math- Handling Dates and Times.	6	Up to K3	2
III	Controls: Text Boxes and Rich text Boxes- command buttons – checkboxes & option buttons – list boxes and combo boxes – picture boxes and image controls – The timer control – The frame control – the label control – the shape control.	6	Up to K4	3
IV	Decision Making and Looping and Toolbars: Using if-else statements- Using select case – Looping. Toolbars, status bars, progress bars and coolbars.	6	Up to K4	4
V	Menus : Visual Basic Menus: adding a menu to a form – modifying & deleting menu items – creating sub menus – using Visual Basic predefined menus-Handling MDI forms & MDI child menus-creating & displaying popup menus – Adding & deleting menu items at runtime.	6	Up to K3	5

Book for Study

1. Visual Basic 6 Programming Black Book by Steven Holzner 16th Reprint Edition -Dreamtech Press Publications.

Chapters:

- Unit I: 2,3
- Unit II: 3
- Unit III: 6, 7, 8, 10, 13, 14
- Unit IV: 3, 4
- Unit V: 5

Books for Reference

1. Mastering Visual Basic 6 by Petroutsos.E, Fifth edition, BPB Publications
2. Visual Basic 6.0 – The Complete reference by Jerke .N, Nineteenth Reprint 2004, Tata-McGraw Hill Publishing.
3. VB 6 from the Ground up by Gary Cornell, Second Reprint 1999-Tata-McGraw Hill Private Ltd.

Web Resources

1. <https://docs.microsoft.com/en-us/visualstudio/get-started/visual-basic>
2. <https://www.vbtutor.net/vbtutor.html>
3. <https://www.tutlane.com/tutorial/visual-basic>

Rationale for Nature of the course

- Helps to develop GUI based applications and to connect them to handler functions provided by the application.

Activity on Knowledge and Skill Development

- Assignment
- Quiz
- Group Discussion

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Mrs. K. Imaya
2. Mrs.S.Sasikala

Lesson Plan

Unit	Topics	Hours	Mode
I	Overview of the IDE - Managing forms in Visual Basic - The Visual Basic Language.	3	Lecture
	Declaring Constants, Variables – Selecting variable types-Converting between data types - setting variable scope- verifying data types – declaring arrays & Dynamic arrays	3	Lecture & GD
II	Declaring Subroutines – Declaring functions – Handling strings – Converting strings to numbers and back again.	3	Lecture
	Handling operators & operator precedence - Handling higher math- Handling Dates and Times.	3	Lecture
III	Text Boxes and Rich text Boxes- command buttons – checkboxes & option buttons – list boxes and combo boxes.	3	Lecture
	Picture boxes and image controls – The timer control – The frame control – the label control – the shape control.	3	Quiz& Lecture
IV	Using if-else statements- Using select case –Looping.	3	Lecture
	Toolbars, status bars, progress bars and coolbars.	3	Lecture
V	Visual Basic Menus: adding a menu to a form – modifying & deleting menu items – creating sub menus – using Visual Basic predefined menus.	3	Lecture, PPT
	Handling MDI forms & MDI child menus-creating & displaying popup menus – Adding & deleting menu items at runtime.	3	Assignment

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	K - Levels
CLO 1	Categorize the types of variables, Constants, data types, and arrays.	Up to K2
CLO 2	Determine the concept of Subroutines and Functions.	Up to K3
CLO 3	Classify the various types of Controls.	Up to K4
CLO 4	Discuss the concept of Decision making and Looping and Toolbars.	Up to K4
CLO 5	Understand the concept of Menus and MDI Forms	Up to K3

Mapping of CLOs with PSOs

CLOs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO 1	1	1	1	-	1	2
CLO 2	2	2	1	-	2	3
CLO 3	2	3	2	2	1	2
CLO 4	2	2	2	2	2	1
CLO 5	3	1	3	1	3	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Mapping of CLOs with POs

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO 1	3	3	2	1	1
CLO 2	3	1	-	3	1
CLO 3	3	3	-	2	2
CLO 4	3	2	-	2	2
CLO 5	3	2	-	3	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Learning Outcome Based Education & Assessment (LOBE)
Formative Exam – Blue Print – Visual Programming (CIA I & II)
Articulation Mapping - K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
CIA I	CLO 1	Up to K2	2	K1& K2	1	K2	2(K2&K2)	1(K2)
	CLO 2	Up to K3	2	K1& K2	2	K1	2(K3&K3)	2(K3)
CIA II	CLO 3	Up to K4	2	K1 & K2	1	K2	2(K1&K1)	1(K4)
	CLO 4	Up to K4	2	K1 & K2	2	K1	2(K4&K4)	2(K3)
Question Pattern (CIA I & II)	No. of Questions to be asked		4		3		4	3
	No. of Questions to be answered		4		3		2	2
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	2	4	-	-	6	10.00	50
K2	2	2	10	10	24	40.00	
K3	-	-	10	20	30	50.00	50
K4	-	-	-	-	-	-	-
Total Marks	4	6	20	30	60	100.00	100%
K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	26.67	34
K2	2	2	-	-	4	6.67	
K3	-	-	-	20	20	33.33	33
K4	-	-	10	10	20	33.33	33
Total Marks	4	6	20	30	60	100.00	100%

Learning Outcome Based Education & Assessment (LOBE)

Blue Print for Summative Examination – Visual Programming

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

SI.No	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. Of Questions	K - Level	No. Of Questions	K - Level		
1	CLO 1	Up to K2	2	K1 & K2	1	K1	2(K2&K2)	1(K2)
2	CLO 2	Up to K3	2	K1 & K2	1	K1	2(K3&K3)	1(K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K2	2(K1&K1)	1(K4)
4	CLO 4	Up to K4	2	K1 & K2	1	K2	2(K4&K4)	1(K3)
5	CLO 5	Up to K3	2	K1 & K2	1	K2	2(K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analysing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100	100%

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: II B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Major Core - 6	20U4FMC6	Java Programming	5	5	25	75	100

Nature of Course				
Knowledge and skill		✓	Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To acquire knowledge on the basics of Java programming.
2. To impart the knowledge of OOPs approach in computer programming.
3. To understand and apply the concepts of Array declaration and uses.
4. Be familiar with programming environment with File handling and Multithreading.
5. To learn the concept of Applet Programming.

UNIT	CONTENT	Hrs	K-Level	CLO
I	Introduction: Java history – Java Features – Simple Java Programs – Class declaration – Tokens – Comments – Statements – JVM – Implementing Java programs – Command line arguments – Constants, Variables and Data types – Operators and Expressions – Decision making statements – Simple if statements – If-else statements – Nesting if-else statements – else-if ladder – switch statement – ternary operator – Looping – While, do-while, for loop statements	15	Up to K3	1
II	Class & objects: Creation of class – Objects and methods – Accessing class members – Constructors – Method Overloading – Overriding – Static members – Inheritance – Interface.	15	Up to K3	2
III	Arrays : Arrays – Types – Length – Strings – Strings Manipulations – Enumerated types – Java API Packages – System package – Creating and accessing user defined and system packages – Managing errors and exceptions.	15	Up to K4	3
IV	Input / Output Managing I/O files in Java – Stream I/O – Byte stream class – Character stream class – creation of files – File handling in Java – Multi threaded programming – Multithreads in Java – Thread class – Life cycle of thread – Thread exceptions – Priority.	15	Up to K2	4

V	Applets & Graphics Programming: Applet programming – Introduction – Preparing to write Applets – Building applet code – Applet life cycle – Creating an executable applet – Applet tag – Running the applet – Passing parameters – Displaying numerical values - Getting input from the user – Working with JDBC APIs – Introducing JDBC API – Communicating with database using JDBC API – Understanding various JDBC Drivers.	15	Up to K4	5

Book for Study

1. Programming with Java by E. Balagurusamy, V Edition., - MGH.
2. Jdbc 4.2, Servlet 3.1, AndJsp 2.3 Includes Jsf 2.2 And Design Patterns, Black Book, by Santosh Kumar K, 2nd Edition, Dream Tech Publications

Chapters:

Unit I: 2.1, 2.2, 3.2, 3.4, 3.6, 3.7, 3.10, 3.9, 3.11, 4, 5, 6, 7.2, 7.3, 7.4

Unit II: 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.12, 8.9, 8.11, 10

Unit III: 9.1, 9.2, 9.3, 9.4, 9.5, 9.8, 11.2, 11.3, 11.5, 11.6, 13

Unit IV: 16.3, 16.4, 16.5, 16.10, 16.8, 12.2, 12.3, 12.5, 12.7, 12.8

Unit V: 14.1, 14.3, 14.4, 14.5, 14.6, 14.8, 14.10, 14.12, 14.15, 14.16

Text Book 2: Chapter 3.

Books for Reference

1. Java How to Program by Deital & Deital, Pearson education-2003.
2. Java A Beginner's Guide by Herbert Schildt, IV Ed., TMH.
3. Java Complete Reference 2 by Patrick Naughton, Herbert Schildt, V Ed., - TMH.

Web Resources

1. <https://www.w3schools.com/java/>
2. <https://www.javatpoint.com/java-tutorial>
3. <https://www.programiz.com/java-programming>

Rationale for Nature of the course

- Helps to construct real time applications without necessarily knowing their inside implementation.

Activity on Knowledge and Skill Development

- Assignment
- Quiz
- Group Discussion

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Mrs. K. Imaya
2. Mrs. R. Lakshapriya

Lesson Plan

Unit	Topics	Hours	Mode
I	Java history – Java Features – Simple Java Programs – Class declaration – Tokens – Comments – Statements.	5	Lecture
	JVM – Implementing Java programs – Command line arguments – Constants, Variables and Data types – Operators and Expressions.	5	Lecture & GD
	Decision making statements – Simple if statements – If-else statements – Nesting if-else statements – else-if ladder – switch statement – ternary operator – Looping – While, do-while, for loop statements	5	Lecture & GD
II	Creation of class – Objects and methods – Accessing class members.	3	Lecture
	Constructors – Method Overloading – Overriding.	6	Lecture
	Static members – Inheritance – Interface.	6	Lecture
III	Arrays – Types – Length – Strings – Strings Manipulations – Enumerated types.	5	Lecture
	Java API Packages – System package – Creating and accessing user defined and system package.	6	Quiz
	Managing errors and exceptions.	4	Lecture
IV	Managing I/O files in Java – Stream I/O – Byte stream class – Character stream class	5	Lecture
	Creation of files – File handling in Java	5	Lecture
	Multithreaded programming – Multithreads in Java – Thread class – Lifecycle of thread – Thread exceptions – Priority.	5	Lecture
V	Applet programming – Introduction – Preparing to write Applets – Building applet code – Applet life cycle – Creating an executable applet – Applet tag – Running the applet – Passing parameters – Displaying numerical values. Getting input from the user	8	Lecture, PPT
	Working with JDBC APIs - Introducing JDBC API – Communicating with database using JDBC API – Understanding various JDBC Drivers.	7	Assignment

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	K - Levels
CLO 1	Categorize the types of variables, Constants, data types, operators, Expressions, Decision Making and Looping.	Up to K3
CLO 2	Determine the concept of Classes and Objects, Constructors, Method Overloading, Inheritance and Interface.	Up to K3
CLO 3	Classify the various types of Arrays and operations related with strings	Up to K4
CLO 4	Write the code for managing I/O files, file handling and multi threaded	Up to K2
CLO 5	Devise the code for Applet programming and JDBC Connectivity.	Up to K4

Mapping of CLOs with PSOs

CLOs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO 1	2	2	3	-	1	2
CLO 2	2	1	2	-	2	3
CLO 3	2	3	2	-	1	2
CLO 4	2	3	2	-	2	1
CLO 5	3	1	3	1	3	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Mapping of CLOs with POs

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO 1	3	3	2	1	1
CLO 2	3	1	-	3	2
CLO 3	3	3	-	2	1
CLO 4	3	2	-	2	2
CLO 5	3	2	-	3	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Learning Outcome Based Education & Assessment (LOBE)
Formative Exam – Blue Print – Java Programming (CIA I & II)
Articulation Mapping - K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
CIA I	CLO 1	Up to K3	2	K1& K2	1	K2	2(K3&K3)	1(K3)
	CLO 2	Up to K3	2	K1& K2	2	K1	2(K3&K3)	2(K3)
CIA II	CLO 3	Up to K4	2	K1 & K2	1	K2	2(K1&K1)	1(K4)
	CLO 4	Up to K2	2	K1 & K2	2	K1	2(K2&K2)	2(K2)
Question Pattern (CIA I & II)	No. of Questions to be asked		4		3		4	3
	No. of Questions to be answered		4		3		2	2
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	2	4	-	-	6	10.00	17
K2	2	2	-	-	4	6.66	
K3	-	-	20	30	50	83.33	83
K4	-	-	-	-	-	-	-
Total Marks	4	6	20	30	60	100.00	100%
K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	26.67	83
K2	2	2	10	20	34	56.67	
K3	-	-	-	-	-	-	-
K4	-	-	-	10	10	16.67	17
Total Marks	4	6	20	30	60	100.00	100%

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for summative Examination – Java Programming
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

SI.NO	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No Of Questions	K - Level	No Of Questions	K - Level		
1	CLO 1	Up to K3	2	K1 & K2	1	K2	2(K3&K3)	1(K3)
2	CLO 2	Up to K3	2	K1 & K2	1	K1	2(K3&K3)	1(K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K2	2(K1&K1)	1(K4)
4	CLO 4	Up to K2	2	K1 & K2	1	K1	2(K2&K2)	1(K2)
5	CLO 5	Up to K4	2	K1 & K2	1	K2	2(K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analysing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100	100%

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: II B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Major Core Practical-4	20U4FMP4	Java Programming Lab	2	3	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To acquire knowledge on the basics of Java programming.
2. To impart the knowledge of OOPs approach in computer programming.
3. To understand and apply the concepts of Array declaration and uses.
4. Be familiar with programming environment with File handling and Multithreading.
5. To learn the concept of Applet Programming.

UNIT	CONTENT	Hrs	K-Level	CLO
I	Introduction: 1. Write a Java program to generate the Fibonacci Series. 2. Write a Java program using Command Line Arguments. 3. Write a Java program to calculate Electricity bill.	9	Up to K2	1
II	Class & objects: 4. Write a Java program to generate student mark list using Classes and Object. 5. Write a Java program to find the Area of different shapes using Method Overloading. 6. Write a Java program for Employee pay bill calculation using Multilevel Inheritance	9	Up to K3	2
III	Arrays, Packages, Exceptions: 7. Write a Java program to perform Arithmetic Calculation using Package. 8. Write a Java program to perform String Manipulation. 9. Write a Java program for User Defined Exception and Built-In Exception	9	Up to K3	3
IV	Input / Output : 10. Write a Java program using Multithreading. 11. Write a Java program to counting vowels in given File	9	Up to K4	4
V	Applets & Graphics Programming: 12. Write a Java Applet program to draw a Smiley using Graphics Packages. 13. Write a Java program for getting input from the user using Applet. 14. Write a java program to create a database of student mark list using JDBC and My Sql. 15. Write a java program to update a student mark list database using JDBC and My Sql.	9	Up to K2	5

Book for Study

1. Programming with Java by E. Balagurusamy, V Edition., - MGH.
2. Jdbc 4.2, Servlet 3.1, AndJsp 2.3 Includes Jsf 2.2 And Design Patterns, Black Book, by Santosh Kumar K, 2nd Edition, Dream Tech Publications

Books for Reference

1. Java How to Program by Deital & Deital, Pearson education-2003.
2. Java A Beginner's Guide by Herbert Schildt, IV Ed., TMH.
3. Java Complete Reference 2 by Patrick Naughton, Herbert Schildt, V Ed., - TMH.

Web Resources

1. <https://www.w3schools.com/java/>
2. <https://www.programiz.com/java-programming/>
3. <https://www.tutorialpoint.com/java-language/>

Rationale for Nature of the course

- Helps to construct real time applications without necessarily knowing their inside implementation.

Activities on Skill Development

- Practice to implement program
- Bug Fixing

Pedagogy

Projector, Demonstration and Practical Session.

Course Designer(s) Name

1. Mrs. K. Imaya
2. Mrs. R. Lakshapriya

Lesson Plan

Unit	Topics	Hours	Mode
I	Write a Java program to generate the Fibonacci Series.	3	Demo & Practical sessions
	Write a Java program using Command Line Arguments.	3	
	Write a Java program to calculate Electricity bill.	3	
II	Write a Java program to generate student mark list using Classes and Object.	3	Demo & Practical sessions
	Write a Java program to find the Area of different shapes using Method Overloading.	3	
	Write a Java program for Employee pay bill calculation using Multilevel Inheritance.	3	
III	Write a Java program to perform Arithmetic Calculation using Package.	3	Demo & Practical sessions
	Write a Java program to perform String Manipulation.	2	
	Write a Java program for User Defined Exception and Built-In Exception	4	
IV	Write a Java program using Multithreading.	5	Demo & Practical sessions
	Write a Java program to counting vowels in given File.	4	
V	Write a Java Applet program to draw a Smiley using Graphics.	2	Demo & Practical sessions
	Write a Java program for getting input from the user using Applet.	2	
	Write a java program to create a database of student mark list using JDBC and My Sql.	3	
	Write a java program to update a student mark list database using JDBC and My Sql.	2	

Course Learning Outcomes

On the completion of the course the student will be able to

CLOs	Course Learning Outcomes	K - Levels
CLO 1	Outline the logic using flowchart for a given problem and develop programs using conditional and looping statements	Up to K2
CLO 2	Develop programs with implementation of classes & object, constructor, Inheritance and Interface	Up to K3
CLO 3	Develop programs with Arrays, String handling functions and Packages.	Up to K3
CLO 4	Construct programs with Managing I/O Files, File Handling, and Multithreaded Programming.	Up to K4
CLO 5	Gain skills to write Applet Programming and JDBC Connectivity with My SQL.	Up to K2

Mapping of CLOs with PSOs

CLOs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO 1	2	2	3	-	1	2
CLO 2	2	1	2	-	2	3
CLO 3	2	3	2	-	1	2
CLO 4	2	3	2	-	2	1
CLO 5	3	1	3	1	3	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5
CLO 1	3	3	2	1	1
CLO 2	3	1	-	3	2
CLO 3	3	3	-	2	1
CLO 4	3	2	-	2	2
CLO 5	3	2	-	3	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: II B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Add – on 1	20U3FADD1	R Programming	2	30	50	50	100

Course Objectives

1. To understand the basics in R programming.
2. To understand the use of Multidimensional Arrays and Data Frames.
3. Learn to feed data into R.
4. Able to apply Control Statements and Functions.
5. To impart knowledge in OOPs.

UNIT	CONTENT	HOURS
I	Basics of R - Basic Math – Variables - Data Types – Vectors - Calling Functions - Function – Documentation - Missing Data – Pipes.	6
II	Advanced Data Structures – data frames – Lists – Matrices – Arrays.	6
III	Reading Data into R - Reading CSVs - Excel Data - Reading from Databases - Data from Other Statistical Tools - R Binary Files - Data Included with R - Extract Data from Web Sites - Reading JSON Data.	6
IV	Writing R functions - Hello, World! - Function Arguments - Return Values – do call - Control Statements - if and else – switch – if else - Compound Tests - Loops, the Un-R Way to Iterate - for Loops - while Loops - Controlling Loops.	6
V	Starting out: Working with Objects – Manipulating Objects – Viewing objects within objects – Constructing Data Objects – Forms of Data Objects – Testing and Converting.	6

Books for Study

1. R for Everyone: Advanced Analytics and Graphics by Jared P. Lander Addison, Wesley Data & Analytics Series, 2013.
2. Art of R Programming: A Tour of Statistical Software Design by Norman Matloff, No Starch Press, 2011.

Chapters:

Book 1:

Unit I: 4

Unit II: 5

Unit III: 6

Unit IV: 8,9,10

Book 2:

Unit V: 3

Books for Reference

1. Beginning R – The Statistical Programming Language by Mark Gardener, Wiley, 2013
2. Robert Knell – “Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R” - Amazon Digital South Asia Services Inc, 2013.

Web Resources

1. <https://elearningindustry.com/applications-r-programming>.
2. <https://www.tutorialspoint.com/r/index.htm>
3. https://www.tutorialspoint.com/r/r_basic_syntax.htm

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Mrs. S. Brindha
2. Mrs. K. Imaya

Blue Print – Model for Add-On Course
Internal Assessment
Distribution of Section – wise Marks

Section	Components	Marks
Section A	Project / Assignment / Quiz	15
Section B	Modeling / Creativity	15
Section C	Innovation in Experiment	20
	Total	50

Blue Print – Model for Add-On Course
External Examination
Distribution of Section – wise Marks

Description	Section A MCQs	Section B (Open Choice)	Total
No. of Questions to be asked	10	7	
No. of Questions to be answered	10	4	
Marks for each question	1	10	
Total Marks for each section	10	40	50

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: II B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Add – on 2	20U4FADD2	Internet of Things	2	2	50	50	100

Course Objectives

1. To understand the technology behind Internet of Things.
2. To know about Internet Protocols.
3. To get familiar with the design principles of connected devices.
4. To acquire knowledge on API.
5. To know about business models and ethics in Internet of Things.

UNIT	CONTENT	HOURS
I	The Internet of Things: An Overview –The Internet of Things – The Technology of the Internet of Things - Enhanced objects.	6
II	Internet Principles: Internet Communications overview – IP – TCP – TCP/I P – UDP. IP Addresses: DNS – Static and Dynamic IP Address Assignment – MAC Addresses – TCP and UDP Ports – Application Layer Protocols - Open Source versus Closed Source.	6
III	Prototyping Embedded Devices: Electronics - Embedded Computing Basics – Tools: Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp. Prototyping the Physical Design: Non digital Methods - Laser Cutting - 3D printing.	6
IV	Prototyping Online Components: API - Writing a New API - Real-Time Reactions - Other Protocols.	6
V	Business Models: History of Business Models – Model – Internet of Starting up – Lean Startups. Moving to Manufacture: Designing Kits - Designing Printed circuit boards – Certification – Costs - Scaling Up Software. Ethics: Privacy – Control – Environment – Solutions.	6

Book for Study

1. Designing the Internet of Things by Adrian McEwen and Hakim Cassimally, Wiley, 2014.

Chapters:

Unit I – 1

Unit II – 3, 4

Unit III – 5, 6

Unit IV – 7

Unit V – 9, 10, 11

Books for Reference

1. Internet of Things – From Research and Innovation to Market Deployment by Ovidiu Vermesan and Peter Friess, River Publishers, 2014.
2. Learning Internet of Things by Peter Waher, Packt Publishing, 2015.
3. The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBoneBlack by Donald Norris, McGraw Hill, 2015.

Web Resources

1. <https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT>
2. https://en.wikipedia.org/wiki/Internet_of_things
3. https://madsg.com/wp-content/uploads/2015/12/Designing_the_Internet_of_Things.pdf

Pedagogy

Chalk and talk, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Mrs. S. Rajalakshmi
2. Mrs. S. Sasikala

Blue Print – Model for Add-On Course

Internal Assessment Distribution of Section – wise Marks

Section	Components	Marks
Section A	Project / Assignment / Quiz	20
Section B	Modeling / Creativity	15
Section C	Innovation in Experiment	15
	Total	50

Blue Print – Model for Add-On Course

External Examination Distribution of Section – wise Marks

Description	Section A MCQs	Section B (Open Choice)	Total
No. of Questions to be asked	10	7	
No. of Questions to be answered	10	4	
Marks for each question	1	10	
Total Marks for each section	10	40	50

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: II B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III & IV	Self Study Course	20U4FADD2	Designing and Editing Tools	2				100

Course Objectives

1. To get familiar with CorelDraw interface and its basic tools.
2. To work with Objects, Layers and their Alignment.
3. To identify the elements in the work area of Adobe Photoshop.
4. To Apply Masks and Typographic design.
5. To impart knowledge in Advanced Tools of Adobe Photoshop.

Unit	Content
I	CorelDRAW - Basic Tools: The CorelDraw Interface – Drawing Predefined Shapes – Drawing Freehand Shapes and Lines – Creating and Manipulating Text -Selecting and Transforming Objects – Shaping Objects - Color, Fills, and Color Management.
II	CorelDRAW - More Tools: Outlining Objects – Viewing, Zooming, and Panning – Object Ordering, Layers, and Object Manager – Rulers, Guidelines, & Grids – Combining, Grouping, and Converting to Curves – Weld, Trim, Intersect, and More – Align, Distribute, Duplicate, Copy, Paste, and Symbols
III	Adobe Photoshop - Basic Tools: Getting To Know The Work Area - Basic Photo Corrections - Working With Selections - Layer Basics
IV	Adobe Photoshop - More Tools: Quick Fixes - Masks And Channels - Typographic Design
V	Adobe Photoshop - Advanced Tools: Vector Drawing Techniques - Advanced Compositing - Painting With The Mixer Brush

Books for study

1. CorelDRAW 12 Unleashed, published by Foster D Coburn III, 2004
2. Adobe Photoshop Classroom in a Book 2020 Release by Andrew Faulkner, Conrad Chavez, Adobe Press.

Chapters:

Unit I: 2 to 8
Unit II: 9 to 15
Unit III: 1, 2, 3, 4
Unit IV: 5, 6, 7
Unit V: 8, 9, 10

Books for reference

1. Corel draw X7 Official Guide by Gary David Bouton
2. Corel Draw Training Guide Prof Satish Jain and M Geetha , BPB Publications
3. Adobe Photoshop CC for Dummies by Peter Bauer, Second Edition.

Web References

1. http://saintangelos.com/studentdesk/Download/COREL_DRAW_BOOK.pdf
2. <http://product.corel.com/help/CorelDRAW/540229932/Main/EN/User-Guide/CorelDRAW-X7.pdf>
3. https://helpx.adobe.com/pdf/photoshop_reference.pdf
4. <https://www.sjsu.edu/ajeep/docs/Photoshop%20Module%20v7c-PC%20for%20WEB-2.pdf>

Course Designer(s) Name

1. Mr. M. Ashok Kumar
2. Mr. N. Radha Krishnan

Blue Print – Model for Self Study Course for Advanced Learners**Summative Assessment****Distribution of Section – wise Marks**

Section	Components	Marks
Section A	Assignment	25
Section B	Improvisation of Experiment / Creativity / Analysis / Innovation	25
Section C	Project Work & Viva Presentation	25
Section D	Internal Test	25
	Total	100

DEPARTMENT OF INFORMATION TECHNOLOGY				Certificate Course				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
	Certificate Course - 1		PC Hardware and Networking	2	2	50	50	100

Course Objectives

1. To understand basic concepts and structure of computer hardware components.
2. To acquire basic and troubleshooting knowledge in Memory Devices.
3. To identify the various External I/O Interfaces.
4. To know about how to connect a system in LAN and Internet.
5. To acquire knowledge of building a PC.

Unit	Content	Hours
I	PC Components, Features, and System Design: What is a PC? – System Types – System Components – Processor Types and Specifications: Processor Specifications. (List only). Mother Boards and Buses: Mother Board Form Factors – Mother Board Selection Criteria.	6
II	Memory: Memory Basics – Memory Standards – Speed and Performance – RAM Upgrades – Troubleshooting Memory – Memory Defect Isolation Procedures.	6
III	Flash and Removable Storage: USB Flash Drives. External I/O Interfaces: Introduction to Input / Output Ports.	6
IV	Local Area Networking: Defining a Network – Client/Server Versus Peer Networks – Hardware Elements of Your Network – Internet Connectivity: Broadband Internet Access Types – Internet Connection Security.	6
V	Building or Upgrading Systems: System Components – Hardware and Software Resources – System Assembly and Disassembly – System Startup – Installing the OS – Troubleshooting New Installations.	6

Books for study

1. Upgrading and Repairing PCs by Scott Mueller, 22nd Edition, Pearson Education, 2015.

Chapters:

- Unit I: 2, 3.2, 4.1, 4.18
Unit II: 6.1, 6.2, 6.3, 6.9, 6.10, 6.11.
Unit III: 9.4, 13.1
Unit IV: 16.1, 16.2, 16.4, 15.2, 15.4
Unit V: 18

Books for Reference

1. Comdex Hardware and Networking Course Kit-Vikas Gupta, Dreamtech Press.
2. Essential Computer Hardware Second Edition : The Illustrated Guide to understanding Computer Hardware(Computer Essentials)-Kevin Wilson

Web Resources

1. <https://www.programmer-books.com/wp-content/uploads/2018/12/Troubleshooting-and-Maintaining-Your-PC-All-in-One-For-Dummies-3rd-Edition.pdf>
2. <https://www.instructables.com/How-To-Assemble-A-Basic-Desktop-PC/>
3. <https://www.cpu-world.com/info/id/Intel-identification.html>
4. <https://www.techrepublic.com/article/how-to-control-a-remote-computer-using-microsofts-remote-desktop-connection/>

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Mr. N. Radha Krishnan
2. Mr. M. Ashok Kumar

Evaluation Pattern

- Distribution of marks for Internal and External examinations will be 50% each.
- Course teacher will fix the components for the distribution of marks in both internal and external examinations.

DEPARTMENT OF INFORMATION TECHNOLOGY				Certificate Course				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
	Certificate Course - 2		Web Designing Tools	2	2	50	50	100

Course Objectives

1. To impart knowledge about the web development and their applications
2. To create forms with radio groups, check boxes and/or text fields
3. To Place image and text elements within a web page using Cascading Style Sheets.
4. To learn the concept of creating a new web page in Dreamweaver CC.
5. To create a basic, fully functional website.

Unit	Content	Hours
I	Basics of HTML: Introduction to HTML – HTML browsers - Different versions of HTML-HTML tags - Document Overview - Header Elements - Section headings - Body Section.	6
II	Working with HTML: Block headings – Lists-Inline elements – Images - working with Tables, Forms, and Frames.	6
III	Cascading Style Sheets: Introduction to Dynamic HTML – CSS – Document Object Model – Event Handling – Filters and Transitions – Data Binding.	6
IV	Introducing Dreamweaver CC: Introduction- Getting Familiar With New Features-Hardware and Software Requirements for Dreamweaver CC- Launching Adobe Dreamweaver CC- Exploring the Adobe Dreamweaver CC User Interface- Creating a Web Page-Exploring Views in the Document Window- Working with Panels-Working with a Workspace-Saving a Web Page and Quitting the Application.	6
V	Setting Up A Website: Static and Dynamic Websites-Common Dreamweaver File Types-Setting Page Properties-Creating a Website-Adding a Title to a Web Page-Managing a Website. Working With Library, Layouts And Templates: Introducing Library Items-Understanding Page Layout with CSS-Introducing Templates-Inserting an Editable Region- Publishing a Website: Publishing a Website.	6

Books for Study

1. Web Technology - A Developer's Perspective by N P Gopalan, J Akilandeswari,, PHI, II Edition, New Delhi ,2008.
2. Dreamweaver CC in Simple Steps by DT Editorial Services, Dreamtechpress, 2019.

Chapters

Book 1

Unit I: 4

Unit II:4

Unit III: 7

Book 2

Unit IV:1

Unit V: 2,6,8

Books for Reference

1. “Web Technology and Design” – C. Xavier, New Age International Publisher
2. . Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI, - Ivan Bayross, BPB Publication.

Web Resources

1. https://www.w3schools.com/html/html_tables.asp
2. <https://www.geeksforgeeks.org/dom-document-object-model/>
3. <https://www.hostinger.in/tutorials/dreamweaver-tutorial/>

Pedagogy

Chalk and talk, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Mrs. K. Vairameenakshi
2. Miss. S. Saranya

Evaluation Pattern

- Distribution of marks for Internal and External examinations will be 50% each.
- Course teacher will fix the components for the distribution of marks in both internal and external examinations.

THE MADURA COLLEGE (Autonomous), MADURAI-11.
(Self Financed Stream)
PG DEPARTMENT OF COMPUTER SCIENCE

VISION

To disseminate quality education in Computer science and related fields to the students make them fit and have strong foundation to compete the challenges in the Computer world.

MISSION

- To implement appropriate and relevant educational programs through quality teaching and learning methods.
- To explore the skills of the students through student centric activities based on Hands on training.
- To create a learning environment for enhancing their innovated ideas, problem solving skills, leadership qualities and team spirit.
- To produce skilled graduates with a creative mind-set who can recognize a computational problem either in IT industry or society, and develop effective solutions.

Programme Educational Objectives (PEOs):

After successful completion of the programme, the students will be able to

PEO-1	Apply algorithmic, mathematical and scientific reasoning to a variety of computational problems.
PEO-2	Develop software systems that meet specified design and performance requirements.
PEO-3	Utilize strong technical aptitude and domain knowledge to develop smart software solutions for the upliftment of the society
PEO-4	Apply research and entrepreneurial skills augmented with rich set of communication, team work and leadership skills to excel in their profession.
PEO-5	Show continuous improvement in their professional career through life long learning, appreciating human values and ethics.

Programme Outcomes (POs):

At the end of the programme, the students will be able to

PO	GRADUATE ATTRIBUTES	DESCRIPTION
PO-1	Knowledge in core competency	Apply knowledge of mathematics, computer science and management to develop theoretical and practical skill set.
PO-2	Problem analysis & Modern tool usage	Identify, critically analyze, formulate and develop computer-based solutions by using modern computing tools and techniques.
PO-3	Design and development of solutions for complex problems	Interpret data, devise and conduct experiment and provide well framed solutions.
PO-4	Communication, Ethics & Individual and Team work	Perform professionally with ethical responsibility as an individual as well as multidisciplinary team member with positive attitudes
PO-5	Lifelong learning	Insist the importance of goal settings and to recognize the need for updated knowledge to achieve them
PO-6	Environment and sustainability	Develop overall personality and character with team spirit, professionalism, integrity and moral values to serve for the society.

Qualification for Admission

Candidates should have passed with minimum 55% in B.Sc. Computer Science / Information Technology / Computer Application of Madurai Kamaraj University or an Examination of any other University accepted by the Syndicate as equivalent there to shall be eligible for admission to M.Sc. Degree Course in Computer Science.

Duration of the Course

The students shall undergo prescribed course of study for the period of two academic years consists of four semesters under CBCS semester pattern with Outcome-Based Education.

Medium of Instruction: English

System: Choice Based Credit System with Outcome Based Education Model.

The curriculum is strengthened through the recent revisions as per UGC and TANSCH Norms.

Based on the feedback about curriculum from the students, the following courses have been included.

1. Internet of Things
2. Block Chain Technologies
3. Python Programming

Evaluation (Theory)

Internal (Formative)	:	25 marks
External (Summative)	:	75 marks
Total	:	100 Marks

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(refer formative table)
Assignment	5	K4
Seminar	5	K4 / K5
Quiz	5	K4
Total	25	

- ✓ There will be a two Internal Assessment tests
- ✓ Duration of Internal Assessment test will be 2 hours
- ✓ Students shall write retest on the genuine grounds if they are absent in either Test I or Test II with the approval of Head of the Department / Coordinator and the Principal / Chief Coordinator.

Question Paper Pattern for External Examination: 75 Marks

Section	Marks
A- Multiple Choice Questions (10 X 1 marks)	10
B- Short answer type (5 X 2 marks)	10
C- Either/Or type (5 X 5 marks)	25
D- Open Choice type (3 out of 5 X 10 marks)	30
Total	75

Evaluation (Practical)

Internal (Formative)	: 40 marks
External (Summative)	: 60 marks
Total	: 100 Marks

Internal	
Components	Marks
Major Question	20
Minor Question	10
Record Work	5
Program Explanation / VIVA	5
Total	40

External	
Components	Marks
Major Question	30
Minor Question	20
Record Work	5
Program Explanation / VIVA	5
Total	60

- In respect of external examinations passing minimum is **45%** for Post Graduate Courses and in total, aggregate of **50%**.



The Madura College (Autonomous), Madurai – 625 011
(Self Financed Stream)
PG Department of Computer Science
Curriculum Structure for M.Sc. Computer Science

Semester	Course Type	Course Code	Course Title	Contact Hours / Week	Credits
I	Major Core - 1	21P1DMC1	Mathematical Foundations for Computer Science	5	4
	Major Core - 2	21P1DMC2	Data Structures and Algorithms in C++	5	4
	Major Core – 3	21P1DMC3	Python Programming	5	4
	Elective - 1	21P1DME1	A. Advanced Computer Organization and Architecture B. Embedded Systems C. Object Oriented Analysis and Design	5	4
	Major Core Practical - 1	21P1DMP1	Data Structures and Algorithms in C++ Lab	4	2
	Major Core Practical - 2	21P1DMP2	Python Programming Lab	4	2
	Non-Major Elective - 1	21P1DNM1	Office Automation	2	2
	Total			30	22
II	Major Core – 4	21P2DMC4	Operating System Concepts	5	4
	Major Core – 5	21P2DMC5	Advanced Computer Networks	5	4
	Major Core – 6	21P2DMC6	Computer Graphics	5	4
	Elective – 2	21P2DME2	D. Compiler Design E. Android Programming F. WAP & XML	5	4
	Major Core Practical – 3	21P2DMP3	Linux Programming Lab	4	2
	Major Core Practical – 4	21P2DMP4	Computer Graphics Lab	4	2
	Non-Major Elective– 2	21P2DNM2	Basics of Internetworks	2	2
	Total			30	22

Semester	Course Type	Course Code	Course Title	Contact Hours/ Week	Credits
III	Major Core – 7	21P1DMC7	Relational Database Management System	6	4
	Major Core – 8	21P1DMC8	Advanced Java Programming	5	4
	Major Core – 9	21P1DMC9	Advanced Software Engineering	5	4
	Elective – 3	21P1DME3	G. Cloud Computing H. Mobile Computing I. Block Chain Technologies	6	4
	Major Core Practical – 5	21P1DMP5	Relational Database Management System Lab	4	2
	Major Core Practical – 6	21P1DMP6	Advanced Java Programming Lab	4	2
	Total			30	20
IV	Major Core –10	21P2DMC10	Data Mining and Data Warehousing	6	4
	Major Core – 11	21P2DMC11	Dot Net Programming	5	4
	Major Core – 12	21P2DMC12	PHP programming	5	4
	Elective – 4	21P2DME4	J. Internet of Things K. Digital Image Processing L. Soft Computing	6	4
	Major Core Practical – 7	21P2DMP7	Dot Net Programming Lab	4	2
	Major Core Practical – 8	21P2DMP8	PHP Lab	4	2
	Project	21P2DMP9	Project & viva-voce	-	6
	Total			30	26

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core - 1	21P1DMC1	Mathematical Foundations For Computer Science	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To introduce the concepts of Mathematical Logic.
2. Students should develop mathematical thinking and problem-solving skills associated with writing proofs.
3. To discover various groups, properties of groups and its operations.
4. To construct a K – map to minimize the Boolean Expressions.
5. To apply theoretical knowledge to solve realistic problems in real life.

Unit	Content	Hrs	K-Level	CLO
I	Mathematical Logic: Statements and Notation- Connectives- Negation-Conjunction-Disjunction-Statement formulas and truth tables –Conditional and Biconditional –Well-formed formulas –Tautologies-Equivalence of Formulas- Duality law-Tautological Implications-Normal forms-Disjunctive Normal forms-Conjunctive Normal forms-Principal Disjunctive Normal forms- Principal conjunctive normal forms-Ordering and Uniqueness of Normal forms-The theory of Inference for the statement calculus-Validity using Truth tables-Rules of Inference Consistency of Premises and Indirect method of proof-The Predicate Calculus-Predicate formulas- Free and Bound variables-The Universe of Discourse.	15	Up to K3	1
II	Set Theory : Basic concepts of Set theory-Notation-Inclusion and Equality of Sets-The Power set-Some Operations on sets-Venn Diagrams-Some Basic set Identities-Cartesian Products-Relations and Ordering-Relations-Properties of Binary Relations in a set-Relation Matrix and the graph of a Relation-Equivalence Relations-Composition of Binary Relations-Partial Ordering-Partially Ordered set: Representation and Associated Terminology-Functions-Definition and Introduction- Composition of Functions-Inverse Functions-Binary and n-ary Operations.	15	Up to K3	2

III	Algebraic Structures: Semigroups and Monoids-Definitions and Examples-Homomorphism of semigroups and Monoids-Subsemigroups and Submonoids-Grammars and Languages- Discussion of Grammars-Formal Definition of a Language-Groups-Definitions and Examples-Subgroups and Homomorphisms.	15	Up to K2	3
IV	Lattices and Boolean Algebra: Lattices as Partially Ordered sets-Definition and Examples-Some properties of Lattices-Lattices as Algebraic systems-Sub lattices, Direct product and Homomorphism-Some special Lattices-Boolean Algebra-Definition and Examples-Subalgebra, Direct product and Homomorphism-Boolean Functions-Boolean forms and free Boolean algebras-Values of Boolean Expressions and Boolean functions-Representation and Minimization of Boolean functions-Representation of Boolean Functions-Minimization of Boolean Functions.	15	Up to K4	4
V	Graph Theory: Introduction-Graph-Finite and Infinite Graphs-Incidence and Degree-Isolated Vertex, Pendant vertex and Null graph-Paths and Circuits-Isomorphism-Subgraphs- Walks, paths and Circuits-Connected Graphs, Disconnected Graphs, and Components-Euler Graphs-Operations on Graphs-Trees-Some Properties of Trees-Pendant vertices in a tree-Distance and Centres in a tree.	15	Up to K4	5

Books for Study

1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay and R. Manohar, McGraw-Hill Publishing Company Limited.
2. Graph Theory with Applications to Engineering and Computer Science, Narsingh Deo, Prentice Hall of India Private limited, New Delhi, 2003.

Chapters

Text Book 1

Unit I: 1.1-1.5

Unit II: 2.1, 2.3, 2.4

Unit III: 3.2, 3.3, 3.5

Unit IV: 4.1-4.4

Text Book 2

Unit V -1.1, 1.3-1.5, 2.1, 2.2, 2.4 - 2.6, 2.7, 3.1 - 3.4

Books for Reference

1. Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition, McGraw Hill education (India) Private Limited.
2. Outline Discrete Mathematics by Seymour, 2nd Edition Tata McGraw- Hill Publications.
3. Discrete Mathematics, D.S. Malik and M.K. Sen, Revised edition Cengage Learning.

Web Resources

1. <https://youtu.be/ELmAyJt1E8w>
2. <https://youtu.be/0WL4fO2MGwY>
3. <https://youtu.be/F71odJrr5Bs>

Rationale for Nature of the course

- Learn working principle of Turing machine related mechanism.

Activities on Knowledge and Skill

- Practice to Solve Problems
- Group Discussion
- Seminar

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Dr. M. Revathi
2. Mrs. S. Rajalakshmi

Lesson Plan

Unit	Topics to be Covered	Hrs	Mode
I	Statements and Notation—Conditional and Biconditional.	3	Chalk and Talk, Quiz, Chalk and Talk, Problem Solving
	Duality law- Normal forms. The theory of Inference for the statement calculus.	3	Chalk and Talk, Group Discussion Chalk and Talk
	Rules of Inference Consistency of Premises and Indirect method of proof.	5 4	
II	Basic concepts of Set theory - Cartesian Products.	4	Chalk and Talk,
	Relations and Ordering - Relation Matrix and the graph of a Relation	5	Group Discussion, Problem Solving
	Composition of Binary Relations Partially Ordered set	4	Chalk and Talk, Chalk and Talk
	Composition of Functions.	2	
III	Semigroups and Monoids	3	Chalk and Talk, Seminar
	Grammars and Languages - Discussion of Grammars.	3	Chalk and Talk, quiz
	Formal Definition of a Language – Groups - Definitions and Examples.	5	Chalk and Talk
	Subgroups and Homeomorphisms.	4	Chalk and Talk, Tutorial
IV	Lattices as Partially Ordered sets.	2	Chalk and Talk, quiz
	Sublattices, Direct product and Homomorphism-Some special Lattices-Boolean Algebra.	4	Chalk and Talk, Problem Solving
	Boolean forms and free Boolean algebras.	5	Chalk and Talk, Tutorial
	Representation of Boolean Functions-Minimization of Boolean Functions.	4	Chalk and Talk,
V	Graph-Finite and Infinite Graphs-Incidence and Degree.	3	Chalk and Talk, quiz
	Paths and Circuits.	5	Chalk and Talk,
	Disconnected Graphs and Components-Trees.	5	Chalk and Talk, Seminar
	Trees-Some Properties of Trees-Pendant vertices in a tree.	2	Chalk and Talk Tutorial. Assignment

Course Learning Outcomes

On the completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOMES	K - Level
CLO 1	Evaluate mathematical problems.	Up to K3
CLO 2	Make use of the Concept of Set Theory and its functions.	Up to K3
CLO 3	Discover various groups, properties of groups and its operations.	Up to K2
CLO 4	Apply the concepts of Lattices as Partially Ordered sets.	Up to K4
CLO 5	Model and solve real-world problems using graphs and trees.	Up to K4

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	1	2	2	2	-
CLO 2	2	1	3	3	3	2
CLO 3	2	1	1	1	1	-
CLO 4	2	2	2	1	1	-
CLO 5	2	2	3	3	3	2

(3– Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K4
Seminar	5	K4
Quiz	5	K4
Total	25	

Learning Outcome Based Education & Assessment (LOBE)

Formative - Blue Print – Model for Mathematical Foundations for Computer Science

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
CIA I	CLO 1	Up to K3	2	K1	2(K2&K2)	2(K3)
	CLO 2	Up to K3	3	K2	2(K3&K3)	1(K3)
CIA II	CLO 3	Up to K2	2	K1	2(K1&K1)	2(K2)
	CLO 4	Up to K4	3	K2	2(K4&K4)	1(K4)
Question Pattern (CIA I & II)	No. of Questions to be asked		5		4	3
	No. of Questions to be answered		5		2	2
	Marks for each question		2		5	10
	Total Marks for each section		10		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	4	-	-	4	6.67	33
K2	6	10	-	16	26.67	
K3	-	10	30	40	66.67	67
K4	-	-	-	-	-	-
Total Marks	10	20	30	60	100	100
K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	4	10	-	14	23.33	66
K2	6	-	20	26	43.33	
K3	-	-	-	-	-	-
K4	-	10	10	20	33.33	34
Total Marks	10	20	30	60	100	100

Learning Outcome Based Education & Assessment (LOBE)
Summative - Blue Print – Model for Mathematical Foundations for Computer Science
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K - Level		
1	CLO 1	Up to K3	2	K2 & K3	1	K1	2(K2&K2)	1(K3)
2	CLO 2	Up to K3	2	K2 & K3	1	K2	2(K3&K3)	1(K3)
3	CLO 3	Up to K2	2	K1 & K1	1	K1	2(K1&K1)	1(K2)
4	CLO 4	Up to K4	2	K3 & K4	1	K2	2(K4&K4)	1(K4)
5	CLO 5	Up to K4	2	K3 & K4	1	K3	2(K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33%	13%
K2	2	4	10	10	26	21.67%	22%
K3	4	2	10	20	36	30%	30%
K4	2	-	20	20	42	35%	35%
Total Marks	10	10	50	50	120	100	100

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core - 2	21P1DMC2	Data Structures And Algorithms in C++	4	5	25	75	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To impart knowledge on fundamental ADTs.
2. To learn the organized structures of Trees and Hashing.
3. To understand the concepts of updatable Queues and Sorting
4. To apply the Graph Algorithms on related applications.
5. To design optimized algorithms with efficacy.

Unit	Content	Hrs	K-Level	CLO
I	Algorithm Analysis and Lists, Stacks, & Queues : Algorithm Analysis: Mathematical Background – Model – What to Analyze – Running –Time Calculations. Lists, Stacks, & Queues: Abstract Data Types – The List ADT – The Stack ADT – The Queue ADT.	15	Up to K2	1
II	Trees and Hashing : Trees: Preliminaries – Binary Trees – The Search Tree ADT - Binary Search Trees – AVL Trees – Tree Traversals – B-Trees – Hashing: General Idea – Hash Function – Separate Chaining – Hash Tables without Linked Lists – Rehashing – Universal Hashing – Extendible Hashing.	15	Up to K3	2
III	Priority Queues (Heaps) and Sorting : Model – Simple Implementation – Binary Heap – Applications of Priority Queues – d-Heaps – Leftist Heaps – Skew Heaps – Binomial Queues – Sorting: Preliminaries - Insertion Sort – A Lower Bound for Simple Sorting Algorithms – Shell Sort – Heap Sort – Merge Sort – Quick Sort – External Sorting .	15	Up to K3	3
IV	Graph Algorithms : Definitions – Topological Sort – Shortest Path Algorithms –Network Flow Problems - Minimum Spanning Tree – Applications of Depth First Search – Introduction to NP-Completeness.	15	Up to K4	4
V	Algorithms Design Techniques: Greedy Algorithms – Divide and Conquer – Dynamic Programming – Randomized Algorithms – Backtracking Algorithms.	15	Up to K5	5

Book for Study

Data Structures and Algorithm Analysis in C++ by Mark Allen Weiss, Fourth Edition, Pearson Publications.

Chapters

Unit I: 2, 3.1, 3.2, 3.5 – 3.7

Unit II : 4.1 – 4.4, 4.6, 4.7, 5.1 – 5.5, 5.8, 5.9

Unit III: 6.1 - 6.8, 7.1 – 7.7, 7.12

Unit IV: 9

Unit V:10

Books for Reference

1. Data Structures with C by Seymour Lipchitz, Mc Grow Hill Publications.
2. Data Structures and Algorithm Analysis in C by Mark Allen Weiss, Second Edition, Pearson Publications.
3. An Introduction to Data Structure with Application by Jean-Paul Tremblay, Paul Sorenson, TMH, II Edition – 1991.

Web Resources

1. <http://freecodecamp.org>
2. <https://www.dzone.com>
3. <https://lecturenotes.in>

Rationale for Nature of the course

- The methods and techniques of data structure are widely used in system programming and application programming.
- Helps to develop logic and structured program by using organized data.

Activities on Skill Oriented

- Practice to write Algorithms
- Seminar
- Data Organization

Pedagogy

Chalk and talk Materials, PPT, Assignment, Seminar, Group Discussion and Interaction.

Course Designer(s) Name

1. Mr. K. RajaSaravanaKumar
2. Mrs. R. LakshaPriya

Lesson Plan

Unit	Topics to be Covered	Hours	Mode
I	Algorithm Analysis	7	Chalk and talk
	Lists, Stacks, & Queues	8	Group Discussion
II	Trees	3	Chalk and talk, Materials
	AVL Tree	3	PPT
	Hashing	5	Chalk and talk, PPT
	Rehashing	4	Chalk and talk, PPT
III	Priority Queues (Heaps)	4	Chalk and talk, PPT
	Binomial Queues	4	Chalk and talk, PPT
	Sorting	4	Group Discussion
	Shell Sort – Heap Sort – Merge Sort – Quick Sort –	4	Chalk and talk, Group
	External Sorting	3	Discussion
IV	Graph Algorithms	7	Chalk and talk, PPT
	Minimum Spanning Tree	8	Chalk and talk, PPT
V	Algorithms Design Techniques	8	Chalk and talk, Group
	Randomized Algorithms – Backtracking Algorithms	7	Discussion, Assignment Chalk and talk, Seminar

Course Learning Outcomes

On the completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOMES	K – Level
CLO 1	Design and analyze the problem statements and various ADTs.	Up to K2
CLO 2	Gain knowledge of non linear data structure like trees and hash which can be applied to solve problems.	Up to K3
CLO 3	Describe the computational efficiency of various sorting techniques.	Up to K3
CLO 4	Design and implement the graph operations and its application.	Up to K4
CLO 5	Analyze the complexity of different algorithms to solve real life problems	Up to K5

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	3	2	3	3	2	-
CLO 2	3	3	3	3	2	-
CLO 3	3	3	3	2	2	2
CLO 4	3	3	3	3	2	2
CLO 5	3	3	3	3	2	-

(3– Advanced Application, 2– Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K4
Seminar	5	K5
Quiz	5	K4
Total	25	

Learning Outcome Based Education & Assessment (LOBE)
Formative - Blue Print – Model for Data Structures and Algorithms in C++
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
CIA I	CLO 1	Up to K2	2	K1	2(K1&K1)	2(K2)
	CLO 2	Up to K3	3	K1	2(K2&K2)	1(K3)
CIA II	CLO 3	Up to K3	2	K2	2(K3&K3)	2(K3)
	CLO 4	Up to K4	3	K2	2(K4&K4)	1(K4)
Question Pattern (CIA I & II)	No. of Questions to be asked		5		4	3
	No. of Questions to be answered		5		2	2
	Marks for each question		2		5	10
	Total Marks for each section		10		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	10	10	-	20	33.33	83
K2	-	10	20	30	50	
K3	-	-	10	10	16.67	17
K4	-	-	-	-	-	-
Total Marks	10	20	30	60	100	100

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	-	-	-	-	-	17
K2	10	-	-	10	16.67	
K3	-	10	20	30	50	50
K4	-	10	10	20	33.33	33
Total Marks	10	20	30	60	100	100

Learning Outcome Based Education & Assessment (LOBE)
Summative - Blue Print – Model for Data Structures and Algorithms
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

UNITS	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K - Level		
1	CLO1	Up to K2	2	K1& K1	1	K1	2(K1&K1)	1(K2)
2	CLO2	Up to K3	2	K2 & K3	1	K1	2(K2&K2)	1(K3)
3	CLO3	Up to K3	2	K2 & K3	1	K2	2(K3&K3)	1(K3)
4	CLO4	Up to K4	2	K3 & K4	1	K2	2(K4&K4)	1(K4)
5	CLO5	Up to K5	2	K3 & K4	1	K3	2(K4&K4)	1(K5)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analysing, presentation and make inferences with evidences
- K5 – Ability to integrate ideas from one situation to newer situations.

Distribution of Section – wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33%	13%
K2	2	4	10	10	26	21.67%	22%
K3	4	2	10	20	36	30%	30%
K4	2	-	20	10	32	26.67%	27%
K5	-	-	-	10	10	8.33%	8%
Total Marks	10	10	50	50	120	100	100

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core – 3	21P1DMC3	Python Programming	4	5	25	75	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To learn and understand the basics of Python programming.
2. To gain Knowledge of handling Strings and Files in Python.
3. To learn the usage of Lists, Tuples, Dictionaries, Classes and Objects in Python programs.
4. To apply the concepts of Inheritance, Overloading and Exception Handling.
5. To implement the techniques like Multiprocessing, Threading, Networking and Graphics.

Unit	Content	Hrs	K-Level	CLO
I	Basics, Controls Statements, Functions and Modules : Basics of python Programming: Features of Python – History of Python – The future of Python – Executing Python program – Literal Constants – Variables and Identifiers _ Data Types – Input Operation – Comments – Reserved Words – Indentation – Operators and Expression – Expressions in Python – Operations on Strings – Other Data Types – Type Conversion. Decision Control Statements: Selection / Conditional Branching Statements – Basic Loop Structures / Iterative Statements – Nested Loops – break, continue, pass statement - Functions and Modules.	15	Up to K2	1
II	Python Strings and File handling : Python Strings: Concatenating, Appending and Multiplying Strings – Strings are Mutable – Formatting Operator - Built-in String Methods and Functions – Slice Operation – Comparing Strings – Iterating String – The String Module – Regular Expression. File Handling: File Path – Types of Files – Opening and Closing of Files – Reading and Writing Files – File Positions – Directory Methods – CSV files.	15	Up to K3	2
III	Data Structures, Classes and Objects: Data Structures: Sequence – Lists -Functional Programming – Tuple – Sets – Dictionaries. Classes and Objects: Classes and Objects – Class Variables and Object Variables – Public and Private Data Members – Private Methods – Built- in Functions – Built-in Class Attributes – Garbage Collection – Class Methods – Static Methods.	15	Up to K3	3

IV	Inheritance, Operator Overloading, Error and Exception handling: Inheritance: Inheriting Classes in Python – Types of Inheritance – Composition or Containership or Complex Objects – Abstract Classes and Interfaces. Operator Overloading: Implementing Operator Overloading – Reverse Adding – Overriding. Error and Exception Handling: Errors and Exceptions – Handling Exceptions – Instantiating Exceptions – Built-in and User-defined Exceptions.	15	Up to K4	4
V	Processes and Threading, Networking, Database Programming and Simple Graphics: Processes and Threading: Multiprocessing Module – Threading Module. Networking: Creating a TCP Client- Creating a TCP Server. Database Programming: SQL Database. Simple Graphics: Simple Graphics Using Turtle.	15	Up to K5	5

Books for Study

1. Python Programming: Using Problem Solving Approach by Reema Thareja, 2017, Oxford University Press.
2. Programming in Python 3: A Complete Introduction to the Python Language by Mark Summerfield, 2018 second edition, Pearson Education.

Chapters

Text Book 1

Unit I - 3, 4, 5

Unit II – 6, 7, Web Resources 1

Unit III – 8, 9

Unit IV - 10, 11, 12

Text Book 2

Unit V - Chapters 10, 11, 12, Appendix C (from Book 1)

Books for Reference

1. Python for Programmers by Paul Deitel & Harvey Deitel, first edition 2020, Pearson Education Inc.
2. Core Python Programming by R. Nageswara Rao, Second edition 2018, Dreamtech.
3. Programming and Problem Solving with Python by Ashok Namdev Kamthane, Amit Ashok Kamthane, McGraw Hill Education India, 2018.

Web Resources

1. <https://realpython.com/python-csv/>
2. <https://docs.python.org/3/>
3. <https://cseweb.ucsd.edu/classes/wi14/cse141/pdf/>

Rationale for Nature of the course

- Develop wide variety of applications including web applications, software and Game development, Network programming, GUI, Scientific and Numeric applications.

Activities on Skill Oriented

- Practice to write coding
- Quiz
- Seminar

Activities on Employability Oriented

- Software Development
- Data Analysis

Pedagogy

Chalk and talk Materials, PPT, Assignment, Seminar, Group Discussion and Interaction.

Course Designer(s) Name

1. Mrs. K. R. Ramadevi
2. Mrs. S. Rajalakshmi

Lesson Plan

UNIT	Topics to be covered	Hours	Mode
I	Features of Python– Comments – Reserved Words.	3	Lecture, GD
	Indentation – Operators and Expression.	5	Lecture, PPT
	Decision Control Statements	7	Lecture
II	Python Strings.	5	Lecture
	Built-in String Methods and Functions.	5	Lecture, quiz
	File Handling.	5	Lecture
III	Data Structures.	5	Lecture
	Classes and Objects.	5	Lecture, Seminar
	Built- in Functions.	5	Lecture
IV	Inheritance.	5	Lecture, PPT
	Operator Overloading.	5	Lecture
	Error and Exception Handling.	5	Lecture
V	Processes and Threading.	4	Lecture, Assignment
	Networking.	4	Lecture
	Database Programming.	4	Lecture
	Simple Graphics.	3	Lecture

Course Learning Outcomes

On the completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOMES	K – Levels
CLO 1	Explain basics, control statements and modules.	Up to K2
CLO 2	Classify various string operations and File handling methods.	Up to K3
CLO 3	Compare various Data Structures and to implement Classes & Objects	Up to K3
CLO 4	Apply the concepts of Object-Oriented Programming.	Up to K4
CLO 5	Utilize Standard libraries to perform Multithreading, Networking, Database and Graphics.	Up to K5

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	2	1	2	2	1
CLO 2	2	3	2	2	2	2
CLO 3	2	3	3	2	1	1
CLO 4	2	3	3	2	2	2
CLO 5	2	2	2	2	2	1

(3– Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K4
Seminar	5	K5
Quiz	5	K4
Total	25	

Learning Outcome Based Education & Assessment (LOBE)

Formative - Blue Print – Model for Python Programming

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
CIA I	CLO 1	Up to K2	2	K1	2(K1&K1)	2(K2)
	CLO 2	Up to K3	3	K1	2(K2&K2)	1(K3)
CIA II	CLO 3	Up to K3	2	K2	2(K3&K3)	2(K3)
	CLO 4	Up to K4	3	K2	2(K4&K4)	1(K4)
Question Pattern (CIA I & II)	No. of Questions to be asked		5		4	3
	No. of Questions to be answered		5		2	2
	Marks for each question		2		5	10
	Total Marks for each section		10		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	10	10	-	20	33.33	83
K2	-	10	20	30	50	
K3	-	-	10	10	16.67	17
K4	-	-	-	-	-	-
Total Marks	10	20	30	60	100	100
K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	-	-	-	-	-	17
K2	10	-	-	10	16.67	
K3	-	10	20	30	50	50
K4	-	10	10	20	33.33	33
Total Marks	10	20	30	60	100	100

Learning Outcome Based Education & Assessment (LOBE)
Summative - Blue Print – Model for Python Programming
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

UNITS	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K - Level		
1	CLO1	Up to K2	2	K1& K1	1	K1	2(K1&K1)	1(K2)
2	CLO2	Up to K3	2	K2 & K3	1	K1	2(K2&K2)	1(K3)
3	CLO3	Up to K3	2	K2 & K3	1	K2	2(K3&K3)	1(K3)
4	CLO4	Up to K4	2	K3 & K4	1	K2	2(K4&K4)	1(K4)
5	CLO5	Up to K5	2	K3 & K4	1	K3	2(K4&K4)	1(K5)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences
- K5 – Ability to integrate ideas from one situation to newer situations.

Distribution of Section – wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33%	13%
K2	2	4	10	10	26	21.67%	22%
K3	4	2	10	20	36	30%	30%
K4	2	-	20	10	32	26.67%	27%
K5	-	-	-	10	10	8.33%	8%
Total Marks	10	10	50	50	120	100	100

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Elective - 1	21P1DME1(A)	Advanced Computer Organization and Architecture	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To impart knowledge on functions of computer.
2. To learn the working principle of CPU with pipelining.
3. To understand memory concepts, arithmetic operations and the importance of I/O system.
4. To know the importance of parallel computing models and properties of networks.
5. To understand the performance of multi core processors.

Unit	Content	Hrs	K-Level	CLO
I	Basic Structure of Computers: Basic operational concepts – Bus structures – Software. Machine Instructions and Programs: Memory operations - Instructions and instruction sequencing– Addressing modes – Basic Input / Output operations – Stacks and Queues – Subroutines.	15	Up to K2	1
II	Basic Processing Unit & Pipelining: Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control. Pipelining: Basic concepts – Data hazards – Instruction hazards – Influence on instruction sets	15	Up to K3	2
III	Memory System & Arithmetic: Basic concepts – Semiconductor RAM – Cache memories - Virtual memory. Arithmetic: Addition & Subtraction of signed numbers – Multiplication of positive numbers – Signed operand multiplication. I/O Organization: Accessing I/O devices –Interrupts – Direct Memory Access.	15	Up to K4	3
IV	Parallel Computer Models: The state of computing - Multiprocessors and multicomputers – Multivector and SIMD computers. Program and Network properties: Conditions of parallelism – Program Partitioning and scheduling – Program flow mechanism - system interconnect architectures.	15	Up to K3	4
V	Multiprocessors and Multicomputers: Multiprocessor System interconnects – Message Passing Mechanisms. Multivector and SIMD Computers: Vector processing principles – SIMD Computer Organizations – Scalable, Multithreaded, and Dataflow Architectures: Principles of Multithreading, Fine-Grain Multicomputers. Software for Parallel Programming: Parallel Programming Models – Parallel Languages and Compilers – Dependence Analysis of Data Arrays.	15	Up to K4	5

Books for Study

1. “Computer Organization” by Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Fifth Edition, Tata McGraw Hill, 2002.
2. “Advanced Computer Architecture – Parallelism, Scalability and Programmability” by Kai Hwang, Naresh Jotwani, , second edition, TMH, New Delhi.

Chapters

Text Book – 1:

Unit I - 1.3, 1.4, 1.5, 2.3, 2.4, 2.5, 2.7, 2.8, 2.9

Unit II - 7.1 - 7.5, 8.1 - 8.4

Unit III – 5.1, 5.2, 5.5, 5.7, 6.1, 6.3, 6.4, 4.1, 4.2, 4.4

Text Book – 2:

Unit IV – 1.1 – 1.3, 2.1 – 2.4

Unit V – 7.1, 7.4, 8.1, 8.4, 9.2, 9.3, 10.1 – 10.3

Books for Reference

1. “Computer Architecture – A Quantitative Approach” by David A. Patterson and John L. Hennessy, Sixth Edition, Morgan Kaufmann Publishers, Elsevier.
2. “Computer Organization and Architecture – Designing for Performance” by William Stallings, Sixth Edition, Pearson Education, 2003.
3. “Computer Architecture and Organization” by John P. Hayes, Third Edition, Tata McGraw Hill, 1998.

Web Resources

1. <http://list.zju.edu.cn/kaibu/comparch/>
2. <https://www.slideshare.net>
3. <https://cseweb.ucsd.edu/classes/wi14/cse141/pdf/>

Rationale for Nature of the course

- Emphasizes the data flow, timing analysis, memory hierarchy, trade off between execution cycles, hardware requirements/cost and software that must be made in order to produce good system design.
- An overview of computer architecture, which stresses the underlying design principles and the impact of these principles on computer performance. General topics include design methodology, processor design, control design, memory organization, system organization, and parallel processing.

Activities on Knowledge and Skill

- Group Discussion
- Quiz
- Seminar

Pedagogy

Chalk and talk Materials, PPT, Assignment, Seminar, Group Discussion and Interaction.

Course Designer(s) Name

1. Mrs. S. Rajalakshmi
2. Mrs. K. R. Ramadevi

Lesson Plan

UNIT	Topics to be Covered	Hours	Mode
I	Basic operational concepts	4	Lecture
	Memory operations	6	Lecture
	Basic Input / Output operations.	5	Lecture & GD
II	Execution of a complete instruction	5	Lecture
	Hardwired control – Micro programmed control	5	Lecture
	Pipelining	5	Lecture & GD
III	Semiconductor RAM – Cache memories	5	Lecture
	Arithmetic Operations	5	Lecture, PPT
	Accessing I/O devices –Interrupts, Direct Memory Access	5	Lecture
IV	The state of computing - Multiprocessors and multicomputers – Multivector and SIMD computers.	7	Lecture
	Conditions of parallelism – Program partitioning and scheduling – Program flow mechanism - system interconnect architectures.	8	Lecture & GD
V	Multiprocessor System interconnects – Message Passing Mechanisms.	4	Lecture
	Vector processing principles – SIMD Computer Organizations - Principles of Multithreading, Fine-Grain Multicomputers.	5	Lecture, Assignment
	Parallel Programming Models – Parallel Languages and Compilers – Dependence Analysis of Data Arrays.	6	Lecture

Course Learning Outcomes

On the completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOMES	K - Level
CLO 1	Explain basic operational concepts and identify the use of various Addressing Modes.	Up to K2
CLO 2	Classify types of controls used in instruction execution and inspect the principle of Pipelining.	Up to K3
CLO 3	Compare various memory organizations and focus on Arithmetic Operations and Interrupt techniques to access I/O devices.	Up to K4
CLO 4	Utilize different types of parallelism and interconnect architectures	Up to K3
CLO 5	Assess the use of vector processing, multithreading and parallel processing software.	Up to K4

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	1	-	-	1	-
CLO 2	2	2	2	1	2	-
CLO 3	2	3	2	2	3	2
CLO 4	2	1	-	1	2	-
CLO 5	2	2	1	1	2	2

(3– Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K4
Seminar	5	K4
Quiz	5	K4
Total	25	

Learning Outcome Based Education & Assessment (LOBE)

Formative - Blue Print – Model for Advanced Computer Organization

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
CIA I	CLO 1	Up to K2	2	K1	2(K1&K1)	2(K2)
	CLO 2	Up to K3	3	K2	2(K3&K3)	1(K3)
CIA II	CLO 3	Up to K4	2	K2	2(K4&K4)	2(K4)
	CLO 4	Up to K3	3	K1	2(K2&K2)	1(K3)
Question Pattern (CIA I & II)	No. of Questions to be asked		5		4	3
	No. of Questions to be answered		5		2	2
	Marks for each question		2		5	10
	Total Marks for each section		10		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	4	10	-	14	23.33	66
K2	6	-	20	26	43.33	
K3	-	10	10	20	33.33	34
K4	-	-	-	-	-	-
Total Marks	10	20	30	60	100	100

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	6	-	-	6	10	33
K2	4	10	-	14	23.33	
K3	-	-	10	10	16.67	17
K4	-	10	20	20	50	50
Total Marks	10	20	30	60	100	100

Learning Outcome Based Education & Assessment (LOBE)

Blue Print – Model for Advanced Computer Organization

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K - Level		
1	CLO 1	Up to K2	2	K1 &	1	K1	2(K1&K1)	1(K2)
2	CLO 2	Up to K3	2	K2 &	1	K2	2(K3&K3)	1(K3)
3	CLO 3	Up to K4	2	K3 &	1	K2	2(K4&K4)	1(K4)
4	CLO 4	Up to K3	2	K2 &	1	K1	2(K2&K2)	1(K3)
5	CLO 5	Up to K4	2	K3 &	1	K3	2(K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	13%
K2	2	4	10	10	26	21.67	22%
K3	4	2	10	20	36	30.00	30%
K4	2	-	20	20	42	35%	35%
Total Marks	10	10	50	50	120	100	100%

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Elective - 1	21P1DME1(B)	Embedded Systems	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To provide experience to integrate hardware and software for microcontroller applications systems.
2. To acquire knowledge about Device Drivers and Interrupts programming concepts, and their applications.
3. To acquire knowledge about microcontroller embedded processors and Software Practices.
4. To enhance the knowledge about the Inter process communication and Real Time Operating Systems.
5. Foster ability to understand the internal architecture and interfacing of different peripheral devices with Microcontrollers.

Unit	Content	Hrs	K-Level	CLO
I	Introduction to embedded systems: An Embedded System- Processor In The System—Other Hardware Units- Software Embedded Into A System – Embedded System On Chip (Soc) And In VLSI Circuit. Processor and memory organisation: Structural Unit In A Processor- Processor Selection For An Embedded System – Memory Devices- Memory Selection for An Embedded System- Allocation Of Memory To Program Segments And Blocks And Memory Map Of A System- Direct Memory Access – Interfacing Processor , Memories And I/O Devices.	15	Up to K2	1
II	Device drivers and interrupts servicing mechanism: Device Drivers- Parallel Port Device Drivers In A System – Serial Port Device Drivers In A System- Device Drivers For Internal Programmable Timing Devices – Interrupt Servicing (Handling) Mechanism – Context And Periods For Context Switching , Deadline And Interrupt Latency. Programming concepts and embedded programming in c and c++: Software Programming In Assembly Language – C Program Elements: Header And Source File And Pre-Processor Directives- Program Elements: Macros And Functions – Program Elements: Data Types, Data Structures, Modifiers, Statements, Loops And Pointers – Queues- Stacks –Lists And Ordered List – Embedded Programming In C++.	15	Up to K3	2

III	Program modelling concepts in single and multi processor systems software development process: Modelling Processes For S/W Analysis Before S/W Implementations – Programming Models For Event Controlled Or Response Time Constrained Real Time Program – Modelling Of Multiprocessor Systems. Software engineering practices in the embedded s/w development process: S/W Algorithm Complexity – S/W Development Process Life Cycle and Its Models – S/W Analysis-S/W Designs – S/W Implementation – S/W Testing, Validating and Debugging.	15	Up to K3	3
IV	Inter process communications and synchronisation of processes, tasks and threads: Multiple Processes In An Application– Problem Of Sharing Data By Multiple Tasks And Routines – Inter Process Communications. Real time operating systems: Operating System Services – I/O Subsystems – Network Operating Systems- Real Time And Embedded System Operating Systems- Interrupt Routines In RTOS Environment: Handling Of Interrupt Source Call By The RTOSs – RTOS Task Scheduling Models, Interrupt Latency And Response Time Of The Tasks As Performance Metrics.	15	Up to K4	4
V	Real time operating system programming tools: Need of a Well Tested and debugged Real Time Operating System (RTOS). Use Of μ c/Os-II H/w and s/w co – design in an embedded system: Embedded System Project Management – Embedded System Design And Co-Design Issues In System Development Process – Design Cycle In The Development Phase For An Embedded System – Uses Of Target System Or Its Emulator And In-Circuit Emulator (Ice) Of An Embedded System – Use Of Scopes And Logic Analyzer For System H/W Tests – Issues In Embedded System Design.	15	Up to K4	5

Book for Study

Embedded Systems Architecture Programming and Design, by Raj Kamal, Tata Mc Graw Hill Publications.

Chapters

Unit I – 1.1 – 1.6, 2.1 – 2.7

Unit II – 4.1 – 4.6, 5.1 – 5.8

Unit III – 6.1 – 6.3, 7.1 – 7.6

Unit IV – 8.1 – 8.3, 9.1 – 9.6

Unit V – 10.1, 10.2, 12.1 – 12.

Books for Reference

1. Embedded Microcomputer Systems: Real-Time Interfacing by Jonathan W. Valvano, Brookes/Cole, Pacific Grove, 2000.
2. Embedded System Design by F. Vahid & T. Givargis, Wiley.
3. Computers as Components: Principles of Embedded Computing System Design by Wolf, W., Morgan Kaufmann, San Francisco, 2001.

Web Resources

1. <https://www.mepits.com/tutorial/421/vlsi/system-on-chip#>
2. <https://www.freertos.org/implementation/a00008.html>
3. <https://www.ques10.com/p/28414/explain-the-embedded-system-design-life-cycle-deve/>

Rationale for Nature of the course

- Knowledge in developing Electronic gadget around us such as digital watches ,mp3 players, washing machines ,security system ,vendor machines, GPS and many more.

Activities on Knowledge and Skill

- Group Discussion
- Quiz
- Seminar

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Mr. M. Ashok Kumar
2. Mrs. S. Saranya

Lesson Plan

UNIT	Topics to be covered	Hours	Mode
I	Introduction to embedded systems. Processor and memory organisation.	7	Lecture
		8	Lecture, GD
II	Device drivers and interrupts servicing mechanism. Programming concepts and embedded programming in c and C++.	7	Lecture
		8	Lecture, PPT
III	Program modelling concepts in single and multi processor systems software development process. Software engineering practices in the embedded s/w development process.	7	Lecture
		8	Lecture
IV	Inter process communications and synchronisation of processes, tasks and threads. Real time operating systems.	7	Lecture
		8	Lecture
V	Real time operating system programming tools. H/w and s/w co – design in an embedded system.	7	Lecture & Assignment
		8	

Course Learning Outcomes

On the completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOME	K - Levels
CLO 1	Understand the Concept of Embedded System, Micro Controller, Different Components of Micro Controller and their interactions.	Up to K2
CLO 2	To analyze the Programming Environment to develop Embedded solutions with C and C++.	Up to K3
CLO 3	Get familiarized with Software Algorithm Complexity, Software Design and Software Testing, Validating, Debugging.	Up to K3
CLO 4	Understand the key concepts of Embedded Systems such as I/O, Timers, Interrupts and RTOS.	Up to K4
CLO 5	Understand the key concepts of Embedded systems with Peripheral devices.	Up to K4

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	2	1	1	1	1
CLO 2	2	3	2	2	2	-
CLO 3	2	3	2	2	2	2
CLO 4	2	2	1	2	1	-
CLO 5	2	2	2	2	3	2

(3– Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K4
Seminar	5	K4
Quiz	5	K4
Total	25	

Learning Outcome Based Education & Assessment (LOBE)

Formative - Blue Print – Model for Embedded Systems

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
CIA I	CLO 1	Up to K2	2	K1	2(K1&K1)	2(K2)
	CLO 2	Up to K3	3	K1	2(K2&K2)	1(K3)
CIA II	CLO 3	Up to K3	2	K2	2(K3&K3)	2(K3)
	CLO 4	Up to K4	3	K2	2(K4&K4)	1(K4)
Question Pattern (CIA I & II)	No. of Questions to be asked		5		4	3
	No. of Questions to be answered		5		2	2
	Marks for each question		2		5	10
	Total Marks for each section		10		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	10	10	-	20	33.33	83
K2	-	10	20	30	50	
K3	-	-	10	10	16.67	17
K4	-	-	-	-	-	-
Total Marks	10	20	30	60	100	100

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	-	-	-	-	-	17
K2	10	-	-	10	16.67	
K3	-	10	20	30	50	50
K4	-	10	10	20	33.33	33
Total Marks	10	20	30	60	100	100

Learning Outcome Based Education & Assessment (LOBE)

Summative - Blue Print – Model for Embedded Systems Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

UNITS	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K – Level		
1	CLO1	Up to K2	2	K1& K1	1	K1	2(K1&K1)	1(K2)
2	CLO2	Up to K3	2	K2 & K3	1	K1	2(K2&K2)	1(K3)
3	CLO3	Up to K3	2	K2 & K3	1	K2	2(K3&K3)	1(K3)
4	CLO4	Up to K4	2	K3 & K4	1	K2	2(K4&K4)	1(K4)
5	CLO5	Up to K4	2	K3 & K4	1	K3	2(K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	13%
K2	2	4	10	10	26	21.67	22%
K3	4	2	10	20	36	30.00	30%
K4	2	-	20	20	42	35	35%
Total Marks	10	10	50	50	120	100	100%

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Elective - 1	21P1DME1(C)	Object Oriented Analysis And Design	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To impart knowledge of object basics and life cycle.
2. To learn the various methods for constructing UML.
3. To understand Object oriented concepts with Use cases.
4. To know the importance of object oriented designing.
5. To apply the concepts of software quality and testing.

Unit	Content	Hrs	K-Level	CLO
I	Introduction: An overview: Introduction – Two orthogonal views of the software – Object-oriented systems development methodology – overview of unified approach. Object basics: object state and properties – Object behaviour and methods – object responds to message – Encapsulation and Information hiding-Class hierarchy – object relationships and associations – Aggregations and object containment – Advanced topics. Object Oriented System development life cycle: Introduction – software development process – building high quality software – Use-case driven approach- reusability.	15	Up to K2	1
II	Methodology and UML: Object – Oriented Methodologies: Introduction – Survey – Rumbaugh, Booch, Jacobson methodologies – Patterns – Frameworks – Unified approach. Unified modeling language: Introduction- Static and Dynamic models – UML diagrams – Class diagram - Use case diagrams – Dynamic modelling – Model organization – Extensibility.	15	Up to K4	2
III	Object – Oriented Analysis: Use-Case Driven: Object – Oriented Analysis Process: Identifying Use Cases: Introduction – Understanding the business layer – the unified approach – business process modeling – use case model – developing effective documentation. Object – Oriented Analysis: Classification: Introduction – classification theory – naming classes. Identifying Object Relationships, Attributes and Methods: Super-Sub class relationships – Aggregation – methods and messages – defining methods for Via Net Bank objects	15	Up to K3	3

IV	Object – Oriented Design : Object – Oriented Design Process and Design Axioms: Object – oriented design axioms – Corollaries – design patterns. Designing Classes: Class visibility – refining attributes – designing methods and protocols. Access Layer: OODBMS: The pure world - Object relational systems: The Practical world – multi database systems. View Layer: Macro level process – micro level process – the purpose of a view layer interface.	15	Up to K3	4
V	Software Quality: Software Quality Assurance: Introduction – quality assurance test – testing strategies - Impact of Object Orientation on Testing – Test cases – Test plan – continuous testing. System usability and measuring user satisfaction: Introduction – Usability Testing – user satisfaction test.	15	Up to K4	5

Book for study

“Object Oriented Systems development” by Ali Bahrami, McGraw Hill Education (India) Private Limited, Edition 2008.

Chapters

Unit I - 1.1, 1.2, 1.3, 1.5, 2.5, 2.6, 2.7, 2.8, 2.9, 2.11, 2.12, 2.14, 3.1 to 3.5

Unit II - 4, 5

Unit III – 6.1, 6.3, 6.4, 6.5, 6.6, 6.7, 7.1, 7.2, 7.8, 8.3, 8.4, 8.9, 8.10

Unit IV – 9.3, 9.4, 9.5, 10.5, 10.6, 10.8, 11.7, 11.8, 11.9, 12.4, 12.5, 12.6

Unit V – 13.1 to 13.7, 14.1, 14.2, 14.3

Books for Reference

1. “Object Oriented Analysis and Design using UML” by Jaya Mala, S. Geetha, McGraw Hill Education, 2013.
2. “Object Oriented Analysis and Design” by Atul Kahate, Tata McGraw Hill Education, 2004.
3. “Object-Oriented Analysis and Design Using UML” by Mahesh P.Matha, PHI Learning Private Limited, 2012.

Web Resources

1. http://www.dba-oracle.com/t_object_oriented_analysis_models.html
2. <https://creately.com/blog/diagrams/uml-diagram-types-examples/>
3. <https://www.geeksforgeeks.org/unified-modeling-language-uml-introduction/>

Rationale for Nature of the course

- Improve the quality and productivity of system analysis and design and focus on behaviour of information system into small modules that combines both data and process

Activities on Knowledge and Skill

1. Group Discussion
2. Quiz
3. Seminar

Pedagogy

Chalk and talk Materials, PPT, Assignment, Seminar, Group Discussion and Interaction.

Course Designer(s) Name

1. Mrs. S. Rajalakshmi
2. Mrs. R. Lakshapriya

Lesson Plan

UNIT	Topics to be Covered	Hours	Mode
I	An overview.	5	Lecture
	Object basics.	5	Lecture
	Object Oriented System development life cycle.	5	Lecture & GD
II	Object – Oriented Methodologies.	7	Lecture
	Unified modeling language.	8	Lecture, PPT
III	Object – Oriented Analysis Process: Identifying Use Cases.	6	Lecture
	Object – Oriented Analysis: Classification.	4	Lecture
	Identifying Object Relationships, Attributes and Methods.	5	Lecture
IV	Object – Oriented Design Process.	5	Lecture
	Designing Classes.	5	Lecture
	OODBMS.	5	Lecture & GD
V	Software Quality Assurance.	8	Lecture
	System usability and measuring user satisfaction.	7	Lecture, Assignment

Course Learning Outcomes

On the completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOMES	K - Level
CLO 1	Summarize the basics of Objects. Describe the life cycle for object development.	Up to K2
CLO 2	Classify various UML methodologies. Construct various UML diagrams.	Up to K4
CLO 3	Identify the relationships between attributes and Use cases.	Up to K3
CLO 4	Evaluate the process of designing in OOAD. Measure the need of different layers.	Up to K3
CLO 5	Describe various testing strategies and the usability level of a product.	Up to K4

(3– Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	1	1	-
CLO2	2	3	3	2	2
CLO3	2	3	2	1	-
CLO4	2	3	3	3	-
CLO5	2	3	1	1	2

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K4
Seminar	5	K4
Quiz	5	K4
Total	25	

Learning Outcome Based Education & Assessment (LOBE)

Formative - Blue Print – Model for Object Oriented Analysis and Design Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
CIA I	CLO 1	Up to K2	2	K1	2(K1&K1)	2(K2)
	CLO 2	Up to K4	3	K2	2(K4&K4)	1(K4)
CIA II	CLO 3	Up to K3	2	K1	2(K2&K2)	2(K3)
	CLO 4	Up to K3	3	K2	2(K3&K3)	1(K3)
Question Pattern (CIA I & II)	No. of Questions to be asked		5		4	3
	No. of Questions to be answered		5		2	2
	Marks for each question		2		5	10
	Total Marks for each section		10		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	4	10	-	14	23.33	67
K2	6	-	20	26	43.33	
K3	-	-	-	-	-	-
K4	-	10	10	20	33.33	33
Total Marks	10	20	30	60	100	100
K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	4	-	-	4	6.67	33
K2	6	10	-	16	26.67	
K3	-	10	30	40	66.67	67
K4	-	-	-	-	-	-
Total Marks	10	20	30	60	100	100

Learning Outcome Based Education & Assessment (LOBE)

Summative - Blue Print – Model for Object Oriented Analysis and Design

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

UNITS	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K - Level		
1	CLO1	Up to K2	2	K1 & K1	1	K1	2(K1&K1)	1(K2)
2	CLO2	Up to K4	2	K2 & K4	1	K2	2(K4&K4)	1(K4)
3	CLO3	Up to K3	2	K2 & K3	1	K1	2(K2&K2)	1(K3)
4	CLO4	Up to K3	2	K3 & K3	1	K2	2(K3&K3)	1(K3)
5	CLO5	Up to K4	2	K3 & K4	1	K3	2(K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analysing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	13%
K2	2	4	10	10	26	21.67	22%
K3	4	2	10	20	36	30.00	30%
K4	2	-	20	20	42	35	35%
Total Marks	10	10	50	50	120	100	100%

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core Practical - 1	21P1DMP1	Data Structures and Algorithms in C++ LAB	2	4	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To impart the knowledge on fundamental ADTs.
2. To learn the organized structures of Trees and Hashing.
3. To understand the concepts of updatable Queues and Sorting
4. To apply the Graph Algorithms on related applications.
5. To design optimized algorithms with efficacy.

Unit	Content	Hrs	K-Level	CLO
I	1. Write a program in C++ to find GCD of given two integers. 2. Write a program in C++ to find the power value for given base and raise value. 3. Write a program in C++ to read N elements in arranged order and perform Binary Search technique. 4. Write a program in C++ to find the maximum subsequence sum from the given list of values. 5. Write a program in C++ to check the Balancing of Parenthesis in a given Expression. 6. Write a program in C++ to convert a given Infix Expression in to its equivalent Postfix Expression. 7. Write a program in C++ to evaluate a given Postfix Expression. 8. Write a program in C++ to perform the basic operations of a Circular Queue using Array.	12	Up to K2	1
II	9. Write a program in C++ to perform the basic operations of Sequential List using Linear Linked List. 10. Write a program in C++ to perform the basic operations of a Hash Table using Hash Function. 11. Write a program in C++ to perform the basic operations of a	12	Up to K3	2

	Binary Search Tree. 12. Write a program in C++ to construct an Expression Tree for a given Postfix Expression and print the same in all three orders.			
III	13. Write a program in C++ to read N elements and arrange them in order using Shell sort technique. 14. Write a program in C++ to read N elements and arrange them in order using Heap sort technique.	12	Up to K3	3
IV	15. Write a program in C++ to read a Graph and print it using BFS and DFS methods. 16. Write a program in C++ to find the order of edges for a given Graph using Topological Sort Algorithm. 17. Write a program in C++ to find All-Pairs Shortest-Path for a given Graph.	12	Up to K4	4
V	18. Write a program in C++ to read N elements and arrange them in order using Quick sort technique. 19. Write a program in C++ to read N elements and arrange them in order using Merge sort technique. 20. Write a program in C++ to construct a optimal Binary Search Tree and Print the same.	12	Up to K4	5

Book for Study

Data Structures and Algorithm Analysis in C++ by Mark Allen Weiss, Fourth Edition, Pearson Publications.

Books for Reference

1. "Data Structures with C" by Seymour Lipschutz, Mc Grow Hill Publications.
2. "Data Structures and Algorithm Analysis in C" by Mark Allen Weiss, Second Edition, Pearson Publications.
3. "An Introduction to Data Structure with Application" – THM, II Edition – 1991.

Web Resources

1. <http://freecodecamp.org>
2. <https://www.dzone.com>
3. <https://lecturenotes.in>

Rationale for Nature of the course

- Developing logic and structured program, organizing data in software development.

Activities on Skill Oriented

- Implement Programming
- Mini Projects

Activities on Employability Oriented

- Software Development
- Data Analysis

Pedagogy

Projector Demonstration and Practical sessions.

Course Designer(s) Name

1. Mr. K. RajaSaravanaKumar

2. Mrs. R. LakshaPriya

Lesson Plan

UNIT	Topics to be Covered	Hours	Mode
I	Write a program in C++ to perform GCD & power value calculation, Binary Search technique, Infix, Prefix, Postfix operations.	6	Demo & Practical Session
	Write a program in C++ to perform the basic operations of a Circular Queue using Array.	6	
II	Write a program in C++ to perform the basic operations of Sequential List, Hash Table, Binary Search Tree, and Expression Tree.	12	Demo & Practical Session
III	Write a program in C++ to read N elements and arrange them in order using Shell sort, Heap sort technique.	12	Demo & Practical Session
IV	Write a program in C++ using BFS and DFS methods, Topological Sort Algorithm.	6	Demo & Practical Session
	Write a program in C++ to find All-Pairs Shortest-Path for a given Graph.	6	
V	Write a program in C++ to read N elements and arrange them in order using Quick sort , Merge sort technique.	6	Demo & Practical Session
	Write a program in C++ to construct a optimal Binary Search Tree and Print the same.	6	

Course Learning Outcomes

On the completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOMES	K – Level
CLO 1	Design and analyze the problem statements and various ADTs.	Up to K2
CLO 2	Gain knowledge of non linear data structure like trees and hash which can be applied to solve problems.	Up to K3
CLO 3	Describe the computational efficiency of various sorting techniques.	Up to K3
CLO 4	Design and implement the graph operations and its application.	Up to K4
CLO 5	Analyze the complexity of different algorithms to solve real life problems.	Up to K4

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	3	2	3	3	2	-
CLO 2	3	3	3	3	2	-
CLO 3	3	3	3	2	2	2
CLO 4	3	3	3	3	2	2
CLO 5	3	3	3	3	2	-

(3– Advanced Application, 2 – Intermediate Level, 1- Basic Level)

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core Practical - 2	21P1DMP2	PYTHON PROGRAMMING LAB	2	4	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To interpret the use of procedural statements, conditional statements, loops and functional calls.
2. To develop programs using string operations, regular expression and handling files.
3. To build programs by using Lists, Tuples, Dictionaries, Classes and Objects.
4. To apply the concepts of inheritance, overloading and exception handling.
5. To demonstrate the use of Multiprocessor, Threading, Networking, Database and Graphics.

Unit	Content	Hrs	K-Level	CLO
I	1. Write a Python program to print all Prime numbers in an Interval. 2. Write a Python program to print N th Fibonacci number using recursion. 3. Write a program to calculate the total amount of money in the piggybank, given the coins of Rs.10, Rs.5, Rs.2 and Rs1. 4. Write a Python program to sort the given n numbers.	12	Up to K2	1
II	5. Write a Python program to implement any 5 string operations. 6. Write a Python program to extract date from the given string and validate the mobile number. 7. Write a Python program to read data from a file and calculate the percentage of vowels and consonants in the file. 8. Write a Python program to create a file and display its contents.	12	Up to K3	2
III	9. Write a Python Program to perform append, insert, pop, reverse, sort methods in list. 10. Write a Python program to add two matrices (using nested lists). 11. Write a Python program to perform repetition, membership, maximum and minimum operations in Tuple. 12. Write a Python program to perform union, intersection, difference, symmetric difference and enumerate operation in Sets. 13. Create a menu driven Python program with a dictionary for words and their meanings. Write functions to add a new entry (word:	12	Up to K3	3

	meaning), search for a particular word and retrieve meaning, for given meaning find words with the same meaning, remove an entry, display all words sorted alphabetically.			
IV	14. Write a python program that has a class person storing name, DOB. The program should subtract DOB from current date to find whether the person is eligible to vote or not. 15. Write a Python program that has classes such as student, course and department. Enroll a student in a course of a particular department. (Use inheritance) 16. Write a Python program that overloads the + operator to add two objects of class Matrix. 17. Write a Python program that opens a file and writes data to it. Handle exceptions that can be generated during I/O operations.	12	Up to K4	4
V	18. Write a python program to create a socket to establish connection to client and server. 19. Write a Python program to create student database in MySQL, insert, update and display the records. 20. Write a Python program to draw line, circle, triangle, square and rectangle with different colors.	12	Up to K4	5

Books for Study

1. Python Programming: Using Problem Solving Approach by Reema Thareja, 2017, Oxford University Press.
2. Programming in Python: A Complete Introduction to the Python Language by Mark Summerfield, 2018 second edition, Pearson Education.

Books for Reference

1. Python for Programmers by Paul Deitel& Harvey Deitel, first edition 2020, Pearson Education Inc.
2. Core Python Programming by R. Nageswara Rao, Second edition 2018, Dreamtech.
3. "Programming and Problem Solving with Python", by Ashok Namdev Kamthane, Amit Ashok Kamthane, McGraw Hill Education India, 2018.

Web Resources

1. <https://realpython.com/python-csv/>
2. <https://docs.python.org/3/>
3. <https://learnpython.org>

Rationale for Nature of the course

- Develop wide variety of applications including web applications, software and Game development, network programming, GUI, scientific and numeric applications.

Activities on Skill Oriented

- Implement Programming
- Mini Projects

Activities on Employability Oriented

- Software Development
- Data Analysis

Pedagogy

Projector Demonstration and Practical sessions.

Course Designer(s) Name

1. Mrs. K. R. Ramadevi
2. Mrs. S. Rajalakshmi

Lesson Plan

UNIT	Topics to be covered	Hours	Mode
I	Write a Python program to print all Prime numbers, N th Fibonacci number	6	Demo &
	Write a program to calculate the total amount of money in the piggybank, given the coins of Rs.10, Rs.5, Rs.2 and Rs1. Write a Python program to sort the given n numbers.	6	Practical Session
II	Write a Python program to implement any 5 string operations.	6	Demo &
	Write a Python program to extract date from the given string and validate the mobile number. Write a Python program to read data from a file and calculate the percentage of vowels and consonants in the file. Write a Python program to create a file and display its contents.	6	Practical Session
III	Write a Python Program to perform append, insert, pop, reverse, sort methods in list.	6	Demo &
	Write a Python program to add two matrices (using nested lists). Write a Python program to perform repetition, membership, maximum and minimum operations in Tuple. Write a Python program to perform union, intersection, difference, symmetric difference and enumerate operation in Sets, Create a menu driven Python program	6	Practical Session
IV	Write a python program to use class, inheritance.	6	Demo &
	Write a Python program that overloads the + operator to add two objects of class Matrix, I/O operations.	6	Practical Session
V	Write a Python program to create two threads to keep a count of numbers of even numbers entered by the user.	6	Demo &
	Write a Python program to create student database in MySQL, insert, update and display the records.	6	Practical Session

Course Learning Outcomes

On the completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOMES	K - Level
CLO 1	Apply the basics, control statements and modules in Python.	Up to K2
CLO 2	Demonstrate various string operations and File handling methods.	Up to K3
CLO 3	Use different Data Structures and implement classes and objects	Up to K3
CLO 4	Implement the concepts of Object-Oriented Programming.	Up to K4
CLO 5	Utilize Standard libraries to perform Multithreading, Networking, Databases and Graphics.	Up to K4

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	2	1	2	2	1
CLO 2	2	3	2	2	2	2
CLO 3	2	3	3	2	1	1
CLO 4	2	3	3	2	2	2
CLO 5	2	2	2	2	2	1

(3– Advanced Application, 2 – Intermediate Level, 1- Basic Level)

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I PG				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	NME - 1	21P1DNM1	Office Automation	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	✓
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To provide foundations for learning computer concept and skills.
2. To explain the functions of the word processing software as used
3. To become familiar with the excel workbook
4. To construct formulas using built-in functions, relative and absolute references.
5. To create presentations that includes text, graphics, animation and transitions.

Unit	Content	Hrs	K-Level	CLO
I	MS WORD 2010: Creating a Document with Word: Viewing the Word Window – Moving around in a Document - Changing Document Views – Setting Up the Page – Setting Up the Page Margins – Selecting Text – Creating an Outline - Checking Spelling and Grammar – Inserting New Pages and Sections - Adding Header and Footers – Inserting Page Numbers and the Date and Time – Creating a Blog Posting on the Web.	6	Up to K2	1
II	Formatting & Enhancing Document with Word: Formatting a Document with Word: Finding and Replacing Formatting – Changing Paragraph Alignment – Changing line spacing – Displaying Rulers – Setting Paragraph Tabs – Setting Paragraph Indents – Changing Character Spacing – Creating Bulleted and Numbered Lists – Hiding Text. Enhancing a Document with Word: Adding a Watermark – Adding Page Backgrounds - Creating a Table – Entering Text in a Table – Modifying a Table – Adjusting Table Cells – Formatting a Table – Calculating a Value in a Table – Addressing Envelops and labels – Creating a Form Letter.	6	Up to K2	2
III	Creating a Worksheet with Excel: Viewing the Excel Window – Selecting Cells – Moving Around the Workbook – Entering Labels on a Worksheet - Entering values on a Worksheet – Entering Values Quickly with AutoFill – Edition Cell Contents – Clearing cell content – inserting and deleting cell contents – Selecting Rows, Columns and Special Ranges – Selecting and Naming a Worksheet – Inserting and Deleting a Worksheet – Moving and Copying a Worksheet – Adjusting Column Width and Row Height.	6	Up to K2	3

IV	Building a Worksheet with Excel: Understanding Formulas – Understanding Cell Referencing – Creating a Simple formula - Create a Formula Using Formula AutoComplete – Editing a Formula – Naming Cells and Ranges – Simplifying a Formula with Ranges – Calculating Totals with AutoSum – Correcting Formulas – Creating Function – Creating Function using the Library.	6	Up to K2	4
V	Creating Presentation with PowerPoint: Viewing the PowerPoint Window – Creating New and Consistent Slides – Working with Objects – Entering and Editing Text –Modifying a Bulleted and Numbered List – Using Slides from Other Presentations- Making your Presentations Look Consistent - Adding background Style – Delivering a Presentation with PowerPoint: Adding Animation – Adding Slide Timing - Creating Slide Transitions – Inserting Videos and Audio- Creating a Custom Slide Show – Starting a Slides Show – Inserting the Date and Time – Inserting Slide Numbers	6	Up to K2	5

Book for Study

“Microsoft Office 2010 On Demand” First Edition by Steve Johnson, Perspection, Inc, Published by Pearson Education, 2012.

Chapters

Unit I: 6

Unit II: 7, 8

Unit III: 9

Unit IV: 10

Unit V: 12, 13

Books for Reference

1. “Learning Computer Fundamentals, MS Office and Internet & Web Technology” by Dinesh Maidasani, Third Edition, Firewall Media ,
2. “Working with MS Office 2000” by Content Development Group. Tata McGraw-Hill Publishing Company Limited.
3. “PC Software for Windows 98 Made Simple” by R K Taxali, Tata McGraw-Hill Publishing Company Limited.

Web Resources

1. <http://www.computer-pdf.com/office/word/12-tutorial-microsoft-word-201.html>
2. <http://www.word-2010.com/>
3. <http://www.guru99.com/inroduction-to-microsoft-excel.html>
4. <http://www.tutorialspoint.com/powerpoint/index.html>

Rationale for Nature of the course

- Makes it possible for business organization to improve their productivity and recognize easier way to do business in profits.

Activities on Knowledge and Skill

- Formal Letter Writing
- Resume Writing
- Data Manipulation

Activities on Employability Oriented

- Data Entry Operation
- Report Generation with Calculation

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Mrs. K. Ima
2. Mrs. R. Laksha Priya

Lesson Plan

UNITS	Topics to be covered	Hours	Mode
I	MS WORD 2010	6	Lecture, PPT
II	Formatting & Enhancing Document with Word	6	Lecture,
III	Creating a Worksheet with Excel	6	Lecture, PPT
IV	Building a Worksheet with Excel	6	Lecture, PPT
V	Creating a Presentation with PowerPoint	6	Lecture, GD, Assignment

Course Learning Outcomes

On the completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOMES	K - Levels
CLO 1	Describe how to create a Document using Microsoft Word.	Up to K2
CLO 2	Learn the concepts of Formatting & Enhancing Document using Microsoft Word	Up to K2
CLO 3	Design and Create a Worksheet using Microsoft Excel .	Up to K2
CLO 4	Perform various calculation using formulae.	Up to K2
CLO 5	Design a slide show using Microsoft PowerPoint	Up to K2

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	2	2	2	2	1
CLO 2	2	2	3	2	3	2
CLO 3	2	2	3	2	3	2
CLO 4	2	2	3	2	3	3
CLO 5	2	2	3	2	2	2

(3 –Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K2
Seminar	5	K2
Quiz	5	K2
Total	25	

Learning Outcome Based Education & Assessment (LOBE)**Formative - Blue Print – Model for Office Automation****Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)**

Units	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No of Questions	K - Level		
1	CLOX	Up to K2	2	K1	2(K2&K2)	2(K1)
2	CLOY	Up to K2	1	K1	2(K2&K2)	1(K1)
No. of Questions to be asked			3		4	3
No. of Questions to be answered			3		2	2
Marks for each question			2		7	10
Total Marks for each section			6		14	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels (CIA I & II)

K - Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Total Marks	% of Marks without choice	Consolidated %
K1	6	-	30	36	56.25	100
K2	-	28	-	28	43.75	
Total Marks	6	28	30	64	100.00	100%

Learning Outcome Based Education & Assessment (LOBE)
Summative - Blue Print – Model for Office Automation
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

UNITS	CLOs	K- Level	Section A		Section B		Section C (Open Choice)
			Short Answers		(Either/or Choice)		
			No of Questions	K - Level	No of Questions	K - Level	
1	CLO1	Up to K2	1	K1	1	K2& K2	1(K1)
2	CLO2	Up to K2	1	K1	1	K2& K2	1(K1)
3	CLO3	Up to K2	1	K1	1	K2& K2	1(K1)
4	CLO4	Up to K2	1	K1	1	K2& K2	1(K1)
5	CLO5	Up to K2	1	K1	1	K2& K2	1(K1)
No. of Questions to be asked			5		10		5
No. of Questions to be answered			5		5		3
Marks for each question			2		7		10
Total Marks for each section			10		35		30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers

Distribution of Section – wise Marks with K Levels *

K Levels	Section A Short Answers	Section B (Either/or Choice)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	10	-	50	60	46.16	46%
K2	-	70	-	70	53.84	54%
Total Marks	10	70	50	130	100	100%

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core - 4	21P2DMC4	Operating System Concepts	4	5	25	75	100

Nature of Course			
Knowledge and skill	✓		Employability oriented
Skill oriented			Entrepreneurship oriented

Course Objectives

1. To understand the fundamental concepts of operating systems and scheduling.
2. To familiar with the concepts of process and process execution.
3. To gain the knowledge on Management of memory and files.
4. To demonstrate the basic concepts of shells in Linux.
5. To apply the concepts of files in Linux.

Unit	Content	Hrs	K-Level	CLO
I	Introduction: Evolution of Operating System –Types of Operating system-Different design and Implementation of Operating System – Processes: The Process concept – The Operating System view of processes- Operating System services for Process Management-Scheduling-Scheduling Algorithms.	15	Up to K3	1
II	Inter-process Communication: Hardware Support for Mutual Exclusion-Classical Problems in Concurrent Programming-Critical Region and Conditional Critical Region- Monitors –Messages-Deadlocks: Reusable and Consumable Resources-Deadlock Prevention-Deadlock Avoidance –Deadlock Detection and Recovery.	15	Up to K4	2
III	Memory Management: Contiguous Allocation –Partitioned Memory Allocation-Static- Partitioned Memory Allocation-Dynamic-Segmentation-Non Contiguous Allocation-Paging- Virtual Memory- File Management:- Command Language view of File Systems-User's Programmer View of File System- Disk Organization-Operating System View of File Management.	15	Up to K3	3
IV	Linux Programming: Getting Started: An Introduction to UNIX, Linux, and GNU - What Is UNIX - What Is Linux- Linux Distributions - Programming Linux: Linux Programs - Text Editors - The C Compiler - Shell Programming: What Is a Shell?- Pipes and Redirection-The Shell as a Programming Language-Shell Syntax.	15	Up to K2	4
V	Working with Files: Linux File Structure-Library Functions-The Standard I/O Library-Formatted Input and Output-File and Directory Maintenance-Scanning Directories-Errors- Managing Text-Based Screens with curses: Compiling with curses-The Screen-The Keyboard-Windows-Sub windows.	15	Up to K4	5

Books for Study

1. Operating Systems Concepts And Design by Milan Milenkovic, Second Edition, Tata McGraw Hill Publishing Ltd.
2. Beginning Linux Programming by Neil Matthew, Richard Stones 4th Edition Wiley Publishing, Inc.

Chapters

Text Book: 1

Unit I: 1.1, 1.2, 1.3, 1.5, 2.1, 2.3-2.6

Unit II: 3.1, 3.3, 3.4, 3.6, 4.1, 4.2, 4.3, 4.5

Unit III: 5.2, 5.3, 5.4, 6.1, 6.2(6.2.1, 6.2.3, 6.2.5, 6.2.6, 6.2.7, 6.2.9, 6.2.10), 7.1- 7.3, 7.5

Text Book: 2

Unit IV: 1, 2

Unit V: 3, 6

Books for Reference

1. Operating System Concepts by Abraham Silberschatz, 8th Edition, Wiley Student Edition 2009
2. Operating system – A Design Oriented Approach by Charles Crowley, McGraw-Hill Education, 2009
3. Linux System Programming by Robert Love, O'Reily, SPD.

Web Resources

1. https://www.crectirypati.com/sites/default/files/lectur_notes/OpertingSystemsLectureNotes.pdf
2. <http://www2.cs.uic.edu/~jbell/CourseNotes/OperatingSystems>
3. <http://www.smartworld.com/notes/linux-programming-pdf-lp-pdf-notes/>

Rationale for Nature of the course

- Help accomplish include managing inputs from users, sending output to the output devices, management of storage spaces and control of peripheral devices.

Activities on Knowledge and Skill

- Case Studies
- Quiz
- Seminar

Pedagogy

Chalk and talk Materials, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Mrs. S.Brindha
2. Ms. S.Saranya

Lesson Plan

Unit	Topics to be covered	Hours	Mode
I	Introduction	6	Lecture
	Processes	9	Lecture, GD
II	Hardware Support for Mutual Exclusion	5	Lecture
	Critical Region and Conditional Critical Region	3	Lecture
	Deadlocks	7	Lecture, PPT
III	Contiguous Allocation -Virtual Memory	7	Lecture
	File Management	8	Lecture, Quiz
IV	Getting Started.	2	Lecture
	Programming Linux	2	Lecture, Case Study
	Shell Programming	11	Lecture, GD
V	Linux File Structure	7	Lecture, Assignment
	Text-Based Screens with curses	8	Lecture, PPT

Course Learning Outcomes

On the completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOMES	K - Levels
CLO 1	Describe the evolution , types, process concepts of operating system and scheduling	Up to K3
CLO 2	Identify the concept of inter-process communication and deadlock	Up to K4
CLO 3	Analyze the concepts of memory and file management.	Up to K3
CLO 4	Devise the code using basic commands in Linux	Up to K2
CLO 5	Design the code to manage files using Linux.	Up to K4

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	2	1	-	-	-
CLO 2	2	2	2	1	-	-
CLO 3	2	2	2	2	1	1
CLO 4	2	3	3	2	2	2
CLO 5	2	3	3	2	2	1

(3 –Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K4
Seminar	5	K4
Quiz	5	K4
Total	25	

Learning Outcome Based Education & Assessment (LOBE)

Formative - Blue Print – Model for Operating System Concepts

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
CIA I	CLO 1	Up to K3	2	K2	2(K3&K3)	2(K3)
	CLO 2	Up to K4	3	K2	2(K4&K4)	1(K3)
CIA II	CLO 3	Up to K3	2	K3	2(K3&K3)	2(K3)
	CLO 4	Up to K2	3	K1	2(K1&K1)	1(K2)
Question Pattern (CIA I & II)	No. of Questions to be asked		5		4	3
	No. of Questions to be answered		5		2	2
	Marks for each question		2		5	10
	Total Marks for each section		10		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	-	-	-	-	-	17
K2	10	-	-	10	16.67	
K3	-	10	30	40	66.67	66
K4	-	10	-	10	16.67	17
Total Marks	10	20	30	60	100	100
K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	6	10	-	16	26.66	43
K2	-	-	10	10	16.67	
K3	4	10	20	34	56.67	57
K4	-	-	-	-	-	-
Total Marks	10	20	30	60	100	100

Learning Outcome Based Education & Assessment (LOBE)

Summative - Blue Print – Model for Operating System Concepts

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

UNIT	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K – Level		
1	CLO1	Up to K3	2	K2&K3	1	K2	2(K3&K3)	1(K3)
2	CLO2	Up to K4	2	K3&K4	1	K2	2(K4&K4)	1(K4)
3	CLO3	Up to K3	2	K3&K3	1	K3	2(K2&K2)	1(K3)
4	CLO4	Up to K2	2	K1&K1	1	K1	2(K1&K1)	1(K2)
5	CLO5	Up to K4	2	K2&K4	1	K1	2(K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	13%
K2	2	4	10	10	26	21.67	22%
K3	4	2	10	20	36	30.00	30%
K4	2	-	20	20	42	35.00	35%
Total Marks	10	10	50	50	120	100	100%

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core - 5	21P2DMC5	Advanced Computer Networks	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To understand the general principles of data communication.
2. To familiarize the transmission media, flow control and error detection and correction.
3. To acquire the knowledge of the basic protocols involved in wired and wireless communication process.
4. To gain core knowledge of network layer routing protocols and IP addressing.
5. To motivate the need for network security practices in organizational units.

Unit	Content	Hrs	K-Level	CLO
I	Introduction: Data Communication -Networks - Network Types - Internet History - Standards and Administration. Network Models: Protocol Layering - TCP/IP Protocol Suite - The OSI Model. Physical Layer: Data Signals - Periodic Analog Signals - Digital Signals - Transmission Impairment - Data Rate Limits – Performance.	15	Up to K2	1
II	Multiplexing - Spread Spectrum. Switching: Introduction - Circuit - Switched Networks - Packet Switching - Structure of a Switch. Data - Link Layer: Introduction - Link Layer Addressing. Error Detection & Correction: Introduction - Block Coding - Cyclic Codes - CheckSum - Forward Error Correction.	15	Up to K3	2
III	Wired LANs: Ethernet: Ethernet Protocol - Standard Ethernet Wireless LANs: Introduction - IEEE 80.11 Projects - Bluetooth Other Wireless Networks: WiMAX - Cellular Telephony - Satellite Networks. Connecting Devices. Network Layer: Introduction to Network Layer: Network - Layer Services - Packet Switching - Network - Layer Performance - IPV4 Addresses - Forwarding of IP Packets.	15	Up to K4	3

IV	Network - Layer Protocol: Internet Protocol (IP) - ICMPv4 - Mobile IP. Next Generation IP: IPv6 Addressing - The IPv6 Protocol - The ICMPv6 Protocol - Transition from IPv4 to Ipv6. Transport Layer: Introduction - Transport - Layer Protocols. Transport - Layer Protocols: Introduction - User Datagram Protocol - Transmission Control Protocol.	15	Up to K3	4
V	Cryptography and Network Security: Introduction – Confidentiality – Other Aspects of Security. Internet Security: Network Layer Security – Transport Layer Security – Application Layer Security - Firewalls	15	Up to K4	5

Book for Study

Data Communications and Networking by Behrouz A.Forouzan, 5th edition, Tata McGraw Hill Education (India) Private Limited.

Chapters

UNIT – I	1: 1.1- 1.5., 2: 2.1- 2.3., 3: 3.1- 3.6.
UNIT – II	6: 6.1, 6.2 , 8: 8.1- 8.4., 9: 9.1, 9.2., 10: 10.1- 10.5.
UNIT – III	13: 13.1, 13.2., 15: 15.1, 15.2., 16: 16.1- 16.3, 17: 17.1, 18: 18.1- 18.5.
UNIT – IV	19: 19.1- 19.3., 22: 22.1- 22.4., 24: 24.1- 24.3
UNIT – V	31: 31.1- 31.3. 32: 32.1- 33.4.

Books for Reference

1. Computer Networks by A.S.Tanenbaum, Fifth Edition, Pearson Education. Inc, 2011.
2. Introduction to Data Communication in Networking by B.Frouzan, Tata McGraw Hill Education (India) Private Limit
3. Computer Networks – A Systems Approach by Larry L. Peterson and Bruce S. Davie, 4th Edition, Publisher: Elsevier Science, 2007.

Web Resources

1. <http://www.geeksforgeeks.org>
2. <http://www.en.m.wikipedia.org>
3. <http://www.tutorialspoint.com>

Rationale for Nature of the course

- To allow multiple processes to send and receive the data over the network without interfering with other processes.

Activities on Knowledge and Skill

- Creating Models
- Quiz
- Seminar

Pedagogy

Chalk and talk Materials, PPT, Assignment, Seminar, Group discussion, Interaction and Projectors.

Course Designer(s) Name

1. Mr. N. RadhaKrishnan
2. Ms. S. Saranya

Lesson Plan

UNITS	Topics to be covered	Hours	Mode
I	Introduction to Networks,	3	Lecture
	Network Models,	5	Lecture, GD
	Physical Layer	7	Lecture
II	Switching.	7	Lecture
	Data - Link Layer, Error Detection & Correction.	8	Lecture
III	Wired LANs: Ethernet.	5	Lecture
	Other Wireless Networks.	5	Lecture
	Network Layer.	5	Lecture, PPT
IV	Network - Layer Protocol.	5	Lecture
	Transport Layer: Transport - Layer Protocols.	10	Lecture
V	Cryptography and Network Security.	7	Lecture, Assignment
	Internet Security.	8	Lecture, PPT

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	COURSE LEARNING OUTCOMES	K - Levels
CLO 1	Describe the functions of each layer in OSI and TCP/IP model.	Up to K2
CLO 2	Differentiate various Switching techniques and Apply the concept of different Error Detection and Correction methods.	Up to K3
CLO 3	Discuss the design principles of wired and wireless communication media.	Up to K4
CLO 4	Understand the various Transport layer protocols and also differentiate IPV4 and IPV6 Protocols.	Up to K3
CLO 5	Discuss and Explain current network authentication applications, network security and their vulnerabilities that are exploited by intentional and unintentional attacks.	Up to K4

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	2	2	1	1	-
CLO2	2	2	2	1	2	-
CLO3	2	2	2	2	2	1
CLO4	2	2	1	2	2	1
CLO5	2	2	1	2	3	3

(3 –Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K4
Seminar	5	K4
Quiz	5	K4
Total	25	

Learning Outcome Based Education & Assessment (LOBE)

Formative - Blue Print – Model for Advanced Computer Networks

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
CIA I	CLO 1	Up to K2	2	K1	2(K1&K1)	2(K2)
	CLO 2	Up to K3	3	K1	2(K2&K2)	1(K3)
CIA II	CLO 3	Up to K4	2	K2	2(K4&K4)	2(K4)
	CLO 4	Up to K3	3	K2	2(K3&K3)	1(K3)
Question Pattern (CIA I & II)	No. of Questions to be asked		5		4	3
	No. of Questions to be answered		5		2	2
	Marks for each question		2		5	10
	Total Marks for each section		10		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	10	10	-	20	33.33	83
K2	-	10	20	30	50	
K3	-	-	10	10	16.67	17
K4	-	-	-	-	-	-
Total Marks	10	20	30	60	100	100

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	-	-	-	-	-	17
K2	10	-	-	10	16.67	
K3	-	10	10	20	33.33	33
K4	-	10	20	30	50	50
Total Marks	10	20	30	60	100	100

Learning Outcome Based Education & Assessment (LOBE)

Summative - Blue Print – Model for Advanced Computer Networks

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

UNITS	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K – Level		
1	CLO1	Up to K2	2	K1& K1	1	K1	2(K1&K1)	1(K2)
2	CLO2	Up to K3	2	K2 & K3	1	K1	2(K2&K2)	1(K3)
3	CLO3	Up to K4	2	K2 & K4	1	K2	2(K4&K4)	1(K4)
4	CLO4	Up to K3	2	K3 & K3	1	K2	2(K3&K3)	1(K3)
5	CLO5	Up to K4	2	K3 & K4	1	K3	2(K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	13%
K2	2	4	10	10	26	21.67	22%
K3	4	2	10	20	36	30.00	30%
K4	2	-	20	20	42	35	35%
Total Marks	10	10	50	50	120	100	100%

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core – 6	21P2DMC6	Computer Graphics	4	5	25	75	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To understand basic display system, display mechanisms and Shapes Algorithms.
2. To know about the colour models and Attributes, Various transformation Techniques.
3. To implement various Clipping Techniques. To Impart Viewing Concepts.
4. To apply various 3D Viewing Transformation Techniques.
5. To understand necessary approaches and techniques to the graphics system in order to provide effective view of surfaces to users.

Unit	Content	Hrs	K-Level	CLO
I	A Survey of Computer Graphics: A Survey of Computer Graphics: Computer Aided Design – Presentation Graphics – Image Processing – Graphical User Interfaces. Overview: Video display devices – Refresh Cathode-Ray Tubes – Raster scan Displays – Random Scan Displays – Flat Panel Displays – Graphics Software. Output Primitives: Points and Lines – Line drawing algorithms – Line Functions – Circle Generating Algorithms – Filled Area Primitives – Character Generation.	15	Up to K3	1
II	Attributes of Output Primitives: Attributes of Output Primitives: Line Attributes – Colour and Gray scale Levels – Area Fill Attributes – Character Attributes – Bundled Attributes. Two Dimensional Geometric Transformations: Basic Transformation – Matrix Representations – Composite Transformations – Other Transformations.	15	Up to K2	2
III	Two-Dimensional Viewing: Two-Dimensional Viewing: The Viewing Pipeline – Viewing Coordinate Reference Frame – Window to Viewport Coordinate Transformation – Clipping Operations – Point Clipping – Line Clipping – Polygon Clipping. Graphical User Interfaces and Interactive Input Methods: Input of Graphical Data – Input Functions – Interactive Picture Construction Techniques.	15	Up to K3	3

IV	Three-Dimensional Display Methods: Three-Dimensional Display Methods: Three-Dimensional Display Methods – Three-Dimensional Graphics. Three Dimensional Geometric and Modelling Transformations: Translation – Rotation – Scaling – Other Transformations – Composite Transformations – Three-Dimensional Transformation functions.	15	Up to K4	4
V	Three-Dimensional Viewing : Three-Dimensional Viewing: Viewing Pipeline – Viewing Coordinates – Projections. Visible Surface Detection Methods: Classification of Visible Surface Detection Algorithms – Back Face Detection – Depth Buffer Method – Scan Line Method – Octree Methods- Ray Casting Methods.	15	Up to K4	5

Book for Study

“Computer Graphics” by Donald Hearn M. Pauline Baker, Second Edition, Pearson Education, 2007.

Chapters

Unit – I: 1.1, 1.2, 1.7, 1.8, 2.1, 2.7, 3.1, 3.2, 3.4, 3.5, 3.11, 3.14

Unit – II: 4.1, 4.3 – 4.6, 5.1, 5.2, 5.3, 5.4

Unit – III: 5.1 – 5.4, 6.1 – 6.3, 6.5 – 6.8, 8.2, 8.3, 8.5

Unit – IV: 9.1, 9.2, 11.1 – 11.6

Unit – V: 12.1 – 12.3, 13.1 – 13.3, 13.5, 13.9, 13.10

Books for Reference

1. “Computer Graphics using Open GL” by F.S Hill, JR, Second Edition, PHI, 2005
2. “Computer Graphics for Scientists and Engineers” by R.G.S Asthana, N. K. Sinha, Second Edition, New Age international Publishers, 2003
3. “Interactive Computer Graphics” by Neuman and Sproull, MC Graw Hill ISE, 1993.
4. “Principles of Interactive Computer Graphics” by William M. Newman and Robert F. Sproull – TMH – 1986.

Web Resources

1. https://www.tutorialspoint.com/computer_graphics/line_generation_algorithm.html
2. <https://www.gatevidyalay.com/tag/2d-and-3d-transformation-in-computer-graphics-ppt/>
3. <https://www.geeksforgeeks.org/z-buffer-depth-buffer-method/>

Rationale for Nature of the course

- Develop cognitive and practical skills such as graphical communications, spatial visualization, creative problem solving, design capabilities and modelling, both physically and logically through Computer graphics.

Activities on Skill Oriented

- Practice to write Algorithms
- Quiz
- Seminar

Pedagogy

Chalk and Talk, PPT, Materials, Assignments, Seminar, Problem Solving, Group Discussion, and Interaction.

Course Designer(s) Name

1. Mrs. S. Sasikala
2. Mrs. S. Rajalakshmi

Lesson Plan

Unit	Topics to be covered	Hours	Mode
I	A Survey of Computer Graphics	3	Lecture
	Graphical User Interfaces	5	Lecture, GD
	Output Primitives	7	Lecture
II	Output Primitives	7	Lecture
	2D Geometric Transformations	8	Lecture
III	Viewing	5	Lecture
	Clipping	5	Lecture
	Graphical User Interfaces and Interactive Input Methods	5	Lecture, PPT
IV	3D Display Methods	5	Lecture
	3D Geometric and Modeling Transformations	10	Lecture
V	3D Viewing	7	Lecture
	Visible Surface Detection Methods	8	Lecture, PPT, Assignment

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	COURSE LEARNING OUTCOMES	K - Levels
CLO 1	Utilize the fundamentals of Graphics system and model various Drawing Algorithms	Up to K3
CLO 2	Understand the fundamental output primitives and 2D Geometric Transformation Techniques.	Up to K2
CLO 3	Evaluate different 2D Viewing Concepts and various Interactive Input Methods.	Up to K3
CLO 4	Apply 3D Geometric Transformation in Computer Graphics.	Up to K4
CLO 5	Classify various Visible Surface Detection Methods to Display Images.	Up to K4

Mapping of CLOs with PO

CLO / PO	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	1	1	-	-	-
CLO 2	2	3	3	3	1	-
CLO 3	2	3	2	2	1	-
CLO 4	2	3	3	3	3	2
CLO 5	2	3	3	3	3	2

(3 –Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K4
Seminar	5	K4
Quiz	5	K4
Total	25	

Learning Outcome Based Education & Assessment (LOBE)

Formative - Blue Print – Model for Computer Graphics

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
CIA I	CLO 1	Up to K3	2	K1	2(K2&K2)	2(K3)
	CLO 2	Up to K2	3	K1	2(K1&K1)	1(K2)
CIA II	CLO 3	Up to K3	2	K2	2(K3&K3)	2(K3)
	CLO 4	Up to K4	3	K2	2(K4&K4)	1(K4)
Question Pattern (CIA I & II)	No. of Questions to be asked		5		4	3
	No. of Questions to be answered		5		2	2
	Marks for each question		2		5	10
	Total Marks for each section		10		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	10	10	-	20	33.33	67
K2	-	10	10	20	33.33	
K3	-	-	20	20	33.33	33
K4	-	-	-	-	-	-
Total Marks	10	20	30	60	100	100

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	-	-	-	-	-	17
K2	10	-	-	10	16.67	
K3	-	10	20	30	50	50
K4	-	10	10	10	33.33	33
Total Marks	10	20	30	60	100	100

Learning Outcome Based Education & Assessment (LOBE)

Summative - Blue Print – Model for Computer Graphics

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S.No	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K - Level		
1	CLO 1	Up to K3	2	K2 & K3	1	K1	2(K2&K2)	1(K3)
2	CLO 2	Up to K2	2	K1& K1	1	K1	2(K1&K1)	1(K2)
3	CLO 3	Up to K3	2	K2 & K3	1	K2	2(K3&K3)	1(K3)
4	CLO 4	Up to K4	2	K3 & K4	1	K2	2(K4&K4)	1(K4)
5	CLO 5	Up to K4	2	K3& K4	1	K3	2(K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	13%
K2	2	4	10	10	26	21.67	22%
K3	4	2	10	20	36	30.00	30%
K4	2	-	20	20	42	35	35%
Total Marks	10	10	50	50	120	100	100%

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Elective - 2	21P2DME2(D)	Compiler Design	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To familiarize the structure of compilers and the role of lexical analysis.
2. To construct the various parsers using parsing methods.
3. To learn various translation Techniques.
4. To understand the concepts of symbol table and various error detection and recovery methods.
5. To implement various optimization techniques and generate object code

Unit	Content	Hrs	K-Level	CLO
I	Introduction to compilers: Compilers and Translators – Structure of a Compiler – Lexical Analysis – Syntax Analysis – Intermediate code generation – Optimization – Code generation – Book keeping – Error handling – Compiler Writing tools – Lexical Analysis: The role of the Lexical analysis – A simple approach to the design of lexical analyzers – Regular expressions – Implementation of a lexical analyzer.	15	Up to K3	1
II	Basic Parsing techniques: Derivations and parse trees – Parsers – shift reduce parsing – Operator Precedence Parsing – Top-down parsing – Predictive parsing – Automatic construction of efficient parsers: LR parsers – The Canonical collection of LR (0) items – Constructing SLR parsing tables – Constructing canonical LR parsing tables – Constructing LALR parsing tables – Using ambiguous grammars.	15	Up to K4	2
III	Syntax- Directed translation: Syntax-directed translation schemes – Implementation of syntax-directed translators – Intermediate code – Postfix notation – Three address code, quadruples, and triples- Postfix translations.	15	Up to K3	3
IV	Symbol tables: The contents of a symbol table – Data structures for symbol tables – Representing scope information – Error detection and recovery: Errors – Lexical-Phase errors – Syntactic –phase errors – Semantic errors.	15	Up to K2	4
V	Introduction to Code optimization: The principal sources of optimization – Loop optimization – The DAG representation of basic blocks – Code generation: Object programs – Problems in code generation – A simple code generator – Peephole optimization.	15	Up to K4	5

Book for Study

1. “Principles of Compiler Design” by Alfred V. Aho and Jeffrey Ullman, Narosa Publishing House, 2002.

Chapters

Unit I: 1.1, 1.3, 1.4, 1.5 to 1.11, 3.1, 3.2, 3.3, 3.8,

Unit II: 4.2, 5, 6.1 to 6.6,

Unit-III: 7.1 to 7.4, 7.6, 7.10,

Unit-IV: 9.1 to 9.3, 11.1 to 11.4

Unit-V: 12.1 to 12.3, 15.1, 15.2, 15.4, 15.7.

Books for Reference

1. “Compilers” by Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Narosa Publishing House, 2002.
2. “Compilers Writing” by Jean-Paul Tremblay and Paul G. Soreson, McGraw Hill International Editions, 2000.
3. Compiler Construction Principles and Practice by Kenneth C. Loudon, Vikas publishing House, 2004.

Web Resources

1. https://www.tutorialspoint.com/compiler_design/index.htm
2. <https://www.javapoint.com/compiler-tutorial>
3. <http://www.geeksforgeeks.org/introduction-of-compiler-design/>

Rationale for Nature of the course

- Helps to write portable programs efficiently and build compilers which translate high level programming languages.

Activities on Knowledge and Skill

- Group Discussion
- Quiz
- Seminar

Pedagogy

Chalk and Talk, PPT, Materials, Assignments, Seminar, Problem Solving, Group Discussion, and Interaction.

Course Designer(s) Name

1. Mrs. K. Vairameenakshi
2. Mrs. S. Rajalakshmi

Lesson Plan

Unit	Topics to be covered	Hours	Mode
I	Compilers and Translators	3	Lecture, GD
	Structure of Compilers and its different phases	5	Lecture, PPT
	Lexical Analysis	7	Lecture
II	Parsing techniques	7	Lecture
	LR Parsers	8	Lecture,quiz
III	Syntax – Directed Translation Scheme	5	Lecture
	Implementation of Syntax – Directed Translation	5	Lecture,
	Three address code, Quadruples, triples	5	Lecture, Seminar
IV	Symbol Tables	5	Lecture, PPT
	Data Structure for Symbol tables	5	Lecture
	Lexical Phase Error, Syntactic Phase Error, Semantic Error	5	Lecture
V	Loop optimization, The DAG representation	7	Lecture, Lecture,
	Simple code generator, Peephole optimization.	8	Assignment

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	COURSE LEARNING OUTCOMES	K - Levels
CLO 1	Understand the structure of compilers, Application of Lexical Analyzers.	Up to K3
CLO 2	Evaluate various Parsing methods.	Up to K4
CLO 3	Compute and Translate various intermediate codes	Up to K3
CLO 4	Construct symbol tables and detect errors	Up to K2
CLO 5	Recommend Code Generation Technique to convert Source Code into Object Code.	Up to K4

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	2	2	2	3	-
CLO 2	2	3	2	2	3	-
CLO 3	2	1	2	2	3	-
CLO 4	2	1	2	2	3	-
CLO 5	2	3	3	2	3	2

(3 –Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K4
Seminar	5	K4
Quiz	5	K4
Total	25	

Learning Outcome Based Education & Assessment (LOBE)

Formative - Blue Print – Model for Compiler Design

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
CIA I	CLO 1	Up to K3	2	K1	2(K3&K3)	2(K3)
	CLO 2	Up to K4	3	K2	2(K4&K4)	1(K3)
CIA II	CLO 3	Up to K3	2	K1	2(K2&K2)	2(K3)
	CLO 4	Up to K2	3	K2	2(K1&K1)	1(K2)
Question Pattern (CIA I & II)	No. of Questions to be asked		5		4	3
	No. of Questions to be answered		5		2	2
	Marks for each question		2		5	10
	Total Marks for each section		10		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	4	-	-	4	6.67	17
K2	6	-	-	6	10	
K3	-	10	30	40	66.67	66
K4	-	10	-	10	16.67	17
Total Marks	10	20	30	60	100	100
K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	4	10	-	14	23.33	67
K2	6	10	10	26	43.33	
K3	-	-	20	20	33.33	33
K4	-	-	-	-	-	-
Total Marks	10	20	30	60	100	100

Learning Outcome Based Education & Assessment (LOBE)

Summative - Blue Print – Model for Compiler Design

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

UNITS	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K - Level		
1	CLO 1	Up to K3	2	K2 & K3	1	K1	2(K3&K3)	1(K3)
2	CLO 2	Up to K4	2	K3 & K4	1	K2	2(K4&K4)	1(K4)
3	CLO 3	Up to K3	2	K2 & K3	1	K1	2(K2&K2)	1(K3)
4	CLO 4	Up to K2	2	K1 &K1	1	K2	2(K1&K1)	1(K2)
5	CLO 5	Up to K4	2	K3 & K4	1	K3	2(K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	13%
K2	2	4	10	10	26	21.67	22%
K3	4	2	10	20	36	30.00	30%
K4	2	-	20	20	42	35.00	35%
Total Marks	10	10	50	50	120	100	100%

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Elective 2	21P2DME2(E)	Android Programming	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To understand the basics of activities and multiple layouts.
2. To understand the usage of menus in designing widgets.
3. To explore the App architecture with fragments.
4. To acquire knowledge in handling database, files and notifications.
5. To impart graphics and animation process.

Unit	Content	Hrs	K-Level	CLO
I	Activities and Layout: Introduction-Declaring an Activity- Starting a new activity with an intent object-Switching between activities-Passing data to another activity-Returning a result from an activity-Saving an activity's state-Storing persistent activity data-Understanding the activity life cycle. Layouts: Introduction –Defining and inflating a layout- Using Relative layout- Using linear layout- Creating tables- Table Layout and Grid Layout-Recycler View replaces List View – Changing layout properties during runtime.	15	Up to K2	1
II	Views, Widgets and Styles: Introduction- Inserting a widget into a layout-Using Graphics to show button state-Creating a widget at runtime-Creating a custom component-Appling a style to a view-Turning a style into a theme-Selecting a theme based on the Android version. Menus and Action Mode: Introduction-Creating an options menu-Modifying menus and menu items during runtime-Enabling Contextual Action Mode for a view-Creating a pop-up menu.	15	Up to K3	2
III	Fragments and System UI: Introduction-Creating and Using a Fragment-Adding and Removing Fragments during runtime-Passing data between Fragments. Home Screen Widgets, Search and the System UI: Introduction- Creating a shortcut on the Home Screen-Creating a Home Screen widget- Adding Search to the Action Bar-Showing your App full-screen	15	Up to K3	3

IV	Data Storage: Introduction-Storing simple data-Read and Write a text file to internal storage-Read and Write a text file to external storage-Including resource files in your project-Creating and Using an SQLite database-Accessing data in the background using a Loader-Accessing external storage with scoped directories in Android N. Alerts and Notifications: Displaying a message box with AlertDialog- Displaying a progress dialog-Making a Flashlight with a Heads-up Notification.	15	Up to K4	4
V	Graphics and Animation: Using the Touchscreen and Sensors: Listening for click and long-press events- Pinch-to-zoom with multi-touch gestures- Reading sensor data-using Android Sensor Framework events- Reading device orientation. Graphics and Animation: Introduction-Scaling down large images to avoid Out of Memory exceptions-A transition animation-defining scenes and applying a transition- Creating a Compass using sensor data and RotateAnimation-Creating a slideshow with ViewPager-Creating a Card Flip Animation with Fragments-Creating a ZoomAnimation with a Custom Transition-Displaying Animated image (GIF/WebP) with the new ImageDecoder library- Creating a Circle image with the new ImageDecoder.	15	Up to K4	5

Book for Study

“Android 9 Development” by Rick Boyer, Cookbook, 3rd Edition, Packet Publishing ltd 2018.

Chapters

Unit-1- Chapter 1, 2
Unit 2- Chapter 3, 4
Unit-3- Chapter 5, 6
Unit-4- Chapter 7, 8
Unit-5- Chapter 9, 10

Books for Reference

1. “Android Programming for Beginners” by John Horton- 1st Edition, Packt Publishing.
2. “Android Programming Unleashed” by B.M.Harwani – Pearson Education 2013.
3. Android Programming by Bill Phillips and Chris Stewart – O’Reilly Media Publishers, Third Edition.

Web Resources

1. <https://www.tutorialspoint.com/android/index.htm>
2. <https://www.w3adda.com/android-tutorial>
3. <https://www.w3points.com/android-tutorial/>
4. <https://sites.google.com/site/cse4707/file-cabinet>

Rationale for Nature of the course

- Build native interfaces, open source, expressive and flexible UI and native performance.

Activities on Knowledge and Skill

- Practice to write Application coding
- Group Discussion
- Seminar

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Ms. S.Saranya
2. Mrs. R. Lakshapriya

Lesson Plan

UNIT	Topics to be covered	Hours	Mode
I	Declaring an Activity- Starting a new activity with an intent object.	7	Lecture, PPT
	Layouts.	8	Lecture, PPT
II	Inserting a widget into a layout-Using Graphics to show button state	8	Lecture, PPT
	Menus and Action Mode	7	Lecture
III	Creating and Using a Fragment.	7	Lecture
	Home Screen Widgets, Search and the System UI.	8	Lecture, PPT
IV	Data Storage.	5	Lecture
	Creating and Using an SQLite database.	5	Lecture, Seminar
	Alerts and Notifications.	5	Lecture, PPT
V	Using the Touch screen and Sensors.	4	Lecture, GD
	Graphics and Animation.	6	Lecture,PPT
	Creating a Card Flip Animation with Fragments.	5	Lecture,PPT, Assignment

Course Learning Outcomes

On the successful completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOMES	K -Levels
CLO 1	Develop various Android applications related to layouts and pass information between multiple activities.	Up to K2
CLO 2	Describe how to design simple GUI applications, use built-in widgets and components.	Up to K3
CLO 3	Discuss the usage of fragments in android platform. Design and develop user interfaces for the Android platform.	Up to K3
CLO 4	Design Android applications which make use of internal storage.	Up to K4
CLO 5	Rate the importance of animation techniques and graphics with simple graphical objects on a display screen.	Up to K4

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	2	1	1	1	2
CLO 2	2	2	1	2	1	2
CLO 3	2	2	1	2	1	2
CLO 4	2	2	2	2	3	2
CLO 5	2	2	3	3	3	2

(3 –Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K4
Seminar	5	K4
Quiz	5	K4
Total	25	

Learning Outcome Based Education & Assessment (LOBE)

Formative - Blue Print – Model for Android Programming

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
CIA I	CLO 1	Up to K2	2	K2	2(K1&K1)	2(K2)
	CLO 2	Up to K3	3	K2	2(K3&K3)	1(K3)
CIA II	CLO 3	Up to K3	2	K1	2(K2&K2)	2(K3)
	CLO 4	Up to K4	3	K3	2(K4&K4)	1(K4)
Question Pattern (CIA I & II)	No. of Questions to be asked		5		4	3
	No. of Questions to be answered		5		2	2
	Marks for each question		2		5	10
	Total Marks for each section		10		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	-	10	-	10	16.67	67
K2	10	-	20	30	50	
K3	-	10	10	20	33.33	33
K4	-	-	-	-	-	-
Total Marks	10	20	30	60	100	100

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	4	-	-	4	6.67	24
K2	-	10	-	10	16.67	
K3	6	-	20	26	43.33	43
K4	-	10	10	20	33.33	33
Total Marks	10	20	30	60	100	100

Learning Outcome Based Education & Assessment (LOBE)

Summative - Blue Print – Model for Android Programming

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

UNIT	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K - Level		
1	CLO 1	Up to K2	2	K1 & K1	1	K2	2(K1&K1)	1(K2)
2	CLO 2	Up to K3	2	K2 & K3	1	K2	2(K3&K3)	1(K3)
3	CLO 3	Up to K3	2	K2 & K3	1	K1	2(K2&K2)	1(K3)
4	CLO 4	Up to K4	2	K3 & K4	1	K3	2(K4&K4)	1(K4)
5	CLO 5	Up to K4	2	K3 & K4	1	K1	2(K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	13%
K2	2	4	10	10	26	21.67	22%
K3	4	2	10	20	36	30.00	30%
K4	2	-	20	20	42	35	35%
Total Marks	10	10	50	50	120	100	100%

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Elective - 2	21P2DME2(F)	WAP and XML	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	✓
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To understand the concept of WAP.
2. To learn about the functionality of WAP gateways.
3. To acquire knowledge and skills for creating WML.
4. To understand the concept of style sheet in Document Display.
5. To learn the concept of XSL, Non Roman Scripts and Unicode.

Unit	Content	Hrs	K-Level	CLO
I	Overview of WAP : WAP and the wireless world – WAP application architecture – WAP internal structure – WAP versus the Web – WAP 1.2 – WTA and push features. Setting up WAP: Available software products – WAP resources – The Development Toolkits.	15	Up to K2	1
II	WAP gateways: Definition – Functionality of a WAP gateway – The Web model versus the WAP model – Positioning of a WAP gateway in the network – Selecting a WAP gateway Basic WML: Extensible mark up language – WML structure – A basic WML card – Text formatting – navigation – Advanced display features.	15	Up to K3	2
III	Interacting with the user: Making a selection – Events – Variables – Input and parameter passing. WML Script: Need for WML script – Lexical Structure – Variables and literals – Operators – Automatic data type conversion – Control Constructs Functions – Using the standard libraries – programs – Dealing with Errors.	15	Up to K4	3
IV	XML: Introduction XML: An Eagle's Eye view of XML – XML Definition – List of an XML Document – Related Technologies – An introduction to XML Applications – XML Applications – XML for XML – First XML Documents Structuring Data: Examining the Data XMLizing the data – The advantages of the XML format – Preparing a style sheet for Document Display.	15	Up to K3	4
V	Attributes, Empty Tags and XSL: Attributes – Attributes Versus Elements – Empty Tags – XSL – Well formed XML documents – Foreign Languages and Non Roman Text – Non Roman Scripts on the Web Scripts, Character sets, Fonts and Glyphs – Legacy character sets– The Unicode Character set – Procedure to Write XML Unicode.	15	Up to K4	5

Books for Study

1. “Professional WAP with WML, WML script, ASP, JSP,XML, XSLT, WTA Push and Voice XML” by Charles Arehart and Others, Shroff Publishers and Distributers Pvt. Ltd 2000.
2. “XML TM Bible” by Eliotte Rusty Harlod, Books India (P) Ltd, 2000

Chapters

UNIT - 1: 1,2 [Text Book 1]

UNIT - 2: 3,4 [Text Book 1]

UNIT - 3: 5,6 [Text Book 1]

UNIT - 4: 1,2,3,4 [Text Book 2]

UNIT - 5:5,6,7 [Text Book 2]

Books for Reference

- 1) “XML: The Complete Reference“ by Heather Williamson, Tata McGraw-Hill Education India.
- 2) HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2nd Edition, DreamTech Press.
- 3) Web Design with XML: Generating Web Pages with XML ,CSS, XSLT and Formatting Objects by Manfred Knobloch, 1st Edition.

Web Resources

1. https://www.tutorialspoint.com/wap/wap_wml_syntax.htm
2. https://ebooks.lpude.in/computer_application/msc_it/term_4/DCAP512_WAP_AND_WML.pdf
3. <http://www.inf.unibz.it/~ricci/MS/slides-2009/11-WAP.pdf>

Rationale for Nature of the course

- Helps to develop website as the need for the web sites are increasing.

Activities on Knowledge and Skill

- Creating Mini Projects
- Quiz
- Seminar

Activities on Employability Oriented

- Website development
- Data Analysis

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Group Discussion and Interaction.

Course Designer(s) Name

1. Mrs. R.Tamil Selvi
2. Mr. N. Radha Krishnan

Lesson Plan

UNIT	Topics to be covered	Hours	Mode
I	WAP and the wireless world. Setting up WAP.	7 8	Lecture, GD Lecture, PPT
II	Functionality of a WAP gateway. Selecting a WAP gateway Basic WML	7 8	Lecture Lecture, quiz
III	Making a selection – Events – Variables – Input and parameter passing. WML Script.	7 8	Lecture Lecture
IV	Introduction XML First XML Documents Structuring Data.	8 7	Lecture, PPT Lecture
V	Attributes – Attributes Versus Elements. Legacy character sets– The Unicode Character set – Procedure to Write XML Unicode.	7 8	Lecture, Seminar Lecture, Assignment

Course Learning Outcomes

On the completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOMES	K - Level
CLO 1	Understand the basics of WAP architecture	Up to K2
CLO 2	Identify the usage of WAP gate ways.	Up to K3
CLO 3	Apply WML concepts to develop Web application.	Up to K4
CLO 4	Develop the interactive real time applications.	Up to K3
CLO 5	Design web sites using XSL Style Sheets.	Up to K4

Mapping of CLOs with POs

CLOs/ POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	2	1	2	1	-
CLO 2	2	2	1	2	1	-
CLO 3	2	2	1	2	1	-
CLO 4	2	2	1	2	1	-
CLO 5	2	2	1	2	2	-

(3 –Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K4
Seminar	5	K4
Quiz	5	K4
Total	25	

Learning Outcome Based Education & Assessment (LOBE)

Formative - Blue Print – Model for WAP and XML

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
CIA I	CLO 1	Up to K2	2	K1	2(K1&K1)	2(K2)
	CLO 2	Up to K3	3	K1	2(K2&K2)	1(K3)
CIA II	CLO 3	Up to K4	2	K3	2(K4&K4)	2(K4)
	CLO 4	Up to K3	3	K2	2(K3&K3)	1(K3)
Question Pattern (CIA I & II)	No. of Questions to be asked		5		4	3
	No. of Questions to be answered		5		2	2
	Marks for each question		2		5	10
	Total Marks for each section		10		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	10	10	-	20	33.33	83
K2	-	10	20	30	50	
K3	-	-	10	10	16.67	17
K4	-	-	-	-		
Total Marks	10	20	30	60	100	100

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	-	-	-	-	-	10
K2	6	-	-	6	10	
K3	4	10	10	24	40	40
K4	-	10	20	30	50	50
Total Marks	10	20	30	60	100	100

Learning Outcome Based Education & Assessment (LOBE)

Summative - Blue Print – Model for WAP and XML

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S.No	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K - Level		
1	CLO 1	Up to K2	2	K1 & K1	1	K1	2(K1&K1)	1(K2)
2	CLO 2	Up to K3	2	K2 & K3	1	K1	2(K2&K2)	1(K3)
3	CLO 3	Up to K4	2	K2 & K4	1	K3	2(K4&K4)	1(K4)
4	CLO 4	Up to K3	2	K3 & K3	1	K2	2(K3&K3)	1(K3)
5	CLO 5	Up to K4	2	K3 & K4	1	K2	2(K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	13%
K2	2	4	10	10	26	21.67	22%
K3	4	2	10	20	36	30.00	30%
K4	2	-	20	20	42	35.00	35%
Total Marks	10	10	50	50	120	100	100%

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core Practical – 3	21P2DMP3	Linux Programming Lab	2	4	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To acquire knowledge on the basics of Shell programming.
2. To construct program using various looping statements.
3. To develop programs using patterns.
4. To design program by implementing system calls.
5. To develop applications using I/O system calls.

Unit	Content	Hrs	K-Level	CLO
I	LINUX COMMANDS & SHELL PROGRAMS USING BASIC TESTS 1. Write a program to implement basic Linux Commands 2. Write a shell program for File permission using basic tests 3. Write a Shell Program to Display File type	12	Up to K2	1
II	SHELL PROGRAMS 4. Write a Shell program to count the number of Lines in a given file 5. Write a Shell program to read command line argument with names. 6. Write a Shell program to check existence of the File. 7. Write a Shell Program to get current System date and time using Date command.	12	Up to K3	2
III	SHELL PROGRAMS USING PATTERNS 8. Write a program to Display the pattern. 9. Write a program to Generate the combinations of 1,2,3	12	Up to K3	3
IV	PROGRAMS USING SYSTEM CALL OF LINUX 10. Write a program for process creation using FORK,EXEC COMMANDS 11. Write a program for process creation using GETPID,SLEEP,EXEC COMMANDS	12	Up to K4	4
V	PROGRAMS USING I/O SYSTEM CALL IN LINUX 12. Write a program to manipulate the File- OPEN,READ,WRITE 13. Write a program for directory manipulation- READ DIR,OPEN DIR PROGRAMS FOR LS AND GREP COMMAND 14. Write a program to implement LS COMMAND 15. Write a program to implement GREP COMMAND	12	Up to K4	5

Book for Study

Beginning Linux Programming by Neil Matthew, Richard Stones 4th Edition Wiley Publishing, Inc.

Books for Reference

1. Linux System Programming by Robert Love, O'Reilly, SPD
2. The Linux Programming Interface by Michael Kerrisk First Edition, No Starch Press
3. How Linux Works by Brian Ward, Second Edition, No Starch Press

Web Resources

1. https://www.crectirypati.com/sites/default/files/lectur_notes/OpertingSystemsLectureNotes.pdf
2. <http://www2.cs.uic.edu/~jbell/CourseNotes/OperatingSystems>
3. <http://www.smartworld.com/notes/linux-programming-pdf-lp-pdf-notes/>

Rationale for Nature of course

- Helps to install processes, hardware requirements and its features.

Activities on Skill Oriented

- Implementing Shell programs
- Bug fixing

Pedagogy

Chalk and talk Materials, PPT, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Mrs.S.Brindha
2. Ms. S.Saranya

Lesson Plan

UNIT	Topics to be coverd	Hours	Mode
I	Linux commands	6	Demo & Practical Session
	Shell programs using basic tests	6	
II	Shell programs using loops	12	Demo & Practical Session
III	Shell programs using patterns	12	Demo & Practical Session
IV	Programs using system call of linux	12	Demo & Practical Session
V	Programs using I/O system call in linux	6	Demo & Practical Session
	Programs for ls and grep command	6	

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	COURSE LEARNING OUTCOMES	K - Level
CLO 1	Demonstrate the basic knowledge of Shell commands and files handling utilities.	Up to K2
CLO 2	Examine the concept of shell programs using loops.	Up to K3
CLO 3	Develop shell programs using patterns	Up to K3
CLO 4	Construct programs using system call of Linux	Up to K4
CLO 5	Develop program using I/O System call and ls command with various attributes.	Up to K4

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	2	2	3	2	2
CLO 2	2	2	2	3	2	2
CLO 3	2	2	2	3	2	2
CLO 4	2	2	2	3	2	2
CLO 5	2	2	2	3	2	2

(3 –Advanced Application, 2 – Intermediate Level, 1- Basic Level)

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core Practical - 4	21P2DMP4	Computer Graphics Lab	2	4	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To understand basic display system, display mechanisms and Shapes Algorithms.
2. To know about the colour models and Attributes, Various transformation Techniques.
3. To implement various Clipping Techniques. To Impart Viewing Concepts.
4. To apply various 3D Viewing Transformation Techniques.
5. To understand necessary Approaches and Techniques to the graphics system in order to provide effective view of surfaces to users.

Unit	Content	Hrs	K-Level	CLO
I	1. To Implement Line Generation using DDA Algorithm. 2. To Implement Line Generation using Bresenham's Algorithm. 3. To Implement Circle Generation using Bresenham's Algorithm. 4. To Implement Ellipse Generation using Bresenham's Algorithm.	12	Up to K2	1
II	5. To demonstrate various types of Text and Fonts. 6. To Implement Polygon filling using boundary fill Algorithm. 7. To make an Image using the various attributes of line, circle, rectangle and ellipse.	12	Up to K3	2
III	8. To implement line clipping using Cohen-Sutherland Clipping Algorithm. 9. To implement line clipping using Sutherland-Hodgeman Polygon Clipping Algorithm. 10. To Implement 2D transformations: Translation, Scaling and Rotation.	12	Up to K3	3
IV	11. To Implement 3D transformations: Translation, Scaling and Rotation. 12. To Implement 3D transformations: Mirror reflection and Shearing. 13. To display 3D objects as 2D display using perspective transformations.	12	Up to K4	4
V	14. To Implement a Window to Viewport Mapping. 15. To Implement Visualizing Projections of 3D Images. 16. To Implement Animation using Transformations.	12	Up to K4	5

Book for Study

“Computer Graphics” by Donald Hearn M. Pauline Baker, Second Edition, Pearson Education, 2007.

Books for Reference

1. “Computer Graphics using Open GL” by F.S Hill, JR, Second Edition, PHI, 2005
2. “Computer Graphics for Scientists and Engineers” by R.G.S Asthana, N. K. Sinha, Second Edition, New Age international Publishers, 2003
3. “Interactive Computer Graphics” by Neuman and Sproull, MC Graw Hill ISE, 1993.
4. “Principles of Interactive Computer Graphics” by William M. Newman and Robert F. Sproull – TMH – 1986.

Web Resources

1. <https://onlineengineering.files.wordpress.com>
2. <https://graphics1513.rssing.com>
3. <https://vardhamancse.yolasite.com>

Rationale for Nature of the course

- Develop cognitive and practical skills such as graphical communications, spatial visualization, creative problem solving, design capabilities and modelling, both physically and logically through Computer graphics.

Activities on Skill Oriented

- Practice to implement Algorithms
- Implementing Basic Animation Techniques

Pedagogy

Projector Demonstration and Practical sessions.

Course Designer(s) Name

1. Mrs. S. Sasikala
2. Mrs. S. Rajalakshmi

Lesson Plan

UNIT	Topics to be covered	Hours	Mode
I	To Implement Line Generation using DDA, Bresenham's Algorithm.	12	Demo & Practical Session
II	To demonstrate various types of Text and Fonts, boundary fill Algorithm.	12	Demo & Practical Session
III	To implement line clipping using Cohen-Sutherland, Sutherland-Hodgeman Algorithm.	12	Demo & Practical Session
IV	To Implement 3D transformations: Translation, Scaling and Rotation, Mirror reflection and Shearing.	12	Demo & Practical Session
V	To Implement a Window to Viewport Mapping. To Implement Visualizing Projections of 3D Images. To Implement Animation using Transformations.	4 4 4	Demo & Practical Session

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	COURSE LEARNING OUTCOMES	K - Levels
CLO 1	Discuss about various Drawing Algorithms	Up to K2
CLO 2	Demonstrate various types of Text and Fonts and Apply the concepts of Polygon filling using boundary fill Algorithm.	Up to K3
CLO 3	Implementing the various Clippings Algorithm and Apply the concept of 2D object representation.	Up to K3
CLO 4	Apply 3D Geometric Transformation in an object.	Up to K4
CLO 5	Describe the importance of Viewing and Projections.	Up to K4

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	1	1	-	-	-
CLO 2	2	3	3	3	1	-
CLO 3	2	3	2	2	1	-
CLO 4	2	3	3	3	3	2
CLO 5	2	3	3	3	3	2

(3 –Advanced Application, 2 – Intermediate Level, 1- Basic Level)

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I PG				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	NME- 2	21P2DNM2	Basics Of Internetworks	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	✓

Course Objectives

1. To impart the knowledge of basics of Internet.
2. Learning the various aspects of internet design and functionalities.
3. To learn the concept of sending and receiving the Email.
4. To familiarize the concept of Computer Security.
5. To provide the knowledge of computer Viruses, Bombs and Worms.

Unit	Content	Hrs	K-Level	CLO
I	Internet: Internet Definition - Network Definition-Common terminologies – Node - Host- Workstation -Network Administrator - Network security - Network Components – Types of Networks - Addressing in Internet – DNS - Network topologies.	6	Up to K2	1
II	Browsers and Search engines: Browsers – browser - Introduction – Parts of a browser window -Running a browser - working with a Browser. Search Engines: What is Search Engine? - Types of Search Engines.	6	Up to K2	2
III	E-mail: E-mail - E-mail Networks and Servers - E-mail Protocols - Structure of E-mail - Attachments – E-mail Clients - web based E-mail- Address book – Signature File.	6	Up to K2	3
IV	Computer Security: Types of Computer Crimes – Computer Security – Crime and Security – Computer Crime by Authorized Users – Computer Crime through Unauthorized access – Malicious Computer Programs.	6	Up to K2	4
V	Computer Viruses, Bombs, and Worms: What do Viruses do? – Virus Prevention guidelines – Types of Viruses – Characteristics of Viruses – Categories of Viruses – Antivirus Software or Virus vaccines.	6	Up to K2	5

Books for Study

1. Internet Technology and Web design by Ramesh Bangia, Firewall Media, Third Edition, Lakshmi Publications Pvt. Ltd, 2011.
2. Fundamentals of Information Technology by Alexis Leon & Mathews Leon, Vikas Publishing House Pvt. Ltd., Second Edition, 2009.

Chapters

Text Book: 1

Unit 1: Chapter 1,2

Unit 2: Chapter 3 & Chapter 4

Unit 3: Chapter 5(5.6), Chapter 8(8.11 &8.13)

Text Book: 2

Unit 4: Chapter 30

Unit 5: Chapter 32

Books for Reference

1. The Internet Book by Douglas E. Comer, Fourth Edition, PHI Learning Pvt. Ltd., New Delhi, 2009.
2. Using the Internet the Easy Way by Young Kai Seng, Minerva Publications, First Edition, 2000.

Web Resources

1. [https:// www.tutorialspoint.com](https://www.tutorialspoint.com)
2. <https://www.simlilearn.com>
3. <https://www.w3schools.com>
4. <https://www.top-windows-tutorials.com>

Rationale for Nature of the course

- Helps to get a chance to showcases their skills and capabilities in an interactive and advanced environment.

Activities on Knowledge and Skill

- Creating and Accessing E-Mail
- Surfing on Web

Activities on Entrepreneurship Oriented

- Networking
- E-Commerce

Pedagogy

Chalk and talk , Materials, PPT, Assignment , Seminar , Problem solving , Group discussion , Interaction and Demonstration.

Course Designer(s) Name

1. Mrs. K. Imaya
2. Ms. S.Saranya

Lesson Plan

UNIT	Topics to be covered	Hours	Mode
I	Internet Types of Networks - Addressing in Internet – DNS - Network topologies.	6	Lecture, GD
II	Browsers -Search Engines.	6	Lecture
III	E-mail.	6	Lecture, PPT
IV	Types of Computer.	6	Lecture, PPT
V	What do Viruses do? Categories of Viruses.	6	Lecture, GD, Assignment

Course Learning Outcomes

On the completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOME	K- Levels
CLO 1	Describe the concept of Network Definition, Network Administrator, Network Security and Network Topologies	Up to K2
CLO 2	Discuss the concepts of Browsers and Search Engines	Up to K2
CLO 3	Describe the E-mail Networks and Servers, E-mail Protocols, Structure of E-mail, Attachments, E-mail Clients, web-based E-mail-Address book, Signature File	Up to K2
CLO 4	Elaborate the concept of Computer Security and Computer Crimes.	Up to K2
CLO 5	Discuss the concept of Computer Viruses, Bombs and Worms	Up to K2

Mapping of CLOs with PO

CLO / PO	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	-	-	-	1	1
CLO 2	2	-	-	-	1	1
CLO 3	2	2	1	2	1	2
CLO 4	2	-	-	2	3	2
CLO 5	2	-	-	3	3	2

(3 –Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K2
Seminar	5	K2
Quiz	5	K2
Total	25	

Learning Outcome Based Education & Assessment (LOBE)**Formative - Blue Print – Model for Basics of Internetworks****Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)**

Units	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No of Questions	K - Level		
1	CLOX	Up to K2	2	K1	2(K2&K2)	2(K1)
2	CLOY	Up to K2	1	K1	2(K2&K2)	1(K1)
No. of Questions to be asked			3		4	3
No. of Questions to be answered			3		2	2
Marks for each question			2		7	10
Total Marks for each section			6		14	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels (CIA I & II)

K - Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Total Marks	% of Marks without choice	Consolidated %
K1	6	-	30	36	56.25	100
K2	-	28	-	28	43.75	
Total Marks	6	28	30	64	100.00	100%

Learning Outcome Based Education & Assessment (LOBE)
Summative - Blue Print – Model for Basics of Internetworks
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S.No	CLOs	K- Level	Section A		Section B		Section C (Open Choice)
			Short Answers		(Either/or Choice)		
			No of Questions	K - Level	No of Questions	K - Level	
1	CLO1	Up to K2	1	K1	1	K2& K2	1(K1)
2	CLO2	Up to K2	1	K1	1	K2& K2	1(K1)
3	CLO3	Up to K2	1	K1	1	K2& K2	1(K1)
4	CLO4	Up to K2	1	K1	1	K2& K2	1(K1)
5	CLO5	Up to K2	1	K1	1	K2& K2	1(K1)
No. of Questions to be asked			5		10		5
No. of Questions to be answered			5		5		3
Marks for each question			2		7		10
Total Marks for each section			10		35		30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

Distribution of Section – wise Marks with K Levels *

K Levels	Section A Short Answers	Section B (Either/or Choice)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	10	-	50	60	46.16	46
K2	-	70	-	70	53.84	54
Total Marks	10	70	50	130	100	100%

DEPARTMENT OF INFORMATION TECHNOLOGY

Syllabi for B.Sc. (I.T.) First Year

(Choice Based Credit System with Outcome Based Education Model)

(Academic Year 2020-2021 Onwards)

THE MADURA COLLEGE (AUTONOMOUS), MADURAI-11
(Self Financed Stream)

DEPARTMENT OF INFORMATION TECHNOLOGY

VISION

To serve the society by producing the disciplined, skilled intellectual and ethical IT professionals with potential to face the changes and challenges of the modern computing industry.

MISSION

- To provide the strong academic foundation in theories and practical of Information Technology.
- To enhance the students knowledge in the latest technologies by organizing and participating in technical programs.
- To encourage the students to deliver their innovative designs and become the successful IT professionals.

Programme Educational Objectives (PEOs):

After successful completion of programme, the students will be able to

PEO 1	Apply the knowledge of Mathematics, Science and fundamentals to the solution of problems with different applications.
PEO 2	Identify, formulate, research literature, and analyze various application problems reaching substantiate conclusions using prime principles of information technologies.
PEO 3	Design system responds or processes that meet the specified needs with appropriate consideration for the public health and safety, and the societal, and environmental considerations.
PEO 4	Create, select and apply appropriate techniques, resources, and modern tools including prediction and formulation of various outcomes.
PEO 5	Apply principles and commit to professional ethics, responsibilities and norms of the scientific and sustainable development.
PEO 6	Perform effectively as an individual, a member or leader in diverse teams and in multidisciplinary environments.

Programme Outcomes for B.Sc. Graduates

At the end of the Programme, the Graduates will be able to

PO1	Integrate learned skills and knowledge derived from the study of the science and other related disciplines, acquiring the necessary depth and breadth required for the transdisciplinary perspective.
PO2	Demonstrate proficiency in using disciplinary appropriate methods for research, critical analysis or creative work and provide scientific solution to the problems of the society.
PO3	Communicate conclusion, interpretation and implication clearly, concisely, effectively both orally and in writing for different types of audiences.
PO4	Articulate and apply values, principles, ethics and ideals derived from an integrated understanding of their areas of study and demonstrate awareness of current societal and environmental challenges and ways of mitigating them.
PO5	Use modern tools, resources and software and be abreast with the emerging trends in their disciplinary area and practice lifelong learning.

Programme Specific Outcomes (PSOs):

At the end of the Programme, the students will be able to

PSO	GRADUATE ATTRIBUTES	DESCRIPTION
PSO-1	Knowledge in core competency	Acquire fundamental concepts, methods and practices of Information Technology to develop theoretical and practical skill sets.
PSO-2	Problem analysis & Modern tool usage	Justify the optimum technique to allocate memory resources, processors, I/O peripherals to provide optimal programmatic solution to a real-time problem.
PSO-3	Design and development of solutions for complex problems	Develop practical skills to provide solutions for computer-oriented problems.
PSO-4	Knowledge in core competency & Problem analysis	Recognize the generalized and distinguished characters of different Hardware and Software Systems for different environments.
PSO-5	Environment and sustainability	Efficiently integrate IT based solution into user friendly environments.
PSO-6	Lifelong Learning & Modern tool usage	Gain skills on basic as well as trendy software languages and packages to design software systems.

Qualification for Admission

Candidates should have passed the Higher Secondary Examination with Physics and Mathematics, conducted by the Board of Higher Secondary Education, Government of Tamil Nadu, CBSE & ICSE or any other examinations approved by Madurai Kamaraj University as equivalent.

Duration of the Course

The students shall undergo prescribed course of study for the period of three academic years under CBCS semester pattern with outcome based education model.

Medium of Instruction: English

System: Choice Based Credit System with Outcome Based Education Model

EVALUATION (THEORY)

Internal (Formative)	: 25 marks
External (Summative)	: 75 marks
Total	: 100 marks

Continuous Internal Assessment: 25 Marks

Components	Marks
Test (Average of two tests) Conducted for 40 marks and converted to 10 marks)	10
Assignment	5
Quiz/ Seminars/ Case lets/ ICT based Assignment/ Mini Projects	5
Attendance	5
Total	25

- ✓ There will be a two Internal Assessment tests
- ✓ Duration of Internal Assessment test will be 2 hours
- ✓ Students shall write retest on the genuine grounds if they are absent in either Test I or Test II with the approval of Head of the Department / Coordinator and the Principal / Chief Coordinator.

Question Paper Pattern for External Examination: 75 Marks

Section	Marks
A- Multiple Choice Questions (10 X 1 marks)	10
B- Short answer type (5 X 2 marks)	10
B- Either/Or type (5 X 5 marks)	25
C- Open Choice type (3 out of 5 X 10 marks)	30
Total	75

EVALUATION (PRACTICAL)

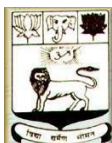
Internal (Formative)	: 40 marks
External (Summative)	: 60 marks
Total	: 100 marks

Question Paper Pattern for Practical Examination

Internal	
Components	Marks
Major Question	20
Minor Question	10
Record work	5
Program Explanation /VIVA	5
Total	40

External	
Components	Marks
Major Question	30
Minor Question	20
Record work	5
Program Explanation /VIVA	5
Total	60

- In respect of external examinations, passing minimum is 35% for Under Graduate Courses and in total, aggregate of 40%.



The Madura College (Autonomous – Self Finance), Madurai-625011
Department of Information Technology
Curriculum structure for B.Sc. Information Technology
(with Mathematics & Commerce ancillaries)

Sem.	Course Type	Subject Code	Course title	Contact hours/week	Credits
I	Part -I : Lang-I	20U1T/S/HLA1	Tamil-I/Sanskrit-I/Hindi-I	6	3
	Part - II : English	20U1NEN1	English –I	6	3
	VE &PE	20U1VEN1	Value Education & Professional Ethics	3	3
	Part III: Allied –I	20U1FAC1	Discrete Mathematics	6	5
	Major Core -1	20U1FMC1	C Programming	3	3
	Major Core- 2	20U1FMC2	Principles of Information	3	3
	Major Core	20U1FMP1	C Programming – Lab	3	2
	Total			30	22
II	Part - I : Lang-II	20U2T/S/HLA2	Tamil-II/Sanskrit-II/Hindi-II	6	3
	Part - II : English-	20U2NEN2	English-II	6	3
	E & G S	20U2EVS1	Environment & Gender studies	3	3
	Part III :Allied-I /	20U2FAC2	Resource Management	6	5
	Major Core -3	20U2FMC3	Object Oriented Programming with C++	3	3
	Major Core- 4	20U2FMC4	Digital Principles and	3	3
	Major Core	20U2FMP2	OOPs with C++ - Lab	3	2
	Extension			--	1
	Total			30	23
III	Part -I : Lang-III	20U3T/S/HLA3	Tamil-III/Sanskrit-III/Hindi-III	6	3
	Part - II : English-	20U3NEN3	English-III	6	3
	Non Major	20U3FNM1	PC Software	2	2
	Skill based	20U3FSM1	Office Automation	2	2
	Part III: Allied-II	20U3FAC3	Financial Accounting	6	5
	Major Core -5	20U3FMC5	Data Structures and Algorithms	5	5
	Major Core Practical-3	20U3FMP3	Data Structures and Algorithms – Lab	3	2
	Total			30	22

Sem.	Course Type	Subject Code	Course title	Contact hours/week	Credits
IV	Part- I : Lang –IV	20U4T/S/HLA4	Tamil-IV/Sanskrit-IV/Hindi-IV	6	3
	Part - II : English-IV	20U4NEN4	English-IV	6	3
	Non-Major Elective	20U4FNM2	Introduction to Internet	2	2
	Skill Based Elective –II	20U4FSM2	Visual Programming	2	2
	Part III: Allied –II / II	20U4FAC4	Business Statistics	6	5
	Major Core -6	20U4FMC6	Java Programming	5	5
	Major Core Practical-	20U4FMP4	Java Programming – Lab	3	2
	Total			30	22
V	Skill Based	20U5FSM3	Web Technologies	2	2
	Major Core -7	20U5FMC7	Dot Net Technologies	5	5
	Major Core- 8	20U5FMC8	Relational Database Management System	5	5
	Major Core -9	20U5FMC9	Data Communication and Computer Network	5	5
	Major Core	20U5FMP5	Dot Net Technologies – Lab	3	2
	Major Core	20U5FMP6	RDBMS – Lab	3	2
	Major Elective –I	20U5FME1	Computer Graphics / Microprocessor / Linux Programming / Multimedia Technologies	4	3
	Major Elective –II	20U5FME2	Compiler Design / Client-Server Computing / E-Commerce / Digital Image Processing	3	2
	Total			30	26
VI	Skill Based Elective	20U6FSM4	Desktop Publishing	2	2
	Major Core -10	20U6FMC10	Programming in PHP	5	5
	Major Core- 11	20U6FMC11	Operating System	5	5
	Major Core -12	20U6FMC12	Software Engineering	5	5
	Major Core	20U6FMP7	Programming in PHP – Lab	3	2
	Major Core	20U6FMP8	Project & Viva-voce – Lab	3	2
	Major Elective –III	20U6FME3	Python Programming / Android Programming / Block chain Technologies / Software Testing	4	3
	Major Elective –IV	20U6FME4	Data Mining / Network Security / Mobile Computing / Cloud Computing	3	2
	Total			30	26

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Allied - 1	20U1FAC1	Discrete Mathematics	5	6	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To acquire knowledge on Discrete Structure and apply Boolean laws.
2. To illustrate the use of relations and comparing various functions.
3. To understand and apply inductions and finding solutions for finite order relations.
4. To elucidate the significance of matrices.
5. To apply the laws & rules used in logic among various applications.

Unit	Content	Hours	K-Level	CLO
I	Set Theory: Introduction – Sets - Notation and Description of Sets – Subsets - Venn-Euler Diagrams - operations on sets - Properties of set operations - verification of the Basic Laws of Algebra by Venn diagram - The principle of Duality.	18	Up to K2	1
II	Relations: Cartesian product of two sets - Relations - Representation of Relations - operations on Relations - Equivalence Relation. Functions and Operators - one-to-one, onto functions - Special types of functions - invertible functions - composition of functions.	18	Up to K3	2
III	Mathematical Induction: Techniques of Proof - Mathematical induction Recurrence Relation and Generating Functions: Recurrence – An introduction - Polynomials and their evaluations - Recurrence Relations - Solution of finite order Homogeneous Relations - Solution of finite order Non-Homogeneous Relations - Generating Functions.	18	Up to K4	3
IV	Matrix Algebra: Introduction - Matrix Operations - Inverse of a square matrix - Elementary operations and Rank of a matrix - Simultaneous equations - Eigen Values and Eigen Vectors.	18	Up to K3	4
V	Logic: Introduction - TF Statements – Connectives - Atomic and Compound statements - Well Formed Formulae - Truth table of a formula – Tautology - Tautological implications and equivalence of formulae - Lattices - Some properties of Lattices.	18	Up to K4	5

Book for Study

Discrete Mathematics by M.K.Venkatraman, N.Sridharan, and N.Chandrasekaran, The National Publishing Company, 2003.

Chapters

Unit – I : 1.

Unit – II : 2.1-2.5, 3.

Unit – III: 4, 5.1-5.6.

Unit – IV : 6.1 -6.5, 6.7.

Unit – V : 9.1 -9.8,10.1 – 10.2.

Books for Reference

1. Applied Discrete Structures for Computer Science by Alan Doerr, Ken Levasseur
2. Discrete Mathematical Structures with Applications to Computer Science by Trembly and Manohar

Web Resources

1. <http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf>
2. <http://home.iitk.ac.in/~aralal/book/mth202.pdf>
3. <https://mathcourses.nfshost.com/archived-courses/mat-375-001-2015-fall/lectures/lec-08-homogeneous-recurrence-relations.pdf>

Rationale for Nature of the Course

- Promotes the making of mathematical connections, provides a setting for problem solving with real world applications. Capitalizes on technological settings.

Activity on Knowledge and Skill

- Group Discussion
- Quiz
- Seminar

Pedagogy

Chalk and talk, Assignment, Seminar, Problem solving, Group discussion, and Interaction.

Course Designer(s) Name

1. Mrs. S. Rajalakshmi
2. Mrs. R. Tamilselvi

Lesson Plan

Unit	Topics to be Covered	Hours	Mode
I	Introduction – Sets - Notation and Description of Sets – Subsets - Venn-Euler Diagrams	6	Lecture
	operations on sets - Properties of set operations	5	Lecture
	Verification of the Basic Laws of Algebra by Venn diagram - The principle of Duality.	7	Lecture & GD
II	Cartesian product of two sets - Relations - Representation of Relations - operations on Relations	6	Lecture
	Equivalence Relation. Functions and Operators - one-to-one, onto functions	5	Lecture
	Special types of functions - invertible functions - composition of functions.	7	Lecture
III	Techniques of Proof - Mathematical induction, Polynomials and their evaluations.	6	Lecture
	Recurrence Relations - Solution of finite order Homogeneous Relations	6	Lecture
	Solution of finite order Non-Homogeneous Relations - Generating Functions.	6	Lecture
IV	Introduction - Matrix Operations	5	Lecture, PPT
	Inverse of a square matrix - Elementary operations and Rank of a matrix	6	Lecture, GD
	Simultaneous equations - Eigen Values and Eigen Vectors	7	Lecture, GD
V	Introduction - TF Statements – Connectives	5	Lecture
	Atomic and Compound statements - Well Formed Formulae - Truth table of a formula – Tautology	7	Lecture, GD
	Tautological implications and equivalence of formulae - Lattices - Some properties of Lattices.	6	Lecture, Assignment

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	K - Level
CLO 1	List various laws of Set theory. Apply the laws and properties to simplify the problems. Discuss the duality principle and solve the problems.	Up to K2
CLO 2	Describe the representations of relations. Illustrate the usage of equivalence relations in real world problems. Outline different types of functions.	Up to K3
CLO 3	Explain Mathematical induction and recurrence relations. Classify the finite order relations.	Up to K4
CLO 4	Outline the operations on matrices. Solve simultaneous linear equations. Find the Eigen values and Eigen vectors.	Up to K3
CLO 5	Relate Atomic and Compound statements of Logic. Identify the relationship between WFF and Tautology. Explain Lattices and its properties.	Up to K4

Mapping of CLOs with POs

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO 1	3	2	1	1	3
CLO 2	3	3	-	-	2
CLO 3	3	3	-	-	2
CLO 4	3	1	-	-	3
CLO 5	3	2	1	1	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Mapping of CLOs with PSOs

CLOs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO 1	3	2	3	2	2	-
CLO 2	3	-	1	-	-	-
CLO 3	1	1	2	-	1	-
CLO 4	2	2	2	-	2	-
CLO 5	3	3	3	2	3	1

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Formative Examination – Discrete Mathematics (CIA I & II)
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
CIA I	CLO1	Up to K2	2	K1 & K2	1	K1	2(K1 & K1)	1(K2)
	CLO2	Up to K3	2	K1 & K2	2	K2	2(K3 & K3)	2(K3)
CIA II	CLO3	Up to K4	2	K1 & K2	1	K1	2(K3 & K3)	1(K4)
	CLO4	Up to K3	2	K1 & K2	2	K2	2(K2 & K2)	2(K3)
Question Pattern (CIA I & II)	No. of Questions to be asked		4		3		4	3
	No. of Questions to be answered		4		3		2	2
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	2	2	10	-	14	23.33	50
K2	2	4	-	10	16	26.67	
K3	-	-	10	20	30	50	50
K4	-	-	-	-	-	-	-
Total Marks	4	6	20	30	60	100	100%
K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2	-	-	4	6.67	33
K2	2	4	10	-	16	26.67	
K3	-	-	10	20	30	50	50
K4	-	-	-	10	10	16.67	17
Total Marks	4	6	20	30	60	100	100%

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination – Discrete Mathematics
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Sl.No	CLOs	K - Level	Section A		Section B		Section C (Either/ or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
1	CLO 1	Up to K2	2	K1 & K2	1	K1	2(K1 & K1)	1(K2)
2	CLO 2	Up to K3	2	K1 & K2	1	K2	2(K3 & K3)	1(K3)
3	CLO 3	Up to K4	2	K1 & K2	1	K1	2(K3 & K3)	1(K4)
4	CLO 4	Up to K3	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
5	CLO 5	Up to K4	2	K1 & K2	1	K2	2(K4 & K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Level	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core-1	20U1FMC1	C Programming	3	3	25	75	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To acquire knowledge on the basis of C programming and train them to develop user friendly application code using C.
2. To familiarize the concept of Decision making and looping.
3. To understand the concepts of Arrays and its uses.
4. To be familiar with programming environment.
5. To learn the concept of file structure and pointers used in code development.

Unit	Content	Hours	K-Level	CLO
I	Overview of C: History of C – Basic Structure of C Programs – C Tokens – Keywords and Identifiers – Constants, Variables and Data Types – Declaration of Variables – Operators and Expressions: Arithmetic, relational, logical, assignment operators – increment and decrement operators, conditional operators, bitwise operators, special operators – Arithmetic Expressions- Evaluation of Expressions.	9	Up to K2	1
II	Managing I/O Operations: Reading and Writing a Character – Formatted Input, Output – Decision Making & Branching: if statement - if else statement - nesting of if else statements - else if ladder – switch statement – the ?: operator – the while statement – do statement – the for statement.	9	Up to K4	2
III	Arrays: One-Dimensional Arrays – Declaration, Initialization – Two-Dimensional Arrays – Multi-dimensional Arrays. Strings: Declaration, Initialization of string variables – reading and writing strings – string handling functions.	9	Up to K3	3
IV	User-defined functions and Structures: Elements of user defined functions – function calls– all types of arguments and return values – nesting of functions – scope visibility and life time of variables. Structures and Unions: Defining a structure – declaring a structure variable – accessing structure members – initialization – copying and comparing – operation on individual members – unions.	9	Up to K3	4
V	Pointers and Files: Accessing the address of a variable – declaration and initialization of pointer variables – accessing a variable through its pointer – pointers as function arguments – pointers and structures. Files: Defining, opening, closing a file – IO Operations on files – Error handling during IO operations – command line arguments.	9	Up to K4	5

Book for Study

Programming in ANSI C by E.Balagurusamy, 7th Edition, 2007, Tata McGraw Hill Publishers.

Chapters

- Unit I: 1, 2, 3.
- Unit II: 4, 5, 6.
- Unit III: 7, 8.
- Unit IV: 9, 10.
- Unit V: 11, 12.

Books for Reference

1. Programming with C by Gottfried, Schaum's Outline Series, 2006, Tata McGraw Hill.
2. Programming with ANSI and Turbo C by Ashok N.Kamthane, 2006, Pearson Education.
3. Let us C by Kanetkar Y, 1999, BPB Pub., New Delhi.

Web Resources

1. <https://www.tutorialspoint.com/cprogramming/>
2. <https://www.programiz.com/c-programming/>
3. <https://www.geeksforgeeks.org/c-language-set-1-introduction/>

Rationale for Nature of the Course

- C is an imperative procedural language. It provides constructs that map efficiently to typical machine instructions.

Activity on Skill Oriented

- Practice to write programs
- Bug fixing

Pedagogy

Chalk and talk, PPT, Assignment, Seminar, Group discussion, Interaction and Demonstration.

Course Designer(s)

1. Mrs. K. Imaya
2. Mrs. R. Lakshapriya

Lesson Plan

Unit	Topics to be Covered	Hours	Mode
I	History of C – Basic Structure of C Programs – C Tokens – Keywords and Identifiers – Constants, Variables and Data Types – Declaration of Variables.	3	Lecture
	Operators and Expressions: Arithmetic, relational, logical, assignment operators – increment and decrement operators, conditional operators, bitwise operators, special operators.	4	Lecture & GD
	Arithmetic Expressions- Evaluation of Expressions.	2	Lecture & GD
II	Reading and Writing a Character – Formatted Input, Output.	3	Lecture
	Decision Making & Branching: if statement - if else statement - nesting of if else statements - else if ladder.	3	Lecture
	switch statement – the ?: operator – the while statement – do statement – the for statement – go to statement.	3	Lecture
III	One-Dimensional Arrays – Declaration, Initialization – Two-Dimensional Arrays – Multi-dimensional Arrays.	5	Lecture
	Strings: Declaration, Initialization of string variables – reading and writing strings – string handling functions.	4	Lecture
IV	Elements of user defined functions – function calls– all types of arguments and return values – nesting of functions – scope visibility and life time of variables.	4	Lecture
	Structures and Unions: Defining a structure – declaring a structure variable – accessing structure members – initialization – copying and comparing – operation on individual members – unions.	5	Lecture
V	Accessing the address of a variable – declaration and initialization of pointer variables – accessing a variable through its pointer – pointers as function arguments – pointers and structures.	5	Lecture
	Files: Defining, opening, closing a file – IO Operations on files – Error handling during IO operations – command line arguments.	4	Lecture, Assignment

Course Learning Outcomes

On the completion of the course the student will be able to

CLOs	Course Learning Outcomes	K – Level
CLO 1	Demonstrate the types of variables, Constants, data types, operators, Expressions.	Up to K2
CLO 2	Examine the concept of Looping and Conditional statements for developing the code.	Up to K4
CLO 3	Implement the various types of Arrays and operations related with strings.	Up to K3
CLO 4	Develop the code for various types of user defined functions, the scope of visibility and lifetime of variables. Apply Structures and Unions for suitable problems.	Up to K3
CLO 5	Describe about the Pointers and the impact of address of pointers used in code development. Explain the usage of File concepts in C coding.	Up to K4

Mapping of CLOs with POs

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO 1	3	2	1	1	3
CLO 2	3	3	-	-	3
CLO 3	3	2	-	-	3
CLO 4	2	2	-	-	2
CLO 5	2	2	-	-	2

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Mapping of CLOs with PSO

CLOs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO 1	3	1	2	1	2	2
CLO 2	3	1	3	1	3	2
CLO 3	2	3	3	-	1	2
CLO 4	3	2	3	-	1	2
CLO 5	2	3	3	-	3	1

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Formative Examination - C Programming (CIA I & II)
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
CIA I	CLO1	Up to K2	2	K1 & K2	1	K1	2(K1&K1)	1(K2)
	CLO2	Up to K4	2	K1 & K2	2	K1	2(K3&K3)	2(K4)
CIA II	CLO3	Up to K3	2	K1 & K2	1	K2	2(K2&K2)	1(K3)
	CLO4	Up to K3	2	K1 & K2	2	K2	2(K3&K3)	2(K3)
Question Pattern (CIA I & II)	No. of Questions to be asked		4		3		4	3
	No. of Questions to be answered		4		3		2	2
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	2	6	10	-	18	30	50
K2	2	-	-	10	12	20	
K3	-	-	10	-	10	16.67	17
K4	-	-	-	20	20	33.33	33
Total Marks	4	6	20	30	60	100	100%

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	-	-	-	2	3.33	33
K2	2	6	10	-	18	30	
K3	-	-	10	30	40	66.67	67
K4	-	-	-	-	-	-	-
Total Marks	4	6	20	30	60	100	100%

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination - C Programming
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S.No	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K -Level		
1	CLO1	Up to K2	2	K1 & K2	1	K1	2(K1&K1)	1(K2)
2	CLO2	Up to K4	2	K1 & K2	1	K1	2(K3&K3)	1(K4)
3	CLO3	Up to K3	2	K1 & K2	1	K2	2(K2&K2)	1(K3)
4	CLO4	Up to K3	2	K1 & K2	1	K2	2(K3&K3)	1(K3)
5	CLO5	Up to K4	2	K1 & K2	1	K2	2(K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels *

K Level	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100	100%

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core-2	20U1FMC2	Principles of Information Technology	3	3	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To acquire knowledge of fundamentals of Computer Systems.
2. To study the concepts of computer architecture and various Input / Output devices.
3. To understand the basics of Computer Software and Software development
4. To learn the concepts of Computer Networks and WWW.
5. To use Multimedia techniques in various areas.

Unit	Content	Hours	K-Level	CLO
I	Introduction: Introduction to Computers - Generation of Computers - Classification of Digital Computer - Anatomy of Digital Computer.	9	Up to K2	1
II	Hardware: Architecture of Computer - CPU and Memory - Secondary Storage Devices - Input Devices - Output Devices.	9	Up to K4	2
III	Software: Introduction to Computer Software - Programming Language - Operating Systems - Introduction to Database Management System.	9	Up to K3	3
IV	Networks: Computer Networks - WWW and Internet - Email - Intranets - Mobile Computing and Business on the Internet.	9	Up to K3	4
V	Multimedia and Security: Introduction to Multimedia - Multimedia Applications - Computers at Home, Education, Entertainment, Science, Medicine and Engineering - Introduction to Computer Security - Computer Viruses, Bombs, Worms.	9	Up to K4	5

Book for Study

Fundamentals of Information Technology by Alexis Leon and Mathews Leon, Vikas Publishing House Pvt. Ltd, 2009.

Chapters

Unit I: Chapters 1 -4.

Unit II: Chapters 5, 7-10.

Unit III: Chapters 11,13,14,16.

Unit IV: Chapters 21, 24-26, 49.

Unit V: Chapters: 33, 34, 46-48, 30, 32.

Books for References

1. Information Technology – The Breaking Wave by Dennis P. Curtin ,Kim foley, KunalSen and Cathleen Morin, Tata-McGraw Hill Publications, 2005.
2. Principle of Information Technology by Kathleen M. Austin and Lorraine N. Bergk.
3. https://www.tutorialspoint.com/mobile_computing/mobile_computing_advantages.htm

Web Resources

1. <http://www.itdesk.info/Basic Concepts of Information Technology notes.pdf>
2. https://www.academia.edu/34887670/Unit_1_-Information_Technology_Notes

Rationale for Nature of the Course

- To process information in a meaningful way.
- Will explore the basics of Computer hardware, Peripherals, Maintenance and trouble shooting.

Activity on Knowledge and Skill

- Group Discussion
- Quiz
- Seminar

Pedagogy

Chalk and talk, PPT, Assignment, Seminar, Group discussion, Interaction and Projectors.

Course Designer(s) Name

1. Mrs. R.Tamil Selvi
2. Ms. S.Saranya

Lesson Plan

Unit	Topics to be Covered	Hours	Mode
I	Introduction to computer systems, five generation of modern computers	4	Lecture
	Classification of digital computer systems Anatomy of a digital computer	5	Lecture, GD
II	Computer Architecture , CPU and memory	6	Lecture
	Secondary storage ,Input/output devices	3	Lecture, GD
III	Introduction to computer software, programming language	5	Lecture
	Operating systems, Introduction DBMS	4	Lecture
IV	Computer Network , Internet, WWW	5	Lecture
	E-mail , Introduction to Intranet, Mobile computing and business on the internet	4	Lecture, GD
V	Introduction to computer security, computer viruses, bombs, worms	5	Lecture, GD
	Multimedia Applications, Computer in Educations and Training, Entertainment, Science, Medicine and Engineering.	4	Lecture, Assignment

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	K - Level
CLO 1	Describe the generation of computer and digital computer systems.	Up to K2
CLO 2	Explain the basics of CPU and memory and different types of storage, Input/output devices.	Up to K4
CLO 3	Illustrate the computer Software and database management systems.	Up to K3
CLO 4	Classify the categories of Computer Networks.	Up to K3
CLO 5	Explain Multimedia applications.	Up to K4

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5
CLO 1	3	2	1	1	3
CLO 2	3	1	-	-	2
CLO 3	2	3	-	-	3
CLO 4	3	2	-	-	2
CLO 5	2	3	1	2	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Mapping of CLOs with PSOs

CLOs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO 1	3	3	1	1	3	-
CLO 2	3	3	3	3	3	2
CLO 3	3	2	2	2	3	2
CLO 4	3	3	2	3	2	1
CLO 5	3	2	3	3	2	2

(3 – Advanced Application, 2 – Intermediate Level , 1- Basic Level)

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Formative Examination - Principles of Information Technology (CIA I & II)
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
CIA I	CLO1	Up to K2	2	K1 & K2	1	K1	2 (K1 & K1)	1(K2)
	CLO2	Up to K4	2	K1 & K2	2	K1	2 (K4 & K4)	2(K3)
CIA II	CLO3	Up to K3	2	K1 & K2	1	K2	2 (K2& K2)	1(K3)
	CLO4	Up to K3	2	K1 & K2	2	K2	2 (K3 & K3)	2(K3)
Question Pattern (CIA I & II)	No. of Questions to be asked		4		3		4	3
	No. of Questions to be answered		4		3		2	2
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	2	6	10	-	18	30	50
K2	2	-	-	10	12	20	
K3	-	-	-	20	20	33.33	33
K4	-	-	10	-	10	16.67	17
Total Marks	4	6	20	30	60	100	100%

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	-	-	-	2	3.33	33
K2	2	6	10	-	18	30	
K3	-	-	10	30	40	66.67	67
K4	-	-	-	-	-	-	-
Total Marks	4	6	20	30	60	100	100%

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination - Principles of Information Technology
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S.No	CLOs	K – Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answer			
			No. of Questions	K – Level	No. of Questions	K - Level		
1	CLO1	Up to K2	2	K1 & K2	1	K1	2 (K1 & K1)	1(K2)
2	CLO2	Up to K4	2	K1 & K2	1	K1	2 (K4 & K4)	1(K3)
3	CLO3	Up to K3	2	K1 & K2	1	K2	2 (K2& K2)	1(K3)
4	CLO4	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1(K3)
5	CLO5	Up to K4	2	K1 & K2	1	K2	2 (K3 & K3)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining analyzing , presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels *

K Level	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without K1	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100	100%

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core Practical-1	20U1FMP1	C Programming - Lab	2	3	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To acquire knowledge on the basis of C programming and train them to develop user friendly application code using C.
2. To familiarize the concept of Decision making and Looping.
3. To understand and apply the concepts of Array and its uses.
4. To be familiar with programming environment.
5. To learn the concept of file structure and pointers used in code development.

Unit	Content	Hrs	K-Level	CLO
I	1. Write a C program to find the Simple Interest. 2. Write a C program to find the Compound Interest. 3. Write a C program to find the sum of N Natural Numbers using formula.	9	Up to K2	1
II	4. Write a C program to check the given number is odd or even. 5. Write a C program to find the biggest of 3 distinct numbers. 6. Write a C program to check the given character is vowel or not. 7. Write a C program to check the given number is Prime or not. 8. Write a C program to find the sum of digits of a given number.	9	Up to K3	2
III	9. Write a C program to arrange the given list of numbers. 10. Write a C program to arrange the given list of Strings. 11. Write a C program to check the given string is palindrome or not. 12. Write a C program to perform Matrix Addition. 13. Write a C program to perform Matrix Multiplication.	9	Up to K3	3
IV	14. Write a C program to convert Binary to Decimal and vice-versa. 15. Write a C program to find the Factorial value using recursion. 16. Write a C program to find the reverse of a given string using recursion. 17. Write a C program to process the student mark list using structures.	9	Up to K4	4

V	18. Write a C program to process Employee Records using Files. 19. Write a C program for case conversion of file content. 20. Write a C program to perform arithmetic operations using Pointers.	9	Up to K2	5

Book for Study

Programming in ANSI C by E.Balagurusamy, 7th Edition, 2007, Tata McGraw Hill Publishers.

Books for Reference

1. Programming with C by Gottfried, Schaum's Outline Series, 2006, Tata McGraw Hill.
2. Programming with ANSI and Turbo C by Ashok N.Kamthane, 2006, Pearson Education.
3. Let us C by Kanetkar Y, 1999, BPB Pub., New Delhi.

Web Resources

1. <https://www.tutorialspoint.com/cprogramming/>
2. <https://www.programiz.com/c-programming/>
3. <https://www.geeksforgeeks.org/c-language-set-1-introduction/>

Rationale for Nature of the Course

- Learning C as the main language will play as important role while studying other programming languages. It is a simple language and provides faster execution.

Activity on Skill Oriented

- Practice to implement programs
- Bug fixing

Pedagogy

Projector, Demonstration and Practical Session.

Course Designer(s) Name

1. Mrs. K. Imaya
2. Mrs. R. Lakshapriya

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	K - Level
CLO 1	Outline the logic using flowchart for a given problem and develop programs using conditional and looping statements.	Up to K2
CLO 2	Develop programs with implementation of arrays, functions and parameter passing techniques.	Up to K3
CLO 3	Develop programs with string handling functions	Up to K3
CLO 4	Construct programs with Structure and Union features.	Up to K4
CLO 5	Gain skills to write file programs and perform various operations on files.	Up to K2

Mapping of CLOs with POs

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO 1	3	3	2	-	3
CLO 2	3	2	-	-	2
CLO 3	3	2	-	-	3
CLO 4	3	1	-	-	1
CLO 5	3	3	-	-	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Mapping of CLOs with PSOs

CLOs/PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO 1	3	3	2	3	2	-
CLO 2	3	3	2	3	1	1
CLO 3	3	3	1	3	1	-
CLO 4	3	3	2	3	2	-
CLO 5	3	3	3	3	3	-

(3 – Advanced Application, 2 – Intermediate Level , 1- Basic Level)

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Allied-2	20U2FAC2	Resource Management Techniques	5	6	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To gain Knowledge of making Linear programming problems from Real time situations.
2. To apply simplex methods and its variants to solve the variety of Complex problems.
3. To acquire the benefits of allocating works using Transportation & Assignment problems.
4. To solve the problems in Games using different strategies.
5. To simplify the development work / project by planning with the help of Networking.

Unit	Content	Hours	K-Level	CLO
I	Linear Programming Problem – I: Mathematical Formulation of the problem – Graphical Solution – Introduction- Graphical Solution Method – Some exceptional cases- General L.P.P. – Canonical and Standard forms of L.P.P.	18	Up to K2	1
II	Linear Programming Problem – II: Simplex Method – Introduction – Fundamental Properties of Solutions – The computational procedure – Use of Artificial Variable. Duality in linear programming – Introduction – The general Primal-Dual pair – Formulating a dual problem – Duality and Simplex method.	18	Up to K3	2
III	Transportation and Assignment problem: Transportation Problem – Introduction – General Transportation Problem – The transportation table – Solution of a Transportation problem – Finding an initial basic feasible solution – Test for optimality – Transportation Algorithm (MODI method). Assignment Problem – Introduction – Mathematical formulation of the problem – The assignment method – Special cases in assignment problems – A typical assignment problem – The traveling salesman problem.	18	Up to K4	3
IV	Game Theory: Introduction – Two-person zero-sum games – Some basic terms – The Maxmin - Minmax principle – Games without Saddle points-mixed strategies – Graphic solution of 2 x n and m x 2 games – Dominance property – Arithmetic method for n x n games.	18	Up to K3	4
V	Network Scheduling: Introduction – Network and basic components – Logical sequencing – Rules of network Construction – Critical path analysis – Distinction between PERT and CPM.	18	Up to K4	5

Book for Study

Operations Research by Kanti Swarup, P.K. Gupta, Man Mohan, 18th edition, Sultan Chand & Sons Educational Publishers, New Delhi.

Chapters

Unit – I : 2.1 – 2.3, 3.1 - 3.5

Unit – II : 4.1 - 4.4, 5.1 – 5.3, 5.7

Unit – III: 10.1, 10.2, 10.5, 10.8 - 10.10, 10.13, 11.1 - 11.5, 11.7.

Unit – IV : 17.1 - 17.8.

Unit – V : 25.1 - 25.4, 25.6, 25.8.

Books for Reference

1. Operations Research an Introduction by Hamdy A. Taha, PHI, 8th edition.
2. Operations Research by S.D. Sharma, 12th edition, Kedar Nath Ram Nath & Co Publishers, Meerut.

Web Resources

1. https://www.mathcity.org/msc/notes/operation_research
2. http://www.pondiuni.edu.in/storage/dde/downloads/mbaii_qt.pdf
3. <https://www.acsce.edu.in/acsce/wp-content/uploads/2020/03/Operation-Research-17CS653-Module5.pdf>

Rationale for Nature of the Course

- It makes the Planning and Management Process more Transparent.
- It gives control over the Project.

Activity on Skill Oriented

- Practice to solve programs.
- Group discussion and Seminar.

Pedagogy

Chalk and talk , Assignment , Seminar , Group discussion, and Interaction.

Course Designer(s) Name

1. Mrs. S. Rajalakshmi
2. Mrs. R. Tamilselvi

Lesson Plan

Unit	Topics to be Covered	Hours	Mode
I	Mathematical Formulation of the problem – Graphical Solution – Introduction- Graphical Solution Method.	7	Lecture
	Some exceptional cases- General L.P.P. – Canonical and Standard forms of L.P.P.	7	Lecture
	Various problems discussions	4	Lecture, GD
II	Simplex Method – Introduction – Fundamental Properties of Solutions – The computational procedure	6	Lecture
	Use of Artificial Variable. Duality in linear programming – Introduction	7	Lecture
	The general Primal-Dual pair – Formulating a dual problem – Duality and Simplex method.	5	Lecture, GD
III	Transportation Problem – Introduction – General TP– The transportation table – Solution of a Transportation problem – Finding an initial BFS.	6	Lecture
	Test for optimality – Transportation Algorithm (MODI method). Assignment Problem – Introduction – Mathematical formulation of the problem.	6	Lecture
	The assignment method – Special cases in assignment problems – A typical assignment problem – The traveling salesman problem.	6	Lecture
IV	Introduction – Two-person zero-sum games – Some basic terms – The Maxmin-Minimax principle.	6	Lecture, Power Point
	Games without Saddle points-mixed strategies – Graphic solution of $2 \times n$ and $m \times 2$ games.	7	Lecture & GD
	Dominance property – Arithmetic method for $n \times n$ games.	5	Lecture & GD
V	Introduction – Network and basic components – Logical sequencing.	5	Lecture, PPT
	Rules of network Construction – Critical path analysis.	7	Lecture, GD
	Distinction between PERT and CPM and discussing various problems.	6	Lecture, Assignment

Course Learning Outcomes

On the completion of the course the student will be able to

CLOs	Course Learning Outcomes	K -Level
CLO 1	List the rules for formulating LPP. Apply the rules to formulate the mathematical formulation. Find the solution for Graphical method problems. Discuss the Canonical and standard forms.	Up to K2
CLO 2	Describe the steps of Computing Simplex method. Illustrate the usage of various simplex methods. Outline the duality principles and solve the problems by applying simplex methods.	Up to K3
CLO 3	Explain various ways to find Initial BFS for transportation problem. Classify the various problem solving techniques in Assignment methods. Find solution for traveling salesman problem.	Up to K4
CLO 4	Outline the strategies used in Games. Solve the games using graphical method and Dominance theory. Describe Arithmetic method.	Up to K3
CLO 5	Discuss the network components, Construction rules. Examine the Critical path in network construction. Relate PERT and CPM.	Up to K4

Mapping of CLOs with POs

CLOs/ POs	PO1	PO2	PO3	PO4	PO5
CLO1	3	3	1	-	3
CLO2	3	2	-	-	1
CLO3	3	3	-	3	2
CLO4	3	2	1	-	2
CLO5	3	3	-	3	3

(3 – Advanced Application, 2 – Intermediate Level, 1 - Basic Level)

Mapping of CLOs with PSOs

CLOs/ PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	3	-	-	-	-	-
CLO2	3	1	-	-	-	-
CLO3	3	3	3	2	3	2
CLO4	3	2	1	-	2	3
CLO5	3	3	3	1	3	3

(3 – Advanced Application, 2 – Intermediate Level, 1 - Basic Level)

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Formative Examination - Resource Management Techniques (CIA I & II)
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
CIA I	CLO1	Up to K2	2	K1 & K2	1	K1	2(K1 & K1)	1(K2)
	CLO2	Up to K3	2	K1 & K2	2	K2	2(K3 & K3)	2(K3)
CIA II	CLO3	Up to K4	2	K1 & K2	1	K1	2(K3 & K3)	1(K4)
	CLO4	Up to K3	2	K1 & K2	2	K2	2(K2 & K2)	2(K3)
Question Pattern (CIA I & II)	No. of Questions to be asked		4		3		4	3
	No. of Questions to be answered		4		3		2	2
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	2	2	10	-	14	23.33	50
K2	2	4	-	10	16	26.67	
K3	-	-	10	20	30	50	50
K4	-	-	-	-	-	-	-
Total Marks	4	6	20	30	60	100	100%

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2	-	-	4	6.67	33
K2	2	4	10	-	16	26.67	
K3	-	-	10	20	30	50	50
K4	-	-	-	10	10	16.67	17
Total Marks	4	6	20	30	60	100	100%

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination - Resource Management Techniques
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S.No	CLOs	K - Level	Section A		Section B		Section C (Either/ or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
1	CLO1	Up to K2	2	K1 & K2	1	K1	2(K1 & K1)	1(K2)
2	CLO2	Up to K3	2	K1 & K2	1	K2	2(K3 & K3)	1(K3)
3	CLO3	Up to K4	2	K1 & K2	1	K1	2(K3 & K3)	1(K4)
4	CLO4	Up to K3	2	K1 & K2	1	K2	2(K2 & K2)	1(K3)
5	CLO5	Up to K4	2	K1 & K2	1	K2	2(K4 & K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Level	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core – 3	20U2FMC3	Object Oriented Programming with C++	3	3	25	75	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objective

1. To introduce Object oriented environment and learn to write Inline functions.
2. To learn how to implement types of Constructors and class member functions.
3. To demonstrate types of inheritance and its various applications.
4. To create and process data in files.
5. To learn how to design & implement generic classes with C++ templates.

Unit	Content	Hours	K-Level	CLO
I	Principles of Object-Oriented Programming: Basic Concepts of Object-Oriented Programming – Benefits of OOP – Structure of a C++ Program – Tokens – Operators in C++ – inline functions – Function overloading –classes and objects: specifying a class – Defining member functions – Making an outside function inline – Friendly functions –Object as function arguments – Returning objects.	9	Up to K2	1
II	Constructor: Constructors – Parameterized constructor – Multiple constructors in a class – Constructors with default arguments – Dynamic initialization of objects – Copy constructor – Destructors. Operator overloading: Defining operator overloading – Overloading unary operators – Overloading binary operators – Overloading binary operators using friend function – Rules for overloading operators.	9	Up to K4	2
III	Inheritance: Defining derived classes – Single inheritance – Making a private member inheritable – Multilevel inheritance – Multiple Inheritance – Hierarchical inheritance – Hybrid inheritance - Virtual base classes – Constructors in derived class – Member classes: Nesting of classes.	9	Up to K3	3
IV	I/O Operations and Files: C++ Stream classes – Unformatted I/O operations – Managing output with manipulators. Classes of file stream operations – Opening and Closing files – Detecting end of file – More about open() function – File modes, File pointers and their manipulation – Sequential input and output operations – Command-line arguments.	9	Up to K3	4
V	Templates and Exception Handling: Class Templates - Class Templates with Multiple Parameters–Function Templates-Basics of Exception Handling– Exception Handling Mechanism.	9	Up to K4	5

Book for Study

Object Oriented Programming with C++ by E. Balagurusamy, Sixth Edition-2013, McGraw Hill Education (India) Private Limited, New Delhi.

Chapters

Unit I – 1.5,1.6,2.6,3.2,3.14,4.6,4.10,5.3,5.4,5.6,5.14-5.16

Unit II – 6.2 to 6.7, 6.11, 7.2 – 7.5, 7.8

Unit III – 8.2 – 8.9, 8.11-8.12

Unit IV – 10.3, 10.4, 10.6, 11.2-11.7, 11.10

Unit V – 12.2, 12.3, 12.4, 13.2, 13.3

Books for Reference

1. C++ - The Complete Reference by Herbert Schildt, 1998,TMH
2. C++ How to Program by Paul Deitel, Harvey Deitel, Ninth edition (2014)PHI
3. Object Oriented Programming with ANSI & Turbo C++ by Ashok N.Kamthane, Pearson Education
4. Object-Oriented Programming With C++ by PoornachandraSarang, 2nd Edition, PHI

Web Resources

1. <https://www.learncpp.com/>
2. <https://hackr.io/tutorials/learn-c-plus-plus>
3. <https://www.programiz.com/cpp-programming/examples>

Rationale for Nature of the Course

- Set of user defined types makes a program more concise.
- It makes many sorts of code analysis feasible.

Activity on Skill Oriented

- Practice to write programs
- Bug fixing

Pedagogy

Chalk and talk , PPT, Assignment , Seminar, Group discussion , Interaction, and Demonstration.

Course Designer(s) Name

Ms. S. Saranya

Mrs. R. Lakshapriya

Lesson Plan

Unit	Topics to be covered	Hours	Mode
I	Basic Concepts of OOPs-Benefits of OOPs-Structure of a C++ Program - Tokens – Operators in C++ – inline functions – Function overloading.	4	Lecture
	Specifying a Class–Defining member functions–Making an outside function inline–Static data member–Static member function–friendly function–Object as function arguments–Returning Objects.	5	Lecture
II	Constructor and destructor-Parameterized Constructor –Multiple constructors in a class–Constructors with default arguments – Dynamic initialization of objects –Copy Constructor–Destructor.	4	Lecture
	Defining operator overloading – Overloading unary operators – Overloading binary operators – Overloading binary operators using friend function–Rules for overloading operators.	5	Lecture
III	Defining Derived Class - Single inheritance – Making a private member inheritable – Multilevel inheritance –Multiple inheritance – hierarchical inheritance– hybrid inheritance–virtual base classes – Constructors in derived class– Member classes: Nesting of classes.	9	Lecture
IV	C++ Streams classes –Unformatted I/O operations – Managing output with manipulators– Classes for file stream operations – Opening and Closing a file– Detecting End -of -file–More about open file modes.	5	Lecture
	File pointers and their Manipulations– Sequential Input and Output Operations– Command line arguments.	4	Lecture
V	Class templates– Class templates with multiple parameters.	4	Lecture, GD Lecture, Assignment
	Function templates– Basics of Exception handling– Exception handling mechanism.	5	

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	K - Level
CLO 1	Explain keywords, tokens, variables constants and datatypes. Apply different types of operators, looping concepts and conditional statements for developing the code. Describe the concepts of oops and its benefits.	Up to K2
CLO 2	Develop the constructor and destructor with their types in user defined Functions.	Up to K4
CLO 3	Illustrate the concepts of inheritance and its types.	Up to K3
CLO 4	Discuss various I/O Formatting.	Up to K3
CLO 5	Utilize Exception for handling Run-Time errors.	Up to K4

Mapping of CLOs with POs

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	2	-	1
CLO2	2	1	-	-	1
CLO3	2	3	-	-	2
CLO4	3	3	-	-	3
CLO5	2	3	-	-	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Mapping of CLOs with PSOs

CLOs/PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	3	-	3	-	2	2
CLO2	3	3	2	2	1	-
CLO3	3	3	2	-	3	3
CLO4	3	3	3	-	3	3
CLO5	2	2	3	2	3	2

(3 – Advanced Application, 2 – Intermediate Level , 1 - Basic Level)

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Formative Examination - Object Oriented Programming with C++ (CIA I & II)
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
CIA I	CLO1	Up to K2	2	K1 & K2	1	K2	2 (K1 & K1)	1(K2)
	CLO2	Up to K4	2	K1 & K2	2	K2	2 (K4 & K4)	2(K3)
CIA II	CLO3	Up to K3	2	K1 & K2	1	K2	2 (K3& K3)	1(K3)
	CLO4	Up to K3	2	K1 & K2	2	K1	2 (K3 & K3)	2(K3)
Question Pattern (CIA I & II)	No. of Questions to be asked		4		3		4	3
	No. of Questions to be answered		4		3		2	2
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	2	-	10	-	12	20	50
K2	2	6	-	10	18	30	
K3	-	-	-	20	20	33.33	33
K4	-	-	10	-	10	16.67	17
Total Marks	4	6	20	30	60	100	100%

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	-	-	6	10	17
K2	2	2	-	-	4	6.67	
K3	-	-	20	30	50	83.33	83
K4	-	-	-	-	-	-	-
Total Marks	4	6	20	30	60	100	100%

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination - Object Oriented Programming with C++
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No	CLOs	K – Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answer			
			No. of Questions	K - Level	No. of Questions	K - Level		
1	CLO1	Up to K2	2	K1 & K2	1	K2	2 (K1 & K1)	1(K2)
2	CLO2	Up to K4	2	K1 & K2	1	K2	2 (K4 & K4)	1(K3)
3	CLO3	Up to K3	2	K1 & K2	1	K2	2 (K3& K3)	1(K3)
4	CLO4	Up to K3	2	K1 & K2	1	K1	2 (K3 & K3)	1(K3)
5	CLO5	Up to K4	2	K1 & K2	1	K1	2 (K2 & K2)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K - Level	Section A (No Choice)	Section B (No Choice)	Section C (Either / or Choice)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100	100%

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core – 4	20U2FMC4	Digital Principles and Applications	3	3	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objective

1. To acquire knowledge on Number systems and Logic gates.
2. To examine the various Logical Expressions.
3. To analyze various Data circuits & Arithmetic operations.
4. To demonstrate the Clocks and Timing Circuits.
5. To characterize various Sequential Circuits.

Unit	Content	Hours	K-Level	CLO
I	Number systems and Digital Logic: Binary Number System-Binary to Decimal Conversion-Decimal to Binary conversion -Octal numbers -Hexadecimal numbers -The ASCII code -The Excess-3 code -The Gray Code – transistor inverter. Digital Logic - Basic gates-NOT, OR, AND-Boolean Algebra - Universal logic gates-NOR, NAND.	9	Up to K3	1
II	Combinational logic circuits: Boolean Laws and Theorems -Sum of Products method -Truth table to Karnaugh map -Pairs, Quads, and Octets –Karnaugh simplifications -Don't care condition- Product of sums method -product of sums simplification.	9	Up to K4	2
III	Data Processing circuits: Multiplexers -Demultiplexers -1 of 16 Decoder –BCD to decimal Decoders -Seven segment Decoders. Arithmetic circuits: Binary Addition -Binary Subtraction - 2's & 1's complement Representation -Complement Arithmetic -Arithmetic Building Blocks.	9	Up to K3	3
IV	Flip-Flops and Timers: RS FLIP FLOP- D FLIP- FLOP - JK FLIP-FLOPs – JK MASTER SLAVE FLIP- FLOP. Clocks and Timing circuits: 555 Timer-Astable-555 Timer – Monostable.	9	Up to K4	4
V	Shift Registers and Counters: Types of Registers -Serial-In -Serial-Out-Serial-In -Parallel-Out -Parallel-In-Serial-Out -Parallel-In -Parallel-Out. Counters: Ring Counter – Ripple Counter - Synchronous Counters.	9	Up to K2	5

Book for Study

Digital Principles and Application by Albert Paul Malvino, Donald P. Leach, 7th Edn, 2011, McGraw Hill Publication.

Chapters

Unit-I : 1, 4

Unit-II : 2

Unit-III : 3.1 to 3.6, 5.1 to 5.7

Unit-IV : 8.1, 8.3, 8.6, 8.7, 9.3, 9.4

Unit-V : 10, 11.1, 11.3

Books for References

1. Digital Logic and computer design by Morris Mano, 2005, Prentice -Hall of India.
2. Digital System Principles and Application by Ronald J. Tocci, 2007, Prentice -Hall of India.

Web Resources

1. https://www.tutorialspoint.com/digital_circuits/
2. https://www.electronics-tutorials.ws/sequential/seq_5.html
3. [https://soaneemrana.org/onewebmedia/DIGITAL PRINCIPLES AND Application BY LEACH & MALVINO.pdf](https://soaneemrana.org/onewebmedia/DIGITAL%20PRINCIPLES%20AND%20Application%20BY%20LEACH%20&%20MALVINO.pdf)

Rationale for Nature of the Course

- Digital logic facilitates computing, and other electronic applications.
- Construct complex electronic components that use both electrical and computational characteristics.

Activity on Knowledge and Skill

- Group Discussion
- Quiz
- Seminar

Pedagogy

Chalk and talk , PPT, Assignment , Seminar , Group discussion , Interaction and Demonstration.

Course Designer(s) Name

1. Mrs. S. Sasikala
2. Mrs. S. Rajalakshmi

Lesson Plan

Unit	Topic	Hours	Mode
I	Binary Number System-Binary to Decimal conversion-Decimal to Binary conversion -Octal numbers -Hexadecimal numbers -The ASCII code -The Excess-3 code -The Gray Code.	6	Lecture, GD
	Basic gates-NOT, OR, AND-Boolean Algebra - Universal logic gates-NOR, NAND.	3	Lecture
II	Combinational logic circuits Boolean Laws and Theorems -Sum of Products method -Truth table to Karnaugh map -Pairs, Quads, and Octets –Karnaugh simplifications -Don't care condition.	6	Lecture, GD
	Product of sums method -product of sums simplification.	3	Lecture, GD
III	Multiplexers -Demultiplexers -1 of 16 Decoder –BCD to decimal Decoders -Seven Segment Decoders.	6	Lecture
	Binary Addition -Binary Subtraction - 2's & 1's complement Representation -Complement Arithmetic -Arithmetic Building Blocks.	3	Lecture& GD
IV	RS FLIP FLOP- D FLIP- FLOP - JK FLIP-FLOPs – JK MASTER SLAVE FLIP- FLOP.	5	Lecture
	555 Timer-Astable - Monostable.	4	Lecture
V	Types of Registers -Serial-In -Serial-Out-Serial-In -Parallel-Out - Parallel-In-Serial-Out -Parallel-In -Parallel-Out.	5	Lecture, PPT
	Ring Counter – Ripple Counter - Synchronous Counters.	4	Lecture, Assignment

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	K – Level
CLO 1	Illustrate the basic idea about number systems and to learn conversion from one number system to another number system.	Up to K3
CLO 2	Examine various logical expressions	Up to K4
CLO 3	Analyze various data processing circuits.	Up to K3
CLO 4	Explain characteristics of Clocks and Timing Circuits.	Up to K4
CLO 5	Compare various sequential circuits.	Up to K2

Mapping of CLOs with POs

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO 1	1	2	1	3	1
CLO 2	1	1	1	-	1
CLO 3	1	3	2	-	2
CLO 4	1	3	3	-	3
CLO 5	1	1	3	3	2

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level,)

Mapping of CLOs with PSOs

CLOs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO 1	3	3	3	3	3	3
CLO 2	3	3	3	3	3	3
CLO 3	3	2	3	2	3	2
CLO 4	2	2	2	1	2	1
CLO 5	2	1	2	1	3	1

(3 – Advanced Application, 2 – Intermediate Level, 1 - Basic Level)

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Formative Examination - Digital Principles and Applications (CIA I & II)
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
CIA I	CLO1	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1(K3)
	CLO2	Up to K4	2	K1& K2	2	K1	2 (K3 & K3)	2(K4)
CIA II	CLO3	Up to K3	2	K1 & K2	1	K2	2 (K2& K2)	1(K3)
	CLO4	Up to K4	2	K1 & K2	2	K2	2 (K4 & K4)	2(K2)
Question Pattern (CIA I & II)	No. of Questions to be asked		4		3		4	3
	No. of Questions to be answered		4		3		2	2
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	2	4	-	-	6	10	17
K2	2	2	-	-	4	6.67	
K3	-	-	20	10	30	50	50
K4	-	-	-	20	20	33.33	33
Total Marks	4	6	20	30	60	100	100%

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	-	-	-	2	3.33	67
K2	2	6	10	20	38	63.33	
K3	-	-	-	10	10	16.67	16
K4	-	-	10	-	10	16.67	17
Total Marks	4	6	20	30	60	100	100%

Learning Outcome Based Education & Assessment (LOBE)
Blue Print for Summative Examination - Digital Principles and Applications

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S.No	CLOs	K - Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answer			
			No. of Questions	K – Level	No. of Questions	K - Level		
1	CLO1	Up to K3	2	K1 & K2	1	K2	2 (K3 & K3)	1(K3)
2	CLO2	Up to K4	2	K1& K2	1	K1	2 (K3 & K3)	1(K4)
3	CLO3	Up to K3	2	K1 & K2	1	K2	2 (K2& K2)	1(K3)
4	CLO4	Up to K4	2	K1 & K2	1	K2	2 (K4 & K4)	1(K3)
5	CLO5	Up to K2	2	K1 & K2	1	K1	2 (K1 & K1)	1(K2)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining analyzing , presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K – Level	Section A (No Choice)	Section B (No Choice)	Section C (Either / or Choice)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100	100 %

DEPARTMENT OF INFORMATION TECHNOLOGY				CLASS: I B.Sc. Information Technology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core Practical – 2	20U2FMP2	OOPs with C++ - Lab	2	3	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To introduce the Object oriented Environment, and learn to write Inline functions.
2. To learn how to implement types of Constructors and class member functions.
3. To demonstrate types of inheritance and its various applications.
4. To create and process data in files.
5. To learn how to design & implement generic classes with C++ templates.

Unit	Content	Hrs	K-Level	CLO
I	1. Write a C++ program to find biggest of three distinct integers. 2. Write a C++ program to Compound Interest. 3. Write a C++ program for Sum of N numbers. 4. Write a C++ program for simple Arithmetic Operations using Inline function. 5. Write a C++ program to find the area of geometric shapes using Function Overloading.	9	Up to K2	1
II	6. Write a C++ program to create a class for student to get and print details of N students. 7. Write a C++ program to swap private data members of classes named as class_1, class_2 using Friend Function. 8. Write a C++ program to count the created Objects using Static Member Function. 9. Write a C++ program to demonstrate Constructor Overloading.	9	Up to K3	2
III	10. Write a C++ program for unary increment and decrement operator overloading. 11. Write a C++ program to add two objects using binary plus operator overloading. 12. Write a C++ program to read and print employee information using Multiple Inheritance. 13. Write a C++ program to demonstrate Multilevel Inheritance.	9	Up to K3	3
IV	14. Write a C++ program to implement I/O operations on characters. 15. Write a C++ program for file creation and to list the file content. 16. Write a C++ program to perform File Manipulations. 17. Write a C++ program to count words and lines of a text file.	9	Up to K4	4

V	18. Write a Template Based C++ Program to sort the given list of elements. 19. Write a C++ program that uses function Templates to find the Largest and Smallest number in a list. 20. Write a C++ program to demonstrate the Catching of All Exceptions.	9	Up to K2	5

Book for Study

Object Oriented Programming with C++ by E. Balagurusamy, Sixth Edition-2013, McGraw Hill Education (India) Private Limited, New Delhi.

Books for Reference

1. C++ - The Complete Reference by Herbert Schildt, 1998, TMH
2. C++ How to Program by Paul Deitel, Harvey Deitel, Ninth edition (2014) PHI
3. Object Oriented Programming with ANSI & Turbo C++ by Ashok N. Kamthane, Pearson Education
4. Object-Oriented Programming With C++ by Poornachandra Sarang, 2nd Edition, PHI

Web Resources

1. <https://www.learncpp.com/>
2. <https://hackr.io/tutorials/learn-c-plus-plus>
3. <https://www.programiz.com/cpp-programming/examples>

Rationale for Nature of the Course

- C++ class construct provide the programmer with a tool for creating new types that can be used as a built in types.

Activity on Skill Oriented

- Practice to implement programs
- Bug fixing

Pedagogy

Projector, Demonstration and Practical Session.

Course Designer(s) Name

1. Ms. S. Saranya
2. Mrs. R. Lakshapriya

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLOs	Course Learning Outcomes	K -Level
CLO 1	Construct the procedural and object oriented paradigm with concepts of streams, classes, data and objects and familiarize with the language environment.	Up to K2
CLO 2	Build programs with various function related concepts.	Up to K3
CLO 3	Develop code on operator overloading and constructors.	Up to K3
CLO 4	Implement programs on inheritance categories, type conversions and files.	Up to K4
CLO 5	Demonstrate the implementation of templates and exception handling.	Up to K2

Mapping of CLOs with POs

CLOs/POs	PO1	PO2	PO3	PO4	PO5
CLO 1	3	2	2	-	1
CLO 2	3	1	-	-	1
CLO 3	3	3	-	-	2
CLO 4	3	3	-	-	3
CLO 5	3	3	-	-	3

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Mapping of CLOs with PSOs

CLOs/PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO 1	3	-	3	-	2	2
CLO 2	2	3	1	2	2	-
CLO 3	2	3	2	-	1	2
CLO 4	3	3	3	-	3	3
CLO 5	2	3	3	2	3	2

(3 – Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Department of Microbiology

Revised Curriculum

(Choice Based Credit system with Outcome Based Education)

Students admitted from the Academic Year 2020-2021 onwards

Semester III and IV (B.Sc. Microbiology)

Semester I and II (M.Sc. Microbiology)

Certificate courses

The Madura College, Madurai

Department of Microbiology

Vision:

- The Department strives to provide high quality education in the field of Microbiology and Biological sciences to produce world class, highly qualified competent and socially responsible graduates who work together to achieve the goals.

Mission:

- To provide a basic and fundamental knowledge in life sciences that includes the skills in the theory and practical.
- To promote good quality of education and inspiring training in various disciplines of Microbiology.
- To create a conducive environment for innovation and application in the field of Microbiology.
- To train the students in both practical and theoretical aspects of Microbiology.
- To motivate and guide the students to develop new techniques in Microbiology
- To achieve excellence in academic and employment career in the field of biological sciences.

The Graduate Attributes

- a. Knowledge in core competency
- b. Problem analysis
- c. Design and development of solutions for complex problems
- d. Conduct investigations of complex problems
- e. Modern tool usage
- f. Environment and sustainability
- g. Ethics
- h. Individual and team work
- i. Communication
- j. Project management and finance
- k. Life-long learning

Programme Educational Objectives (PEOs)

The objectives of this programme are:

PEOs	Programme Educational Objectives
PEO-1	To provide graduates with fundamental knowledge about life science especially microbiology with a view to impart in them high quality scientific skills like analyzing, designing and implementing techniques.
PEO-2	To prepare graduates with recent scientific developments in the field of life Science and help them for life learning.
PEO-3	To train graduates to choose a suitable career option or higher studies and excel in competitive examination.
PEO-4	To make graduates socially responsible and to develop interpersonal skills in order to become a good team member and leader.
PEO-5	To accomplish ability to communicate effectively and able to understand ethical responsibility.

Programme Specific Outcomes (PSOs)

On the successful completion of B.Sc., Microbiology, the students will be able to

PSOs	Programme Specific Outcomes	Graduate Attributes
PSO-1	Understand, analyze and apply microbiological techniques in the areas related to medical, food, agricultural, environmental, industrial and pharmaceutical microbiology field.	a. Knowledge in core competency b. Problem analysis c. Design and development of solutions for complex problems
PSO-2	Apply recent microbiological techniques in creating career paths to become an entrepreneur or getting higher studies/employability in the field of microbiology.	c. Design and development of solutions for complex problems k. Life-long learning
PSO-3	Design scientific methodology, hypothesis generation and testing, design and execution of experiments.	c. Design and development of solutions for complex problems d. Conduct investigations of complex problems h. Individual and team work
PSO-4	Recognize the application oriented aspects of Microbiology and Build proficiency in the quantitative skills necessary to analyze biological problems.	1. Problem analysis 2. Design and development of solutions for complex problems 3. Conduct investigations of complex problems e. Modern tool usage
PSO-5	Acquire and demonstrate proficiency in good laboratory practices in a microbiological laboratory and Develop strong oral and written communication skills through the effective presentation of experimental results as well as through seminars.	g. Ethics 4. Modern tool usage 1. Communication 2. Project management and finance

Qualification for Admission

Candidates should have passed the Higher Secondary Examination /Botany/Zoology/Biology as one of the subject, conducted by the Board of Higher Education, Government of Tamilnadu, CBSE& ICSE or any other examination approved by Madurai Kamaraj University as equivalent.

Duration of the Course

The students shall undergo prescribed course of study for the period of three academic years under CBCS semester pattern with outcome based education.

Medium of Instruction: English.

System: Choice Based Credit System with Outcome Based Model.

EVALUATION (THEORY)

Internal(Formative)	: 25marks
External(Summative)	: 75marks
Total	:100 marks

Continuous Internal Assessment (CIA): 25 Marks

Components of CIA	Marks
Test (Average of two tests) Conducted for 40 marks and converted into 10 marks)	10
Assignment	5
Quiz/ Documentation/ Case lets/ ICT based Assignment/ Mini Projects	5
Attendance / Quiz	5
Total	25

BLUE PRINT FOR INTERNAL ASSESSMENT - I

Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)	Total
			MCQs		Short Answers				
			No. of Questions	K- Level	No. of Questions	K- Level			
1	CLO 1	Up to K2	2	K1& K2	1	K1	2(K2&K2)	2(K2/K3)	
2	CLO 2	Up to K3	2	K1& K2	2	K2	2(K3&K3)	1(K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	11
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answer

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

BLUE PRINT FOR INTERNAL ASSESSMENT - II
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)	Total
			MCQs		Short Answers				
			No. of Questions	K- Level	No. of Questions	K- Level			
1	CLO 3	Up to K2	2	K1 & K2	1	K1	2(K2&K2)	2(K2/K3)	
2	CLO 4	Up to K3	2	K1& K2	2	K2	2 (K3&K3)	1(K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	11
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	2		--	4	6.67	50
K2	2	4	10	10	26	43.33	
K3	-	-	10	10	20	33.33	33
K4	-	-	-	10	10	16.67	17
Total Marks	4	6	20	30	60	100.00	100%

Question Paper Pattern for External Examination: 75 Marks

Section	Marks
A- Multiple Choice Questions(10 X 1mark)	10
B- Shortanswertype (5 X 2mark)	10
B- Either/Or type(5X 5 marks)	25
C- Open Choice type (3out of 5 X10 marks)	30
Total	75

EVALUATION (PRACTICAL)

Internal(Formative)	: 40 marks
External(Summative)	: 60 marks
Total	:100 marks

Question Paper Pattern for External Practical Examination (Major):60 Marks

Components	Marks
I – Major question	20
II - Minor question	15
III-Spotters (5 x 4)	20
IV –Record book	5
Total	60

Question Paper Pattern for External Practical Examination (Ancillary) :60 Marks

Components	Marks
I – Major question	20
II - Minor question	15
III - Spotter (4 x 5)	20
IV – Record book	5
Total	60

In respect of external examinations passing minimum is 35% for Under Graduate Courses and in total, aggregate of 40%.The curriculum is revised to suit the changing trends by propagation of ideas ensuring professional growth through innovative method of teaching. The curriculum is strengthened through the latest amendments and revisions as per UGC Norm.

Add-On Courses

Evaluation pattern for Add-on courses

Internal evaluation	: 50 % marks
External evaluation	: 50 %marks

Continuous Internal Assessment components	Marks
Assignment (3nos)/mini project	20 %
Paper presentation/seminar	15 %
Quiz	15 %
Total	50%

External examination duration: 2 hours

Question paper pattern

Part-A

Multiple choice type 10 x 1 = 10 marks

Part- B

Descriptive type 4x10 =40 marks [4 out of 7]

Self-learning Courses

Evaluation pattern for Self-study courses

Assessment components	Marks
Assignments (minimum 2)	25%
Project/innovative experimental design	25%
Paper presentation/ viva voce	25%
Internal test	25%
Total	100%

The Madura College (Autonomous), Madurai-625011

Department of Microbiology

Curriculum structure for B.Sc. Microbiology implemented from 2020-2021 onwards

Semester	Course	Subject Code	Course Title	Contact hours/Week	Credits
I	Part I : Language. I	20U1TLA1	Tamil - I / Sanskrit - I / Hindi – I	6	3
	Part II : English. I	20U1NEN1	English –I	6	3
	VE & PE	20U1VEN1	Value Education and Professional Ethics	3	3
	Part III: Allied – I	20U1CAC1	Allied Chemistry - I	4	4
	Allied Practical	20U1CAP1	Allied Practical - I	2	1
	Major Core -1	20U1RMC1	General Microbiology	3	3
	Major Core -2	20U1RMC2	Basic Techniques in Microbiology	3	3
	Major Core practical - I	20U1RMP1	Major Practical – I	3	2
			Total	30	22
II	Part I : Language. II	20U2TLA2	Tamil - II / Sanskrit -II / Hindi – II	6	3
	Part II : English. II	20U2NEN2	English –II	6	3
	E & G S	20U2EVS1	Environmental and Gender Studies	3	3
	Part III: Allied – II	20U2CAC2	Allied Chemistry - II	4	4
	Allied Practical	20U2CAP2	Allied Practical - II	2	1
	Major Core-3	20U2RMC3	Microbial Taxonomy	3	3
	Major Core-4	20U2RMC4	Cell and Molecular Biology	3	3
	Major Core practical - II	20U2RMP2	Major Practical – II	3	2
	Extension (AEEP)			-	1
			Total	30	23
III	Part I : Language. III	20U3TLA3	Tamil - III / Sanskrit - III / Hindi – III	6	3
	Part II : English. III	20U3NEN3	English –III	6	3
	Non Major Elective – I	20U3RNM1	Nutrition and Health	2	2
	Skill based Elective (SBE-I)	20U3RSM1	Cosmetic Microbiology	2	2
	Part III: Allied – I	20U3LAC1	Paper I- Concepts in Biotechnology	4	4
	Allied Practical	20U3LAP1	Allied Practical - I	2	1
	Major Core-5	20U3RMC5	Biochemistry	5	5
	Major Core Practical - III	20U3RMP3	Major Practical – III	3	2
			Total	30	22

IV	Part I : Language. IV	20U4TLA4	Tamil - IV / Sanskrit - IV / Hindi – IV	6	3
	Part II : English. IV	20U4NEN4	English –IV	6	3
	Non Major Elective-II	20U4RNM2	Microbes in Human Welfare	2	2
	Skill based Elective –II	20U4RSM2	Immunology and Immunotechnology	2	2
	Part III:Allied –II	20U4LAC2	Paper I- Biotechnology in Human Welfare	4	4
	Allied Practical	20U4LAP2	Allied Practical - II	2	1
	Major Core –6	20U4RMC6	Microbial Physiology	5	5
	Major Core Practical - IV	20U4RMP4	Major Practical – IV	3	2
			Total	30	22
V	Skill Based Elective (SBE - III)	20U5RSM3	Diagnostic Microbiology and Haematology	2	2
	Major Core-7	20U5RMC7	Environmental Microbiology	5	5
	Major Core-8	20U5RMC8	Medical Microbiology	5	5
	Major Core-9	20U5RMC9	Microbial Genetics	5	5
	Major Core Practical – V	20U5RMP5	Major Practical – V	3	2
	Major Core Practical – VI	20U5RMP6	Major Practical – VI	3	2
	Major Elective I	20U5RME1	Elective I	4	3
	Major Elective II	20U5RME2	Elective II	3	2
			Total	30	26
VI	Skill Based Elective (SBE - IV)	20U6RSM4	Entrepreneurship in Microbiology	2	2
	Major Core-10	20U6RMC10	Food Microbiology	5	5
	Major Core-11	20U6RMC11	Biotechnology	5	5
	Major Core-12	20U6RMC12	Pharmaceutical and Forensic Microbiology	5	5
	Major Core Practical - VII	20U6RMP7	Major Practical – VII	3	2
	Major Core Practical – VIII	20U6RMP8	Major Practical – VIII	3	2
	Major Elective III	20U6RMP3	Elective III	4	3
	Major Elective IV	20U6RMP4	Elective IV	3	2
			Total	30	26

Elective Papers* for B.Sc., Microbiology
ELECTIVES OFFERED

Semester	Paper	Title of the paper
V	Major Electives I and II	1. Biostatistics and Bioinformatics
		2. Parasitology and Entomology
		3. Biosafety and Bioethics
		4. Introduction to Genomics
VI	Major Electives III and IV	1. Fermentation Technology
		2. Microbial Nanotechnology
		3. Agricultural Microbiology
		4. Veterinary Microbiology

***Students can choose any 2 papers each in V and VI Semesters as electives**

Add-on and Self-study Papers for B.Sc., Microbiology

Semester	Paper	Title of the paper
III	Add-On I	Biofertilizers and Biopesticides
IV	Add-On II	Medical Coding
III & IV	Self-Study	Probiotics
-	Certificate Course - I	Mushroom Technology
-	Certificate Course - II	Food Processing and Preservation

The Madura College (Autonomous), Madurai-625011
Department of Microbiology

**Curriculum structure for B.Sc. Biotechnology (Major) with ancillary Microbiology
implemented from 2021-2022**

Semester	Course	Subject Code	Course title	Contact hours/week	Credits
III	20U3RAC1	Ancillary-I Theory	Basic Microbiology	4	4
	20U3RAP1	Ancillary-I Practicals	Lab in Basic Microbiology	2	1
IV	20U4RAC2	Ancillary-II Theory	Applied Microbiology	4	4
	20U4RAP2	Ancillary-II Practicals	Lab in Applied Microbiology	2	1
			Total	12	10

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	NME - I	20U3RNM1	Nutrition and Health	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives:

1. To understand the fundamental concepts of food, nutrition and health
2. To understand the relationship among food, nutrition and health
3. To gain knowledge regarding nutritional contribution of various food groups
4. To know about the importance of food safety and food quality
5. To gain knowledge regarding nutritional disorders ranging from nutritional deficiencies to life style disorders

Course Learning Outcomes:

On successful completion of the programme, the students will be able to

1. Understand basic concepts in food, nutrition and health
2. Summarize nutritional contribution of various food groups
3. Elaborate the functions and dietary sources of Macronutrients and Micronutrients
4. Explain food laws, regulations and standards
5. Identify the causes, symptoms of Nutritional deficiency diseases

Unit	Description	Hours	K-level	CLO
I	Unit - I: Basic concepts in food and nutrition Basic terms used in study of food and nutrition. Understanding relationship among food, nutrition and health. Functions of food- Physiological, Psychological and Social.	6 hrs	Up to K2	1
II	Unit- II: Major Food Groups Nutritional contribution of the food groups: cereals, pulses, fruits and vegetables, milk and milk products, egg, meat, poultry and fish, fats and oils. Role of fibres in nutrition.	6 hrs	Up to K2	2
III	Unit- III: Nutrients Functions, dietary sources of the following nutrients: Macronutrients- carbohydrates, lipids and proteins. Micronutrients- Fat soluble vitamins-A, D, E and K, Water soluble vitamins – thiamine, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C, Minerals – calcium, iron and iodine.	6 hrs	Up to K2	3

IV	Unit- IV: Food Adulteration Prevention of Food Adulteration (PFA) - Definition of food adulteration. Adulterants in commonly consumed food items. Accidental contamination: botulism, staphylococcal and aflatoxin intoxication. Importance of food labels in processed foods and nutritional labelling. Food laws, regulations and standards - Codex Alimentarius - Prevention of Food Adulteration (PFA) Act - Agmark - Fruit Products Order (FPO) - Meat Products Order (MPO) - Bureau of Indian Standards (BIS) - MMPO – FSSAI.	6 hrs	Up to K2	4
V	Unit-V: Nutritional deficiency diseases Introduction to Nutritional deficiency diseases - causes, symptoms, treatment, prevention of the following: Protein Energy Malnutrition (PEM), Vitamin A Deficiency (VAD), Iron Deficiency Anaemia (IDA), Iodine Deficiency Disorders (IDD), Zinc Deficiency, Fluorosis	6 hrs	Up to K2	5

Total 30 Hours

Books for Study

1. Mudambi, S.R. and Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed. New Age International Publishers, Chennai.
2. Wadhwa, A. and Sharma, S. (2003). Nutrition in the Community-A Textbook. Elite Publishing House Pvt. Ltd., New Delhi.
3. Srilakshmi. (2010). Food Science, 4th Edition. New Age International Ltd., Chennai.

Books for Reference

1. Virag Gupta. (2011). The Food Safety and Standards Act along with Rules and Regulations. Commercial Law Publishers (India) Pvt Ltd, New Delhi.
2. Mahan, L. K. and Escott Stump, S. (2013). Krause's Food & Nutrition Therapy, 13th ed. Saunders-Elsevier, Philadelphia.
3. Stacy Nix. (2009). William's Basic Nutrition and Diet Therapy, 13th Edition. Elsevier Mosby, Philadelphia.
4. Bamji, M.S., Krishnaswamy, K, Brahman, G.N.V. (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
5. Park, K. (2011). Park's Textbook of Preventive and Social Medicine, 21st Edition. M/s Banarasidas Bhanot Publishers, Jabalpur, India.

Web Resources

1. <https://egyankosh.ac.in/bitstream/123456789/41571/1/CNCC-01-E-B1-U1.pdf>
2. https://www.brainkart.com/article/Physiological,-Social,-Psychological-functions-of-food_2499/
3. <https://www.healthychildren.org/English/healthy-living/nutrition/Pages/The-5-Food-Groups-Sample-Choices.aspx>
4. <https://www.open.edu/openlearncreate/mod/oucontent/view.php?id=315&printable=1>
5. <https://www.medlife.com/blog/nutritional-deficiency-anemia-causes-symptoms-treatment/>

Rationale for Nature of the course

Proper nutrition practices enable the achievement and maintenance of optimal physical and mental health. The paper focuses on the raising standards in food science, food safety practices, and food

standards. The beneficiaries will be imbibed with knowledge and skills that would help them to secure good health and well being for themselves and their family, which leads to a healthy society.

Activities having direct impact on Skill development/Employability / Entrepreneurship

- Developing skills in preparing diet charts for nutritional deficiency diseases.
- Would apply knowledge gained through this paper in meal planning safety
- Safety quality of good would be assessed

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

	Course Learning Outcome <i>On successful completion of the programme, the students will be able to</i>	Knowledge Level
CLO1	Understands basic concepts in food, nutrition and health.	Up to K2
CLO2	Summarizes nutritional contribution of various food groups.	Up to K2
CLO3	Elaborates the functions and dietary sources of Macronutrients and Micronutrients	Up to K2
CLO4	Explains food laws, regulations and standards	Up to K2
CLO5	Identifies the causes, symptoms of Nutritional deficiency diseases	Up to K2

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	1	2	1	1
CLO2	1	1	1	2	2
CLO3	1	2	1	1	2
CLO4	2	2	1	1	2
CLO5	1	1	2	3	2

Advance application–3

Intermediate level –2

Basic level –1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	1	1	1	1	1
CLO2	2	1	1	1	1
CLO3	2	2	1	1	1
CLO4	2	2	1	2	2
CLO5	3	2	2	2	2

Advance application–3

Intermediate level –2

Basic level –1

Learning Outcome Based Education & Assessment (LOBE)

Formative Exam – Blue Print (CIA I & II)

Articulation Mapping - K Levels with Courses Learning Outcomes (CLOs)

CLOs	K- Level	Section A		Section B		Section C	
		Short Answers		(Either/or Choice)		(Open Choice)	
		No. of Questions	K- Level	No. of Questions	K- Level	No. of Questions	K- Level
CLO x	Up to K2	1	K1	1	K2/K2	1	K1
CLO y	Up to K2	2	K1	1	K2/K2	2	K1
No. of Questions to be asked		3		2		3	
No. of Questions to be answered		3		2		2	
Marks for each question		2		7		10	
Total Marks for each section		6		14		20	

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels (CIA I & II)

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	6	-	30	-	36	56.25	100
K2	-	28	-	-	28	43.75	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	6	14	30	-	64	100.00	100%

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K-Level	Section – A		Section – B		Section – C	
			Short Answers		(Either / or Choice)		(Open Choice)	
			No. of Questions	K-Level	No. of Questions	K-Level	No. of Questions	K-Level
1	CLO 1	Up to K2	1	K1	1	K2/K2	1	K1
2	CLO 2	Up to K2	1	K1	1	K2/K2	1	K1
3	CLO 3	Up to K2	1	K1	1	K2/K2	1	K1
4	CLO 4	Up to K2	1	K1	1	K2/K2	1	K1
5	CLO 5	Up to K2	1	K1	1	K2/K2	1	K1
No. of Questions to be asked			5		5		5	
No. of Questions to be answered			5		5		3	
Marks for each question			2		7		10	
Total Marks for each section			10		35		30	

Distribution of Section-Wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (No Choice)	Section D (No Choice)	Total Marks	% of Marks (without choice)	Consolidated
K1	10	-	50	-	60	46.15	100
K2	-	70	-	-	70	53.85	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	10	35	50	-	130	100.00	100

LESSON PLAN

Units	Description	Staff	Hours	Mode
I Basic concepts in food and nutrition	Basic terms used in study of food and nutrition		1	Chalk and Talk
	Understanding relationship among food, nutrition and health.		2	
	Functions of food- Physiological, Psychological		2	
	Functions of food- Social.		1	
II Major Food Groups:	Nutritional contribution of the food groups - cereals, pulses.		2	Chalk and Talk
	Nutritional contribution of fruits and vegetables,		1	
	Nutritional contribution of milk and milk products,		1	
	Nutritional contribution of egg, meat, poultry and fish, fats and oils. Role of fibres in nutrition		2	
III Morphology and fine Structure of Bacteria	Functions, dietary sources of the following nutrients: Macronutrients- Carbohydrates, lipids and proteins.		2	Chalk and Talk & PPT
	Micronutrients- Fat soluble vitamins-A, D, E and K		2	
	Water soluble vitamins – thiamine, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C, Minerals – calcium, iron and iodine		2	
IV Food Adulteration	Prevention of Food Adulteration (PFA) - Definition of food adulteration. Adulterants in commonly consumed food items.		2	PPT & Chalk and Talk
	Accidental contamination: botulism, staphylococcal and aflatoxin intoxication. Importance of food labels in processed foods and nutritional labelling.		2	
	Food laws, regulations and standards - Codex Alimentarius - Prevention of Food Adulteration (PFA) Act - Agmark - Fruit Products Order (FPO) - Meat Products Order (MPO) - Bureau of Indian Standards (BIS) - MMPO - FSSAI		2	
V Nutritional deficiency diseases:	Introduction to Nutritional deficiency diseases - causes, symptoms, treatment, prevention of the following: Protein Energy Malnutrition (PEM)		2	PPT
	Causes, symptoms, treatment, prevention of Vitamin A Deficiency (VAD), Iron Deficiency Anaemia (IDA)		2	
	Causes, symptoms, treatment, prevention of Iodine Deficiency Disorders (IDD), Zinc Deficiency, Fluorosis		2	
	Total		30 Hrs	

Course designers

1. Mrs. K. Rajeswari

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	SBE - I	20U3RSM1	Cosmetic Microbiology	2	2	25	75	100

Nature of Course			
Knowledge and skill	✓		Employability oriented
Skill oriented			Entrepreneurship oriented

Course Objectives:

To understand the history of cosmetic microbiology

1. To understand the Fundamental concepts and manufacturing of cosmetics
2. To gain knowledge regarding cosmetics and microbiological testing of cosmetics
3. To know about the mechanism of preservation of cosmetic products
4. To gain knowledge of antimicrobial properties of natural cosmetic products

Course Learning Outcome:

On successful completion of the programme, the students will be able to

1. Outline the history, need and scope of microbiology, microbial limits on cosmetic products
2. Describe to make cosmetics on HACCP
3. Determine microorganisms in cosmetics using various testing methods
4. Apply precautions that prevent growth of microorganisms
5. Specify general characters and determine mode of action of various antimicrobial natural cosmetic microbiology

Unit	Description	Hours	K-level	CLO
I	Unit - I: History and Scope of Cosmetic Microbiology History and Scope of Cosmetic Microbiology- definition of Cosmetics–Need for cosmetic microbiology - Role of microbes in cosmetics preparation - Significance of Cosmetic Microbiology - Microbial limits for Cosmetic Products.	6Hrs	Up to K2	1
II	Unit- II : Manufacturing Control of Cosmetics Sanitary practices in cosmetic manufacturing - Microbial environment of the manufacturing plant - Hazard analysis and critical control point (HACCP) protocols in cosmetic microbiology - Microbiological Quality Controls of Cosmetic Products.	6Hrs	Up to K3	2
III	Unit- III: Testing Methods of Cosmetics Cosmetic microbiology test methods - Antimicrobial preservative efficacy and microbial content testing - Validation of methods. – Validation in Microbiology Laboratory – Media, microbial Content Test, Identification, Sterilizers, Decontamination.	6 Hrs	Up to K3	3

IV	Unit- IV: Mechanism of Preservation of Cosmetics Overview of biocide mechanism and suitability for use in cosmetic Preservation- Preservation of cosmetics - Preservation strategies - Mechanisms of action of Cosmetic preservatives -Preservative resistance - Global regulatory and toxicological aspects of cosmetic preservation- Consumer safety considerations of cosmetic preservation.	6 Hrs	Up to K3	4
V	Unit- V: Antimicrobial Properties Antimicrobial properties of natural cosmetic products – Garlic, Neem, Turmeric, Aloe vera and Tulsi. Antimicrobial Care Products – Dental Products, Consumer Hand and Body Washes - Hand Sanitizers and Wipes - Antiseptic Products used in healthcare Settings - Factors affecting effectiveness of antimicrobial preservative.	6 Hrs	Up to K4	5

Total 30 Hours

Books for Study

1. Philip, A.G. (2006). Cosmetic Microbiology. A Practical approach. 2nd Edition. Taylor & Francis group, New York.
2. Daniel K. Brannan. (1997). Cosmetic Microbiology: A practical handbook. CRC Press, Florida.

Books for Reference

1. Wilkinson, J.B., and Moore, R.J. (1982). Harry's Cosmeticology. 7th Edition. Chemical Publishing Company, New York.
2. Sharma, P.P. (1998). Cosmetics – Formulation, Manufacturing and Quality Control. 4th Edition. Vandana Publications Pvt. Ltd., New Delhi.
3. Hilda Butler and Poucher. W.A. (2000). Poucher's Perfumes, Cosmetics and Soaps. 10th Edition. Kluwer Academic Publishers, Boston.
4. André O. Barel, Marc Paye, Howard I. Maibach. (2009). Handbook of Cosmetic Science and Technology. 3rd Edition. Marianne Mahieu Informa Healthcare, USA.
5. Leon Lachmann and Herbert A Lienermann. (2013). Theory and Practice of Industrial Pharmacy. CBS Publishers & Distributors Pvt. Ltd., New Delhi.
6. Rawlins, E.A. (1997) Bentley's Text book on pharmaceuticals, 8th Edition. Bailliere Tindall Ltd., London.

Web Resources

1. <https://www.fda.gov/cosmetics/resources-you-cosmetics/resources-industry-cosmetics>
2. <http://www.simbhq.org/docs/simbnews/SNND2013.pdf>
3. <https://www.criver.com/resources/webinar-pi-ms-importance-cosmetic-microbiology>
4. <https://www.fda.gov/cosmetics/potential-contaminants-cosmetics/microbiological-safety-and-cosmetics>
5. <https://www.sigmaaldrich.com/analytical-chromatography/microbiology.html>
6. <https://firstthingsfirst966.files.wordpress.com/2018/01/microbiology1.pdf>
7. <https://www.tentamus.com/microbiology-chemistry-cosmetics/>
8. <https://www.youtube.com/watch?v=Bpe2ROWKsZU>

Rationale for Nature of the course

The purpose of this course is to share the unique knowledge of a small group of cosmetic microbiologists and cover all aspects that are critical to providing consumers with microbiologically safe products in a focused discussion that allows immediate application. The course will emphasize current trends in the selection of cosmetic ingredients.

Activities having direct impact on Skill development/Employability / Entrepreneurship

- Understanding all aspects that are critical for providing consumers with microbiologically safe products.
- Providing in depth learning in cosmetic science, which will serve as a focus for research into the field of cosmetic science.
- Applying knowledge on cosmetics in the field of related sciences, cosmeceuticals, personal care and hygiene products.

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

CLOs	Course Learning Outcome <i>On successful completion of the programme, the students will be able to</i>	Knowledge Level
CLO1	Outline the history, need and scope of microbiology and microbial limits on cosmetic products.	Up to K2
CLO2	Explain the need of HACCP protocol in manufacturing cosmetics	Up to K3
CLO3	Determine Microorganisms in Cosmetics using various testing methods	Up to K3
CLO4	Apply precautions that prevent growth of Microorganisms	Up to K3
CLO5	Specify general characters and determine mode of action of various antimicrobial natural cosmetics.	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	2	3
CLO2	2	2	2	3	2
CLO3	2	2	2	2	3
CLO4	3	2	2	2	2
CLO5	3	3	3	3	2

Advance application–3

Intermediate level –2

Basic level –1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	3	2	2
CLO2	2	2	3	2	2
CLO3	2	3	2	2	3
CLO4	2	2	2	2	2
CLO5	3	2	2	2	2

Advance application–3

Intermediate level –2

Basic level –1

Learning Outcome Based Education & Assessment (LOBE)

Blue Print

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.8	41.6%
K2	5	6	10	10	31	25.8	
K3	-	-	20	30	50	41.7	41.7%
K4	-	-	10	10	20	16.7	16.7%
Total Marks	10	10	50	50	120	100.00	100%

LESSON PLAN

Units	Description	Staff	Hours	Mode
I History of Cosmetic Microbiology	a)History and Scope of Cosmetic Microbiology.		1	Chalk and Talk
	b)Definition of Cosmetics, Need for cosmetic microbiology,		2	
	c) Role of microbes in cosmetics preparation		1	
	d)Significance of Cosmetic Microbiology		1	
	e) Microbial limits for Cosmetic Products.		1	
II Manufacturing of Cosmetics	a) Sanitary practices in cosmetic manufacturing,.		2	Chalk and Talk
	b)Microbial environment of the manufacturing plant		1	
	c)Hazard analysis and critical control point (HACCP) protocols in cosmetic microbiology		2	
	d)Microbiological Quality Controls of Cosmetic Products		1	
III Testing Methods of Cosmetics	a)Cosmetic microbiology test methods		1	Chalk and Talk & PPT
	b)Antimicrobial preservative efficacy and microbial content testing		1	
	c)Validation of methods. Validation in Microbiology Laboratory – Media		2	
	d) microbial Content Test Identification, Sterilizers, Decontamination.		2	
IV Mechanism of Preservation of Cosmetics	a)Overview of biocide mechanism and suitability for use in cosmetic Preservation		2	PPT & Chalk and Talk
	b)Preservation of cosmetics - Preservation strategies - Mechanisms of action of Cosmetic preservatives. - Preservative resistance.		2	
	c)Global regulatory and toxicologic aspects of cosmetic preservation-		1	
	d)Consumer safety considerations of cosmetic preservation.		1	

V Antimicrobial Properties	a)Antimicrobial properties of natural cosmetic products – Garlic, Neem, Turmeric, Aloe vera and Tulsi		2	PPT
	b)Antimicrobial Care Products – Dental Products, Consumer Hand and Body Washes ,Hand Sanitizers and Wipes		2	
	c)Antiseptic Products used in healthcare Settings.		1	
	d)Factors affecting effectiveness of antimicrobial preservative.		1	
Total			30 Hours	

Course designers : 1. Mrs. N.Sumathy

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Major Core - 5	20U3RMC5	Biochemistry	5	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives:

1. To understand the basic building blocks of living organisms
2. To introduce the structure and properties of various biomolecules
3. To emphasis on the association between structure and function of various biomolecules
4. To learn the concepts involved in the mechanism of enzyme action
5. To understand the significance of vitamins as vital ingredient of life

Course Learning Outcome:

On successful completion of the programme, the students will be able to

1. Acquaint with chemical and molecular foundations of life and appreciate the role of water in biological systems
2. Comprehend the structure, function and properties of carbohydrates, amino acids and lipids
3. Introduce the significance of carbohydrates, proteins and lipids in biological systems
4. Aware of the importance of vitamins in biological systems
5. Elaborate the mechanism of enzyme action

Unit	Description	Hours	K-level	CLO
I	Unit - I: Water and Carbohydrates Water: The solvent of life - physical properties and structure of water molecule. pH and Buffers. Carbohydrates—definition, structure and classification. Physical and chemical properties of Monosaccharides- Glucose, Disaccharides- lactose, Polysaccharides – starch. Biological significance of carbohydrates.	15Hrs	Up to K2	1
II	Unit - II: Amino acids and Proteins Amino acids – Structure and classification. Properties – physical and chemical. Uncommon amino acids and their functions. Proteins – definition, classification based on composition and solubility. Structural levels of organization – primary, secondary, tertiary and quaternary structure and their functions.	15Hrs	Up to K3	2

III	Unit - III: Enzymes Enzymes –definition and nomenclature.IUB classification with examples. Mechanism of enzymeaction-lock and key model. Enzyme inhibition-competitive and non-competitive. Factors affecting enzymes activity.	15Hrs	Up to K3	3
IV	Unit - IV: Lipids Lipids – definition ,classification and physical and chemical properties. Saturated and unsaturated fatty acids. Plant steroids. Biological significance of lipids. Lipid metabolism - β -oxidation, biosynthesis of saturated fatty acid eg. Palmitic acid.	15Hrs	Up to K3	4
V	Unit - V: Vitamins and Hormones Vitamins- Source and importance of vitamins. Classification - water soluble vitamins (Vitamin B and C).Fat soluble vitamins (Vitamin A, D, E and K). Vitamin deficiency diseases and symptoms. Hormones: Definition, Chemical classification of hormones. Functions of hormones and their regulation	15Hrs	Up to K4	5

Total 75 Hours

Books for Study

1. Jain, J. L. (2000). Fundamentals of Biochemistry. S. Chand & Co. Ltd., New Delhi

Books for Reference

1. Nelson, D.L., and Cox,M.M., (2000). LehningerPrinciples of Biochemistry, Third edition, Macmillan Worth publishers. London
2. David, B.D., Delbecco,. R., Eisen, H.N and Ginsburg, H.S (1990). "Microbiology" 5th Edition. Harper & Row, New York.
3. Stryer. L. (1995). Biochemistry, 4th edition , W.H. Freeman &Co. NY.
4. RoberMurray,K., Daryl Grammer, K., (1990).Harper's Biochemistry, 25th edition, McGraw Hill, Lange Medical Books,New York.
5. Satyanarayana, U (2005). Essentials of Biochemistry, Books and Allied (P) Ltd., Kolkata.
6. Veerakumari, L (2004). Biochemistry. MJP Pubilshers, A Unit of Tamil Nadu Book House, Chennai.

Web Resources

1. <https://bio.libretexts.org/Bookshelves/Biochemistry>
2. <https://www.edx.org/course/principles-of-biochemistry>
3. <https://online-learning.harvard.edu/course/principles-biochemistry>
4. <https://courses.lumenlearning.com/introchem/chapter/protein-structure>
5. <https://www.medicalnewstoday.com/articles/319704>

Rationale for Nature of the course

The goal of this course is to understand the basic building blocks of living organisms, its structure and properties and to emphasize on the association between structure and function of various biomolecules. This course highlights on the concepts involved in the mechanism of enzyme action and to understand the significance of vitamins as a vital ingredient of life.

Activities having direct bearing on skill development/ employability/entrepreneurship

- Providing knowledge on biomolecules, and their significance in the metabolism
- Exploring the structure of biomolecules found in cells and to determine their structures.
- Inculcating the formulation of biomolecules such as enzymes, hormones and vitamins in drug designing.

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

CLOs	Course Learning Outcome On successful completion of the programme, the students will be able to	Knowledge Level
CLO1	Acquaint with chemical and molecular foundations of life and appreciate the role of water in biological systems.	Up to K2
CLO2	Comprehend the structure, function and properties of carbohydrates, amino acids and lipids.	Up to K3
CLO3	Introduce the significance of carbohydrates, proteins and lipids in biological systems.	Up to K3
CLO4	Aware of the importance of vitamins in biological systems.	Up to K3
CLO5	Elaborate the mechanism of enzyme action.	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	2	3
CLO2	2	2	2	2	2
CLO3	2	2	3	2	3
CLO4	3	2	2	2	2
CLO5	2	2	2	3	2

Advance application–3

Intermediate level –2

Basic level –1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	2	2	3
CLO2	2	2	2	2	3
CLO3	3	2	2	2	2
CLO4	2	2	3	2	2
CLO5	3	2	2	2	2

Advance application–3

Intermediate level –2

Basic level –1

Learning Outcome Based Education & Assessment (LOBE) - Blue Print Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.8	41.6%
K2	5	6	10	10	31	25.8	
K3	-	-	20	30	50	41.7	41.7%
K4	-	-	10	10	20	16.7	16.7%
Total Marks	10	10	50	50	120	100.00	100%

LESSON PLAN

UNITS	DESCRIPTION	STAFF	HOURS	MODE
I Water and Carbohydrates	a) Water: The solvent of life - physical properties and structure of water molecule		1	PPT
	b) pH and Buffers		3	
	c) Carbohydrates- definitions, classification, structure		2	
	d) Physical and chemical properties of Carbohydrates		3	
	e) Physical and chemical properties of - Monosaccharides – Glucose. Disaccharides- lactose		3	
	f) Polysaccharides – starch. Biological significance of carbohydrates		3	
II Amino acids and Proteins	a) Amino acids – Structure and classification.		3	PPT
	b) Properties – physical and chemical		3	
	c) Uncommon amino acids and their functions		2	
	d) Proteins – definitions, classification based on composition, solubility		3	
	e) Structural levels of organization – primary, secondary, tertiary and quaternary structure and functions		4	
III Enzymes	a) Enzymes –definitions, nomenclature, IUB classification with examples		5	PPT
	b) Mechanism of enzyme action-lock and key model		2	
	c) Enzyme inhibition-competitive and non-competitive		4	
	d) Factors affecting enzymes activity.		4	
IV Lipids	a) Lipids - classifications, physical and chemical properties, saturated and unsaturated fatty acids.		5	PPT
	b) Plant steroids. Biological significance of lipids		3	
	c) Lipid metabolism - β -oxidation,		2	
	d) biosynthesis of saturated fatty acid eg. Palmitic acid.		5	
V Vitamins and Hormones	a) Vitamins- Source and importance of vitamins		2	PPT
	b) Classification– water soluble vitamins (Vitamin B and C).		3	
	c) Fat soluble vitamins (Vitamin A, D, E and K).		3	
	d) Vitamin deficiency diseases and symptoms.		2	
	e) Hormones: Definition, Chemical classification of hormones		3	
	f) Functions of hormones and their regulation.		2	
Total			75 Hrs	

Course designers

1. Dr.A.P.Ashakannan

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Major Core Practical - III	20U3RMP3	Major Practical – III-	2	3	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives:

1. Provide hands on training to perform basic laboratory techniques in chemistry and biology
2. Provide fundamental principles, such as the structure/function of biomolecules, regulation of biological/biochemical processes
3. Analyse antibiogram of bacteria
4. Perform separation techniques of biomolecules
5. Explore microbiology of cosmetics

Course Learning Outcomes:

On successful completion of the programme, the students will be able to

1. Perform basic laboratory techniques in both chemistry and biology
2. Prepare chemicals and buffers for biological reactions
3. Identify and quantify the amount of biomolecules present in the samples
4. Analyse Microbiological assay of antibiotics
5. Perform testing of Cosmetics and Personal Care Products

Sl.No.	Experiments
1	Measurement of pH of various samples using pH meter
2	Buffer preparation (Verification of Henderson-Hassel Balch equation)
3	Verification of Beer's Law
4	Separation of amino acids by paper chromatography and TLC
5	Qualitative analysis of carbohydrate (monosaccharides, disaccharides and polysaccharides).
6	Microbiological assay of antibiotics
7	Antimicrobial Preservative Effectiveness Test (Challenge Test)
8	Minimum Inhibitory Concentration (MIC test)
9	Microbiological Testing of Cosmetics and Personal Care Products.
10	Suitability and Validation of microbiological tests in cosmetics

Books for Reference

1. Plummer, D.T. (2008) An Introduction to Practical Biochemistry. Tata McGraw- Hill Publication, New Delhi
2. Dua, S and Garg, N. (2010) Biochemical methods of analysis. Narosa Publishing, New Delhi.
3. Nigam and Ayyagai, A. (2007) Lab Manual in Biochemistry, Immunology and Biotechnology. Tata McGraw- Hill Publication, New Delhi
4. Wilson, K and Walker, J. (2008). Practical Biochemistry. Cambridge State University Press, U.K.
5. Boyer, R.F. (2012) Modern Experimental Biochemistry, Pearson Education, India.

Web Resources

1. https://en.wikipedia.org/wiki/blue_white_screen
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/pmc169282/>
3. <https://rajswasthya.nic.in/RHSDP%20Training%20Modules/Lab.pdf>
4. <https://www.ouh.nhs.uk/biochemistry/tests/>
5. <https://iubmb.onlinelibrary.wiley.com/doi/10.1002/bmb.2003.494031020192>

Rationale for nature of the course

This course provides an in-depth knowledge and practical skills pertaining to separation and estimation of various biological macromolecules. It explores the role of preservatives in the field of cosmetology and highlights the production of microbiologically safe cosmetic products.

Activities having direct bearing on skill development/ employability/entrepreneurship

- Hands-on experience in separation and identification of biomolecules
- Testing and validating microbiologically safe cosmetic products.
- Applying knowledge on antimicrobial compounds in cosmetics, personal care and hygiene products.

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

CLOs	Course Learning Outcomes	Knowledge Level
	On successful completion of the programme, the students will be able to	
CLO1	Perform basic laboratory techniques in both chemistry and biology	Up to K1
CLO2	Prepare chemicals and buffers for biological reactions.	Up to K2
CLO3	Identify and quantify the amount of biomolecules present in the samples.	Up to K2
CLO4	Analyse Microbiological assay of antibiotics	Up to K2
CLO5	Perform testing of Cosmetics and Personal Care Products	Up to K3

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	2	3
CLO2	2	2	2	3	2
CLO3	2	3	2	2	3
CLO4	3	2	2	2	2
CLO5	2	2	3	2	2

Advance application – 3, Intermediate level – 2, Basic level – 1.

Mapping of course outcome with Programme outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	3	2	2
CLO2	2	3	2	2	2
CLO3	2	2	3	3	2
CLO4	3	3	2	2	3
CLO5	2	2	2	2	2

Advance application – 3, Intermediate level – 2, Basic level – 1

Course designers:

1. Dr. A. P. AshaKannan

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	NME - II	20U4RNM2	Microbes in Human welfare	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives:

1. To impart basic knowledge on history of microbiology
2. To identify the principles of industrially important microorganisms and the process of production of industrially important products
3. To know the biopharmaceuticals and their production
4. To study beneficial microbes in soil and control of plant diseases
5. To emphasize the significance of microbes in sewage treatment

Course Learning Outcome:

On successful completion of the programme, the students will be able to

1. Explain the fundamental concepts; describe the history and development of microbiology
2. Describe the microorganisms of industrial importance and industrial production of products
3. Define the production of biopharmaceuticals and antibiotics
4. Discuss beneficial microbes in soil and control plant diseases
5. Identify the microbes in sewage treatment and environment

Unit	Description	Hours	K-level	CLO
I	Unit I - History and Scope of Microbiology Discovery of microorganisms- Contributions of Leeuwenhoek, Louis Pasteur, Edward Jenner, Robert Koch, Elie Metchnikoff and Fleming. Classification based on Carl Woese (The three domains) and Robert H. Whittaker (Five Kingdom system).	6 hrs	Up to K2	1
II	Unit II – Microbes in Food, medicine and Industrial products Microbes in Dairy and fermented beverages - <i>Saccharomyces</i> , <i>Lactobacillus</i> , <i>Agaricus</i> , <i>Spirulina</i> . Industrial production of alcohol.	6 hrs	Up to K2	2

III	Unit III – Microbes in Pharma field Industrial production of Insulin. Antibiotics- Industrial production of Penicillin. Immunization- Vaccines, immunization schedule for children, role of vaccines for Small pox, Rabies and Polio.	6 hrs	Up to K2	3
IV	Unit IV – Microbes in Agriculture Soil microflora, Rhizosphere, organic manure. Bio control agents- Biofertilizers (Bacteria-Rhizobium, Fungi-Trichoderma, Blue green algae- NOSTOC, Actinomyces-Frankia), Bioinsecticides- <i>Bacillus thuringiensis</i> .	6 hrs	Up to K2	4
V	Unit V – Microbes in sewage treatment Introduction of sewage, Trickling filter, activated sludge, oxidation pond, oxidation ditch. Microbes in production of biogas.	6 hrs	Up to K2	5

Total 30 Hours

Books for Study:

1. Dubey, R.C. and Maheswari, D.K. (2005). A text book of Microbiology. Revised Multicolour Edition. Published by S. Chand & Company Limited. New Delhi.
2. Pelczar, T.R., Chan, E.C.S. and Kreig, N.R. (2006) Microbiology. 5th Edition. Tata McGraw – Hill, New Delhi.

Books for Reference:

1. Prescott, M. (2005). Microbiology. 6th Edition. Tata McGraw – Hill. New Delhi.
2. Albert Moat, G. and John Foster, W. (2004). Microbial Physiology. 4th Edition. John Wiley & Sons. New York.
3. Robert Boyd, F. (1984). General Microbiology. Times Mirror / Mosby College Publishers. UK.
4. Purohit, S.S. (2005). Microbiology – Fundamentals and Applications. Reprinted & Published by Student Edition. Behind Nasrani Cinema, Chopasani Road, Jodhpur.
5. Schlegel, H.G. (1993). General Microbiology. Seventh edition. Cambridge University Press. UK.

Web Resources:

1. <https://www.periobasics.com/basic-microbiology>
2. <https://www.microbiologynutsandbolts.co.basic-concepts>
3. <https://www.microbiologyinfo.com/category/basic-microbiology>
4. <https://www.Microbiology-Overview-youtube.com>
5. <https://www.Introductiontomicrobiology.youtube.com>

Rationale for Nature of the course

Microorganisms are the major component of biological system and they are present everywhere- soil, water, air, inside our bodies and of animals and plants. The microorganisms infect the living organisms and cause serious diseases in plants, animals and humans and hence can be harmful to man both directly and indirectly. But some of them are also very useful to human beings. These

microorganisms help in the preparation of medicines, in food industry, in brewery, baking, agriculture, household and health products.

Activities having direct impact on Skill development/Employability / Entrepreneurship

- Employing microorganisms for production of biogas in rural areas.
- Identifying essential microbes for producing food and health products.
- Exploring research related to biocontrol agents.

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

CLOs	Course Learning Outcome	Knowledge Level
CLO-1	Explain the fundamental concepts; describe the history and development of microbiology.	Up to K2
CLO-2	Describe the microorganisms of industrial importance and industrial production of products.	Up to K2
CLO-3	Define the production of biopharmaceuticals and antibiotics	Up to K2
CLO-4	Discuss beneficial microbes in soil and control plant diseases	Up to K2
CLO-5	Identify the microbes in sewage treatment and environment	Up to K2

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	2	2
CLO2	2	3	3	3	3
CLO3	2	3	2	3	2
CLO4	2	2	3	3	3
CLO5	3	3	2	2	2

Advance application – 3,

Intermediate level – 2,

Basic level – 1.

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	2	2	2
CLO2	2	3	3	2	3
CLO3	3	2	2	3	3
CLO4	2	3	2	2	2
CLO5	2	2	2	2	2

Advance application – 3, Intermediate level – 2, Basic level – 1.

LESSON PLAN

UNITS	DESCRIPTION	STAFF	HOURS	MODE
I History and scope of Microbiology	a) Introduction, History of Microbiology, Discovery of microorganisms		2	Chalk and talk
	b) Contributions of Leeuwenhoek, Louis Pasteur, Edward Jenner , Robert Koch, Elie Metchnikoff and Fleming		2	Screening of educational videos
	c) Classification based on Carl Woese (The three domains) and Robert H. Whittaker (Five Kingdom system)		2	Chalk and talk
II Microbes in Food and Industrial products	a) Study of <i>Saccharomyces</i> nutritional requirement and commercial application in fermented beverages.		2	PPT
	b) Probiotic properties, diversity and beneficial activity of <i>Lactobacillus</i> in food and feed.		1	Screening of educational videos
	c) Isolation, cell structure, metabolism, nutritional status, chemical composition, utilization of <i>Spirulina</i> and <i>Agaricus</i> as food source.		2	Screening of educational videos
	d) Microbes used in ethanol fermentation		1	PPT
III Microbes in Pharma field	a) History, raw material, manufacturing processes and quality control of Insulin.		2	Chalk and talk
	b) Penicillin: Discovery and its commercial production.		1	PPT
	c) Introduction to vaccines and WHO recommendations for routine immunization schedule for children.		2	Screening of educational videos
	d) Role of vaccines for small pox, rabies and		1	

IV Microbes in Agriculture	a) Mode of action of microbial biological control agents against plant diseases: Relevance beyond efficacy.		2	PPT
	b) Recent advances and future prospects of biofertilizers.		2	Chalk and talk
	c) Role of microorganisms in soil health and uses of organic manure.		2	Chalk and talk
V Microbes in sewage treatment	a) Study of physical and biological environment processes for sewage treatment.		3	PPT
	b) Biogas Production from Organic Waste: Recent Progress and Perspectives.		3	Chalk and talk, seminar.
		Total	30 Hrs	

Learning Outcome Based Education & Assessment (LOBE)
Formative Exam – Blue Print (CIA I & II)
Articulation Mapping - K Levels with Courses Learning Outcomes (CLOs)

CLOs	K- Level	Section A		Section B		Section C	
		Short Answers		(Either/or Choice)		(Open Choice)	
		No. of Questions	K- Level	No. of Questions	K- Level	No. of Questions	K- Level
CLO x	Up to K2	1	K1	1	K2/K2	1	K1
CLO y	Up to K2	2	K1	1	K2/K2	2	K1
No. of Questions to be asked		3		2		3	
No. of Questions to be answered		3		2		2	
Marks for each question		2		7		10	
Total Marks for each section		6		14		20	

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels (CIA I & II)

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	6	-	30	-	36	56.25	100
K2	-	28	-	-	28	43.75	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	6	14	30	-	64	100.00	100%

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K-Level	Section – A		Section – B		Section – C	
			Short Answers		(Either / or Choice)		(Open Choice)	
			No. of Questions	K-Level	No. of Questions	K-Level	No. of Questions	K-Level
1	CLO 1	Up to K2	1	K1	1	K2/K2	1	K1
2	CLO 2	Up to K2	1	K1	1	K2/K2	1	K1
3	CLO 3	Up to K2	1	K1	1	K2/K2	1	K1
4	CLO 4	Up to K2	1	K1	1	K2/K2	1	K1
5	CLO 5	Up to K2	1	K1	1	K2/K2	1	K1
No. of Questions to be asked			5		5		5	
No. of Questions to be answered			5		5		3	
Marks for each question			2		7		10	
Total Marks for each section			10		35		30	

Distribution of Section-Wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (No Choice)	Section D (No Choice)	Total Marks	% of Marks (without choice)	Consolidated
K1	10	-	50	-	60	46.15	100
K2	-	70	-	-	70	53.85	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	10	35	50	-	130	100.00	100

Course designers

1. Dr.S.Sree Gayathri

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	SBE - II	20U4RSM2	Immunology and Immunotechnology	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives:

1. To understand various immune mechanisms
2. To describe various immune cells and organs involved in immunity
3. To understand different immunological techniques used and serological diagnosis of infectious diseases
4. To understand the basis of allergy reactions, auto immune mechanisms, transplantation and cancer immunity
5. To describe the development and function of the immune system

Course Learning Outcome:

On successful completion of the programme, the students will be able to

1. Define the basic biology of the cells of the immune system, including their development and specific functions
2. Outline how the cells interact with each other in the formation of an immune response
3. Interpret the molecular basis by which the immune system identifies pathogens
4. Perceive what occurs when there are failures of the immune system
5. Become skilled at the experimental basis and reasoning that underlies the material in the course

Unit	Description	Hours	K-level	CLO
I	Unit I: Immunity Introduction. Immunity – types – innate and acquired. Cell mediated immunity and Humoral immunity. Organs of immune system: Primary- Thymus and Bone marrow. Secondary – spleen –lymph nodes – GALT and MALT. Immunoreactive cells- structure and functions - macrophages, granulocytes, NK cells, T and B lymphocytes. Phagocytosis.	6 Hrs	Up to K2	1
II	Unit II: Antigens and Immunoglobulins Antigen - types, properties. Hapten, adjuvants, Immunoglobulins – Basic structure and classes – (IgG, IgA, IgM, IgD and IgE) and functions. Immunotechnology – hybridoma and monoclonal antibodies, antibody engineering – production of chimeric and hybrid monoclonal antibodies.	6 Hrs	Up to K3	2

III	Unit III:MHC and Hypersensitivity Major Histocompatibility Complex – structure of MHC I and MHC II. Hypersensitivity reactions - types, Antibody mediated (Type- I, Type II and Type III) and Cell mediated (Type IV). Autoimmunity– organ specific – Grave’s disease - Myasthenia gravis – Hashimoto’s thyroiditis- Systemic-Rheumatoid arthritis-Multiple sclerosis- Systemic lupus erythematosus (SLE).	6 Hrs	Up to K3	3
IV	Unit IV:Transplantation Immunology and Vaccines Transplantation Immunology – Immunologic Basis of Graft Rejection -Allograft rejection –cells involved– GVHD – Prevention of graft rejection. Tumor Antigens –Immunity to tumor - Tumor evasion mechanisms - Immunodiagnosis – Tumor therapy. Vaccines - Types - Attenuated – Killed – Purified proteins (Toxoid) – Recombinant Vaccines. Immunization schedule.	6 Hrs	Up to K3	4
V	Unit V: Antigen-Antibody reactions and Immunological techniques Antigen – Antibody reactions – Precipitation and agglutination reactions. Immuno electrophoresis, Radial immune diffusion (RID), Clinical applications – WIDAL, VDRL, CFT.	6 Hrs	Up to K4	5
Total		30 Hours		

Books for Study

1. Coico, R., Sunshine, G., Benjamini, E. (2003) Immunology: A Short Course VI edition. WileyBlackwell, New York
2. Goldsby, R.A., T.J. Kindt., B.A. Osborne, Kuby. J.(2002). Immunology. Fifth edition. W.H. Freeman and Company, New York.
3. Arora, M.P. (2010). Immunology, Ane Books Pvt. Ltd., New Delhi.

Books for Reference

1. Abbas, A.K., A.H.Lichtman, and J.S.Pober. (2000). Cellular and Molecular immunology, Fourth Edition, W.B. Saunders Company, London.
2. Coleman, R.M., M.F.Lombard and R.E. Sicard. (1992). Fundamental Immunology, Second Edition, Wm.C.Brown Publishers, USA.
3. Cruse, J.M. and R.Lewis. (1999). Atlas of Immunology, CRC Press, New York.
4. David, M., B.Jonathan, B.R. DavidandR.Ivan.(2008). Immunology, Seventh Edition, Elsevier Publications.
5. Tizard, I.R. (2009). Immunology – An Introduction, Fourth Edition, Cengage Learning India Pvt. Ltd., New Delhi.
6. Janeway, Jr.C.A. and Travers.P.(2001). Immunobiology.5th Edition. Garland Publishing. London.
7. Khan, F.H. (2009). Elements of Immunology. Dorling Kindersley India Pvt. Ltd. India.
8. Roitt, I., J. Brostoffand D.Male, (2001). Immunology, 6th Edition. Mosby. London.
9. Rao, C.V.(2008). Immunology.2nd Edition.Narosa Publishing House. New Delhi.
10. Kuby, J. (1994) Immunology. 2nd Edition, W.H. Freeman and Company. New York.

Web Resources

1. <https://www.hhmi.org/biointeractive/immunology/lectures.html/>
2. <https://bitesized.immunology.org/what-is-immunology/>
3. [https://onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)1365-2567](https://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1365-2567)
4. <https://www.helmborg.at/immunology.pdf>
5. <https://www.mednotes.net/notes/immunology/>

Rationale for Nature of the course

Immunology involves a complex network of interacting molecules and cells that function to recognize and respond to foreign agents. It deals with physical, chemical and physiological characteristics of the components of immune system *in vitro*, and *in vivo*. Immunology has a vast array of uses in several disciplines of science and medical sciences.

Activities having direct bearing on skill development/ employability/entrepreneurship:

- The most important aspect of immunology is research because it is the biggest portion of jobs. Immunologists work in various areas such as biomedical research, healthcare, agriculture and environmental monitoring. A career in scientific research.
- Immunology has applications in various disciplines of medicine that are virology, organ transplantation, dermatology, oncology, parasitology, bacteriology, and psychiatry.

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

CLOs	Course Learning Outcome <i>On successful completion of the programme, the students will be able to</i>	Knowledge Level
CLO1	Define the basic biology of the cells of the immune system, including their development and specific functions	Up to K2
CLO2	Outline how the cells interact with each other in the formation of an immune response	Up to K3
CLO3	Interpret the molecular basis by which the immune system identifies pathogens.	Up to K3
CLO4	Perceive what occurs when there are failures of the immune system.	Up to K3
CLO5	Become skilled at the experimental basis and reasoning that underlies the material in the course.	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	2	3
CLO2	2	2	2	2	2
CLO3	2	2	2	3	3
CLO4	2	2	2	2	2
CLO5	2	2	3	3	2

Advance application–3

Intermediate level –2

Basic level –1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	1	1	2	1
CLO2	1	2	1	1	2
CLO3	2	2	1	1	1
CLO4	3	2	2	1	1
CLO5	3	2	2	2	1

Advance application–3

Intermediate level –2

Basic level –1

Learning Outcome Based Education & Assessment (LOBE)

Blue Print

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.8	41.6%
K2	5	6	10	10	31	25.8	
K3	-	-	20	30	50	41.7	41.7%
K4	-	-	10	10	20	16.7	16.7%
Total Marks	10	10	50	50	120	100.00	100%

LESSON PLAN

Units	Description	Staff	Hours	Mode
I Immunity	a) Introduction. Immunity – types – innate and acquired		1	Chalk and Talk
	b) Cell mediated immunity and Humoral immunity.		1	Lecture
	c) Organs of immune system: Primary- Thymus and Bone marrow. Secondary – spleen –lymph nodes – GALT and MALT		1	PPT
	d) Immunoreactive cells- structure and functions.		1	Lecture
	e) Macrophages, granulocytes, NK cells,		1	Demonstration
	f) T and B lymphocytes. Phagocytosis		1	Demonstration
II Antigens and Immunoglobulins	a) Antigen - types, properties. Hapten, adjuvants		2	Chalk and talk
	b) Immunoglobulins – Basic structure and classes – (IgG, IgA, IgM, IgD and IgE) and functions.		1	PPT
	c) Immunotechnology – hybridoma and monoclonal antibodies,		2	Discussion
	d) Antibody engineering – production of chimeric and hybrid monoclonal antibodies.		1	Demonstration
III MHC and Hypersensitivity	a) Major Histocompatibility Complex (MHC) – structure of MHC I and MHC II .		1	Chalk and talk
	b) Hypersensitivity reactions - types, Antibody mediated (Type- I, Type II and Type III) and Cell mediated (Type IV).		2	Discussion
	c) Autoimmunity–organspecific – Grave’s disease - Myasthenia gravis-Hashimoto’s thyroiditis		2	Discussion
	d) Systemic-Rheumatoid arthritis-Multiple		2	Demonstration
IV Transplantation Immunology and Vaccines	a) Transplantation Immunology – Immunologic Basis of Graft Rejection		1	Chalk and talk
	b) Allograft rejection –cells involved– GVHD – Prevention of graft rejection.		2	Demonstration
	c) Immunity to tumor-Tumor evasion mechanisms-Immunodiagnosis – Tumor therapy.		2	Discussion
	d) Vaccines - Types - Attenuated – Killed –		1	Discussion
V Antigen-Antibody reactions and Immunological	a) Antigen – Antibody reactions – Precipitation and agglutination reactions		2	PPT
	b) Immuno electrophoresis, Radial immune diffusion (RID)		2	Demonstration
	c) Clinical applications – WIDAL, VDRL, CFT.		2	Demonstration
Total			30 Hrs	

Course designers

1. Dr. P.N. Rajarajan

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Major Core	20U4RMC6	Microbial Physiology	5	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives:

1. To understand microbial nutrition and energy flow
2. To understand the concept of microbial metabolism and photosynthesis
3. To know the concept of catabolism and catabolic pathways in microbes
4. To gain knowledge about the microbial anabolism and anabolic pathways
5. To know about different biosynthetic pathways in microbes

Course Learning Outcome:

On successful completion of the programme, the students will be able to

1. Outline the concept of microbial nutrition and energy flow
2. Define the basic concept of microbial metabolism and photosynthesis
3. Summarize the concept of catabolism and catabolic pathways in microbes
4. Interpret the microbial anabolism and anabolic pathways
5. Illustrate biosynthetic pathways in microbes

Unit	Description	Hours	K-level	CLO
I	Unit I: Microbial Nutrition Nutritional requirements of microorganisms -autotrophs, heterotrophs, phototrophs and chemotrophs. Energy production- Phosphorylation - types. Structure of ATP and its significance.	15 hrs	Up to K2	1
II	Unit II: Transport of nutrients Transport of nutrients – uptake of nutrients – passive diffusion – facilitated diffusion – active transport. Simple transport (uniport, symport and antiport) – group translocation and protein export system. Role of osmoregulatory proteins.	15 hrs	Up to K3	2

III	Unit III: Metabolism Metabolism- Types, Aerobic, anaerobic respiration and fermentation. Catabolism – Glycolysis, Krebs cycle and ED pathway. Glyoxylate Pathway and Gluconeogenesis and their significance. Fermentation – alcoholic and lactic acid. Homo and heterolactic acid fermentation.	15 hrs	Up to K3	3
IV	Unit IV: Anabolism Anabolism - Photosynthesis- Classification and properties of prokaryotic photosynthetic microbes. Light reaction of Cyanobacteria, Purple and green bacteria. Dark reaction - C3 cycle and reductive TCA cycle.	15 hrs	Up to K3	4
V	Unit V: Biosynthetic Pathways Biosynthetic Pathway of Aminoacids – leucine, valine, isoleucine, methionine, lysine. Biosynthetic Pathways - Purine and Pyrimidine pathways. Biosynthesis of Peptidoglycan.	15 hrs	Up to K4	5

Total 75 Hours

Books for Study

1. Sale, A.J. (1992). Fundamentals Principles of Bacteriology. 7th Edition. McGraw Hill Publishing Co. Ltd. New York.
2. Dubey, R.C. and Maheswari, D.K. (2005). A Text book of microbiology. S. Chand & Company Ltd. New Delhi.

Books for Reference

1. Dall, D.O and Rao, K.K. (1995). Photosynthesis. Cambridge University press. Cambridge.
2. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L and Painter, P.R. (1986). General Microbiology. Mac Milan Education Ltd. London

Web Resources

1. <https://www.microbiologynutsandbolts.co.basic-concepts>.
2. <https://www.microbiologyinfo.com>
3. <https://www.microbiology-overview-youtube.com>
4. <https://www.introduction to microbiology. youtube.com>

Rationale for nature of the course

Microbial physiology provides information on sources of energy and its utilization by microorganisms. Microorganisms play important role in environment as producers, consumers and decomposers. These are the only group of organisms which takes part in all three important stages of ecosystem. Understanding microbial physiology has greater application in industry, developing medicine and even in agriculture.

Activities having direct bearing on skill development/ employability/entrepreneurship:

- Microbial physiology has traditionally played a very important role in both fundamental research and in industrial applications of microorganisms.
- The classical approach in microbial physiology has been to analyze the role of individual components (genes or proteins) in the overall cell function.
- It is Possible to optimize industrial fermentations through introduction of directed genetic modification - an approach referred to as metabolic engineering.

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

CLOs	Course Learning Outcome <i>On successful completion of the programme, the students will be able to</i>	Knowledge Level
CLO1	Outline the concept of microbial nutrition and energy flow.	Up to K2
CLO2	Define the basic concept of microbial metabolism and photosynthesis.	Up to K3
CLO3	Summarize the concept of catabolism and catabolic pathways in microbes.	Up to K3
CLO4	Interpret the microbial anabolism and anabolic pathways	Up to K3
CLO5	Illustrate biosyntheses pathways of microbes	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	2	3
CLO2	2	2	2	2	2
CLO3	2	2	2	2	3
CLO4	3	3	2	2	2
CLO5	2	2	2	3	2

Advance application–3

Intermediate level –2

Basic level –1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	1	2	3	2	3
CLO2	2	3	2	2	2
CLO3	2	2	3	3	3
CLO4	2	2	2	2	2
CLO5	2	3	2	3	2

Advance application–3

Intermediate level –2

Basic level –1

LESSON PLAN

UNITS	DESCRIPTION	STAFF	HOURS	MODE
I Microbial Nutrition	a) Nutritional requirements of microorganisms - autotrophs, heterotrophs, phototrophs and chemotrophs		5	Chalk and Talk
	b) Energy production- Phosphorylation - types		5	
	c) Structure of ATP and its significance.		5	
II Transport of nutrients	a) Transport of nutrients – uptake of nutrients – passive diffusion – facilitated diffusion – active transport		5	Chalk and Talk
	b) Simple transport (uniport, symport and antiport) – group translocation and protein export system		5	
	c) Role of osmoregulatory proteins		5	
III Metabolism	a) Metabolism- Types, Aerobic, anaerobic respiration and fermentation		3	Chalk and Talk & PPT
	b) Catabolism – Glycolysis		3	
	c) Krebs cycle and ED pathway		3	
	d) Glyoxylate Pathway and Gluconeogenesis and their significance		3	
	e) Fermentation – alcoholic and lactic acid. Homo and heterolactic acid fermentation		3	
IV Anabolism	a) Anabolism - Photosynthesis		3	PPT & Chalk and Talk
	b) Classification and properties of prokaryotic photosynthetic microbes		4	
	c) Light reaction of Cyanobacteria, Purple and green bacteria		4	
	d) Dark reaction - C3 cycle and reductive TCA cycle		4	
V Biosynthetic pathways	a) Biosynthetic Pathway of Aminoacids – leucine, valine, isoleucine, methionine, lysine		6	PPT
	b) Biosynthetic Pathways - Purine and Pyrimidine pathways		5	
	c) Biosynthesis of Peptidoglycan		4	
Total			75 Hrs	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.8	41.6%
K2	5	6	10	10	31	25.8	
K3	-	-	20	30	50	41.7	41.7%
K4	-	-	10	10	20	16.7	16.7%
Total Marks	10	10	50	50	120	100.00	100%

Course designers

1. Mr. P. Sasikumar

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Major Practical	20U4RMP4	Major Practical – IV	2	3	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives:

1. To understand and acquire a wide knowledge on immunity and immune system
2. To know different immunological techniques
3. To employ laboratory techniques that basically develop the pre-analytical, analytical and post analytical skills for the performance of the tests
4. To demonstrate the stages of bacterial growth
5. To identify the effects of factors on bacterial growth

Course Learning Outcomes:

On successful completion of the programme, the students will be able to

1. Demonstrate an understanding of the key concepts in immunology
2. Illustrate the salient features of antigen antibody reactions and their uses in diagnostics and various other studies
3. Apply scientific principles in the interpretation of immunological responses and data
4. Analyse bacterial growth stages
5. Demonstrate the effects of factors affecting bacterial growth

S.No.	Experiments
1.	Study on blood cells - Identification of blood cells
2.	Total Leukocyte Count (TLC) of blood
3.	Separation of serum and plasma from the blood sample (demonstration).
4.	Identification of human blood groups and Rh typing
5.	Widal test for typhoid fever
6.	Immunodiffusion by Ouchterlony method
7.	Radial Immuno Diffusion method
8.	Immunoelectrophoresis
9.	Bacterial growth curve
10.	Factors affecting bacterial growth curve – Temperature and pH

Books for Reference

1. Carpenter D.L.(1975). Immunology and Serology. Third Edition. W.B. Saunders Company, London.
2. Garvey, J.S., Cremer, N.E. and Sussdorf, D.H. (1977). Methods in Immunology - A Laboratory Text for Instruction and Research. Third Edition. The Benjamin Cummings Publishing Company Advanced Book Program, London.
3. Hudson, L. and Hay, F.C. (1989). Practical Immunology. Third Edition. Blackwell scientific Publications, Oxford.
4. Myers, R.L. (1989). Immunology: A Laboratory Manual. Wm. C.Brown Publishers, Iowa.
5. Rastogi S.C. (1996). Immunodiagnostics Principles and Practice. New Age International (P) Ltd., New Delhi.
6. Talwar, G.P. (1983). A Hand Book of Practical Immunology. Vikas Publishing House Pvt. Ltd., New Delhi.
7. Talwar, G.P. and Gupta, S.K. (1992). A Hand Book of Practical and Clinical Immunology. Vol. 1 -2. CBS Publishers & Distributors, Delhi.
8. Turgeon, M.L. (1990). Immunology and Serology in Laboratory Medicine. The C.V. Mosby Company, Baltimore.

Web Resources

1. <https://www.mechanobio.info> › Development
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2581910>
3. <https://microbiologybook.org/mayer/ab-ag-rx.htm>
4. https://www.ebi.ac.uk/interpro/potm/2005_2/Page2.htm
5. <https://www.nejm.org/medical-research/autoimmune-disease> Course Learning Outcomes (CLO)

Rationale for nature of the course

Practical skills on immunological techniques help to understand and acquire a wide knowledge on immunity and immune system. It also provides wider knowledge on disease diagnosis and severity of infections. It helps to explore various growth stages of bacteria and the factors affecting bacterial growth.

Activities having direct bearing on skill development/ employability/entrepreneurship

- Applying key concepts in antigen-antibody reaction for immunological diagnosis
- Employing scientific principles in the interpretation of immunological responses for devising treatment plan
- Demonstrating bacterial growth stages and identifying the factors affecting bacterial growth.

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

CLOs	Course Learning Outcomes <i>On successful completion of the programme, the students will be able to</i>	Knowledge Level
CLO1	Demonstrate an understanding of the key concepts in immunology	Up to K1
CLO2	Illustrate the salient features of antigen antibody reactions and their uses in diagnostics and various other studies	Up to K2
CLO3	Apply scientific principles in the interpretation of immunological responses and data	Up to K2
CLO4	Analyse bacterial growth stages	Up to K3
CLO5	Demonstrate the effects of factors affecting bacterial growth	Up to K2

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	2	3
CLO2	2	2	2	3	2
CLO3	2	3	2	2	3
CLO4	2	2	2	2	2
CLO5	2	2	3	2	2

Advance application – 3,

Intermediate level – 2,

Basic level – 1.

Mapping of course outcome with Programme outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	3	2	2
CLO2	2	3	2	2	2
CLO3	2	2	3	3	2
CLO4	3	3	2	2	3
CLO5	2	2	2	2	2

Advance application – 3,

Intermediate level – 2,

Basic level – 1.

Course designers:

1. Dr.P.N.Rajarajan

2. Mr.P.Sasi Kumar

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	ADD ON -I	21U3RAD1	Biofertilizers and Biopesticides	2	2	50	50	100

Course Objectives:

1. To know the history and importance of biofertilizers and biopesticides
2. To analyze the interactions of biofertilizer with plant and soil system
3. To compare the uses of conventional and nano fertilizers
4. To explore the mechanisms used by biofertilizers and biopesticides
5. To recognize the roles of biofertilizer and biopesticides for the prevention plant diseases and improve yield

Course Learning Outcome:

n successful completion of the programme, the students will be able to

1. Understand the history and importance of biofertilizers and biopesticides
2. Discuss the interactions of biofertilizer with plant and soil system
3. Compare and contrast the uses of conventional and nano fertilizers
4. Explore the mechanisms used by biofertilizers and biopesticides
5. Recognize the roles of biofertilizer and biopesticides for the prevention of plant diseases and improve yield

Unit	Description	Hours
I	Unit I: Biofertilizers and Mass Production Biofertilizers - introduction, status and scope. Structure and characteristic features of bacterial biofertilizers (<i>Rhizobium</i> , <i>Azospirillum</i> and <i>Azotobacter</i>). Mycorrhizal Biofertilizers - Non - Symbiotic Nitrogen Fixers- Phosphate Solubilizers - Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Strategies of Mass multiplication and packing.	6hrs
II	Unit II: Biopesticides and Mass Production History and concept of biopesticides. Classification of biopesticides viz. pathogen, botanical pesticides, and biorationales - Bioinsecticides. Mass production technology of bio-pesticides.	6hrs
III	Unit III: Mass cultivation and Carrier Materials Mass production of biofertilizers - <i>Rhizobium</i> . Properties and qualities- Peat, perlite, charcoal or soil aggregates, Alginate-perlite dry granule, Mineral soils, Composted sawdust, Agriperlite, , Kaolin, Celite, Diatom, Vermiculite, Wheat bran, sugarcane baggass, waste water sludge, Sterilization of Carrier materials-storage.	6hrs

IV	Unit IV: Biocontrol agents Definition, scope and importance of Biological control Microbial control, Production of biopesticide based on Fungi (<i>Trichoderma</i>), bacteria (<i>Bacillus thuringiensis</i>), Viruses and Nematodes. Mechanism of disease control by bioagents.	6hrs
V	Unit V: Formulations and applications Liquid biofertilizers - Seed treatment- Root dipping- Soil application- foliar application - factors affecting quality of inoculants- Nano-fertilizers- Conventional-fertilizers- packing, Strategies of marking, Quality standard for biofertilizers and biopesticides.	6hrs

Total 30 Hours

Books for study

1. Kannaiyan, S. (2003). Bioethnology of Biofertilizers, CHIPS, Texas.
2. Mahendra K. Rai (2005). Hand book of Microbial biofertilizers. The Haworth Press Inc., New York.
3. Subba Rao N.S (1995) Soil microorganisms and Plant growth. Oxford and IBH publishing co. Pvt. Ltd., New Delhi.

Books for reference

1. Burges, H.D. (1998) Formulation of Microbial Pesticides. Kluwer Academic Publishers, Boston.
2. Motsara, I.M.R., Bhattacharyya, P. and Srivastava, B. (1995). Biofertilizer Technology, Marketing and Usage- A Source Book-cum-glossary. FDCO, New Delhi.
3. Subba Rao, N.S. (1993). Biofertilizers in Agriculture and Forestry. Oxford and IBH. Publ. Co., New Delhi.

Web Resources

1. <https://www.epa.gov/ingredients-used-pesticide-products/what-are-biopesticides>
2. https://agritech.tnau.ac.in/farm_enterprises/Farm%20enterprises_%20bio%20pesticides.html
3. https://agritech.tnau.ac.in/ta/org_farm/orgfarm_biofertilizers.html

Course Designers

1. Dr. K. Kannan

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	ADD ON - II	21U4RAD2	Medical Coding	2	2	50	50	100

Course Objectives:

1. To understand Anatomy and Physiology of the human body
2. To become familiar with medical definitions and terminology, their pronunciation and use of medical prefixes
3. To recognize coding medical procedures like what to code and how to prepare the forms
4. To identify differences between ICD-9-CM and ICD-10-CM guidelines
5. To apply coding conventions when assigning diagnoses and procedure code

Course Learning Outcomes:

On successful completion of the programme, the students will be able to

1. Understand medical terminology and definitions
2. Analyze the structure of human body systems and their functions
3. Explore biochemical analysis of human body fluids
4. Understand diseases of human body
5. Recognize different coding guidelines and coding exams

Unit	Course Topics	Hours
I	Unit I: Introduction to Medical Coding Medical Coding in History - The Black Death - William Farr and the Cholera Studies - International list of causes of death - Beyond death - Modern times.	6hrs
II	Unit II: Medical Terminology Definition and Origin of Medical Terms. Components of Medical Terms – Prefixes, Suffixes, Roots and Combining forms. Terms relating to the body as a whole.	6hrs
III	Unit III: Anatomy and Physiology The chemical basis of life. Anatomy of cells and tissues. Anatomy and Physiology of skin and appendages, skeleton- muscular, nervous, cardiovascular, respiratory, digestive and urinary systems.	6hrs
IV	Unit IV: Biochemistry Chemistry of the human body fluids in health and diseases – blood, cerebrospinal fluid and urine. Clotting mechanism of the blood. Enzymes produced in the G.I. Tract. Electrolytes and water balance, acid-base balance. Normal values and ranges of biochemistry investigations	6hrs

V	Unit V: Procedure Coding Healthcare Common Procedure Coding System (HCPCS). International Classification of Diseases and Clinical Modification - ICD-9-CM and ICD-10-CM coding guidelines. Current Procedural Terminology (CPT) procedure coding. Certified Professional Coder (CPC) exam.	6hrs

Total 30 Hours

Books for Study

1. Carol J Buck. (2021). Step-by-step Medical Coding. 3rd Edition, Saunders, Philadelphia.
2. Patricia Aalseth. (2006). Medical Coding. Jones and Bartlett Publishers, Massachusetts.

Course designers

1. **Mr. P. Sasikumar**

DEPARTMENT OF MICROBIOLOGY				Certificate Course				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Certificate Course - II		Food Processing and preservation	2	2	50	50	100

Course Objectives:

1. To know the principle and methods involved in the processing of perishable foods
2. To familiarize the students about the processing and preservation techniques of variety of foods
3. To develop skills in handling the perishable food processing equipment
4. To study the need for processing foods composition and nutritive value of plant and animal foods and storage

Course Learning Outcomes:

On successful completion of the programme, the students will be able to

1. Understand the principles and methods involved in the processing of Perishable foods
2. Discuss the processing and preservation techniques of variety of foods
3. Handle skillfully the various food processing equipment
4. Explore the need for processing foods, composition and nutritive value of plant and animal foods and storage

Unit	Description	Hours
I	Introduction of food preservation Definition and scope of food preservation, principles of preservation, preservatives and its types, shelf life of food products, Food Preservation by high temperature, Drying and dehydration, Low temperature.	6hrs
II	Cereals, Millets and Pulses Nutritive value, Composition and structure of Cereals, Millets and Pulses - Milling and processing of Cereals, Millets and Pulses for value added products - puffs, flakes, extruded products and pasta. Flour Fortification to Improve Nutritive Value, Specialty Corn for Value Addition. Malting Technology. Germination, decortication and splitting of pulses. Elimination of toxic factors in fermented and Non-fermented soya products.	6hrs
III	Fruits and Vegetables Nutritive value, Composition and Classification of fruits and vegetables. Processing and preservation of Fruits-Controlled atmosphere storage of perishables (frozen, canned) Dry storage of fruits and vegetables - dehydration and sun drying. Ohmic Processing, Extrusion technology, High pressure technology- Ozonation. Value added products -Jams, Jellies, Pickles, Purees, Powders, Crush, Squash, Juices, Fruit Wine).	6hrs

IV	Meat, Poultry and Sea foods Meat and poultry processing - smoking and curing, Meat products- fermented meat, sausage, bacon, kebabs, dehydrated powders, frozen meat and chicken. Storage and Packaging of meat products. Sea Food Processing – Types, Pre-Processing, Processing & Preservation. Dielectric, Ohmic and Infra-red heating. Nutritional losses during Processing and Storage.	6hrs
V	Milk and Milk Products Pasteurization, Homogenization and Standardization. Manufacture of condensed milk, milk powder, cheese, ice-cream, fresh cream, butter, ghee, Khoa, Curd and Paneer. Evaluation of quality parameters. Defects encountered during production, packaging and storage. Substitutes for milk and milk products.	6hrs

Total 30 Hours

Books for Study

1. Srilakshmi, B. (2002). Food science, New Age Publishers, New Delhi.
2. Meyer. (2004). Food Chemistry. New Age, New Delhi.
3. Bawa. A.S., and Chauhanetal. O.P. (2013). Food Science. New India Publishing agency, New Delhi.
4. Frazier,W.C.,Westh off, D.C. (2004). Food Microbiology. TMH Publication, New Delhi.

Web resources

1. <https://www.scitechnol.com/scholarly/food-processing-and-preservation-journals-articles>.
2. <http://www.fao.org/3/x5573E/x5573e0e.htm>
3. <https://www.eufic.org/en/food-production/article/processed-food-qa>
4. https://www.streetdirectory.com/food_editorials/meals/food/common_methods_of_processing_and_preserving_food.html
5. <https://www.highspeedtraining.co.uk/hub/food-preservation-methods/>

Course designers

1. **Dr. A. P. Ashakannan**

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III & IV	Self Study	20U4RSS1	Probiotics	2	-	50	50	100

Course Objectives:

1. To know the history and importance of probiotics
2. To analyze the interactions of probiotics with immune system
3. To compare the uses of various probiotic bacteria
4. To explore the mechanisms used by probiotic microbes to modulate the immune responses in animals and humans
5. To recognize the roles of probiotic microorganisms for the prevention or treatment of animal and human diseases

Course Learning Outcome:

On successful completion of the programme, the students will be able to

1. Understand the history and importance of probiotics
2. Discuss the interactions of probiotics with immune system
3. Compare and contrast the uses of various probiotic bacteria
4. Explore the mechanisms used by probiotic microbes to modulate the immune responses in animals and humans
5. Recognize the roles of probiotic microorganisms for the prevention or treatment of animal and human diseases

Unit	Description	Hours
I	Unit I: Introduction to Probiotics Definitions and History. Classification and physiology - Lactic acid bacteria (LAB), <i>Bifidobacterium</i> and <i>Propionibacterium</i> . Impact of genomics on the characterization of probiotics.	6hrs
II	Unit II: Probiotics and immune system Introduction to innate and adaptive immunity. Immuno modulatory properties of probiotics- bacterial surface proteins. Interactions with the immune system, Genetically engineered LAB and <i>Bifidobacterium</i> for mucosal delivery of health-associated molecules	6hrs
III	Unit III: Biotechnological applications Applications of LAB in food fermentation. Antimicrobials components of LAB. Nutraceuticals and high value metabolites produced by LABs. Development of Probiotics for animal and human health.	6hrs
IV	Unit IV: Probiotics safety and efficacy Guidelines on Probiotics (FAO/WHO). Safety considerations on probiotics. Environmental factors influencing the efficacy of probiotics, Efficacy of probiotics in human host.	6hrs

V	Unit V: Recent developments in probiotics Overview on the microbiome. Prebiotics, Probiotics, and Symbiotics. Manipulation of the microbiome with probiotics. Microbiome based new probiotic microorganisms.	6hrs

Total 30 Hours

Books for Study

1. Salminen, S. and Wright, A.V. (1998). Lactic acid bacteria Microbiology and Functional Aspects. 2nd Ed., Marcel Dekker, New York.
2. Adams, M.R. and Nout, M.J.R. (2001). Fermentations and Food Safety. Aspen Publication. Aspen Publishers, Inc., Gaithersburg, Maryland.
3. Wood, B.J.B. and Holzapfel, W.H. (1995). The genera of Lactic acid bacteria. Vol 1 and 2. Springer, US.
4. Dash ANS and Beth ML (2000). Health Benefits of Probiotics, BL Publications, California.

Books for Reference

1. Gibson, G.R. and Christine M. Williams. (2001). Functional foods: Concept to product. CRC Press, Boca Raton, Boston.
2. Gibson, GR and Roberfroid (2008) Handbook of Prebiotics, CRC Press, Taylor & Francis Group, Boca Raton, FL
3. Goktepe, I., Juneja, V.K. and Ahmedna M. (2006). Probiotics in Food Safety and Human Health. CRC Press, Taylor & Francis Group, Boca Raton, FL
4. Yuan KL and Seppo S (2008). Handbook of Probiotics and Prebiotics, WileyInterscience Publication, New Jersey.

Web Resources:

1. <https://www.food.lth.se>
2. https://onlinecourses.swayam2.ac.in/cec20_ag14/preview
3. <https://www.healthline.com/nutrition/11-super-healthy-probiotic-foods>
4. <https://www.longdom.org/probiotics-health.html>

Course designers

1. **Mr. P. Sasikumar**

DEPARTMENT OF MICROBIOLOGY				CLASS: I B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core Practical - I	20U1RMP1	Major Practical - I	2	3	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives:

1. To familiarize in general microbiology techniques
2. To develop a sufficient background to students about the growth of microbes
3. To explain the ubiquitous nature and characteristics of microbes
4. To prepare different media for culturing microorganisms
5. To identify and differentiate bacteria and fungi using different methods

Course Learning Outcomes:

On successful completion of the programme, the students will be able to

1. Define the principles and application of instruments associated with microbiology
2. Describe the various methods to control microbial growth
3. Elaborate the concepts of microbial cells in terms of growth, division, specialization, motility and interaction
4. Demonstrate the methods for the isolation of bacteria, fungi and algae
5. Exhibit the practical skills in the use of tools, technologies and methods common to microbiology

S.No.	Experiments
1.	Principle, methods of sterilization and safety measures.
2.	Preparation of media (simple and selective media).
3.	Pure culture techniques: streak plate, spread plate and pour plate.
4.	Description of compound microscope and its parts.
5.	Motility determination-Hanging drop method.
6.	Isolation and identification of bacteria and fungi from different environmental samples.
7.	Enumeration of bacteria-viable count (plate count) and total count (Haemocytometer count-yeast cells).
8.	Fungal staining-Lactophenol cotton blue.
9.	Staining methods: simple, Gram's staining, endospore staining, negative and capsule
10.	Measurement of growth rate and generation time by turbidometry method.

Books for Reference

1. Aneja, K.R. (2003). Experiments in Microbiology: Plant Pathology and Tissue Culture. WishwaPrakashan, New Delhi.
2. Cappuccino, J.H and Sherman, N. (2007). Microbiology- A Lab Manual. 7th edition. The Benjamin Publishing Company, Singapore.
3. Gunasekaran, P. (2008). Laboratory Manual in Microbiology. New Age International (P) Ltd. Publishers, New Delhi.

Web Resources

1. <https://www.biocourseware.com>
2. <https://www.microbiologyonline.com>
3. <https://www.ncbi.nlm.nih.gov/>
4. [https://www.youtube.com](https://www.youtube.com/watch?v=Introduction-to-microbiology-culture)
5. [https://www.practical microbiology.m.youtube.com](https://www.youtube.com/watch?v=Practical-microbiology)

Rationale for Nature of the course

The course familiarizes different concepts in general microbiology techniques and to develop a sufficient background to students about the growth of microbes. The ubiquitous nature and characteristics of microbes, different media for culturing microorganisms will be focussed.

Activities having direct bearing on skill development/ employability/entrepreneurship

- Students will be able to observe ubiquitous nature of microbes through microscope.
- Handle various tools, instruments and apply the same for the identification of microbes.
- Identify and differentiate various microorganism based on their characteristics features.

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

CLOs	Course Learning Outcomes	Knowledge Level
	<i>On successful completion of the programme, the students will be able to</i>	
CLO1	Define the principles and application of instruments associated with microbiology.	Up to K1
CLO2	Describe the various methods for microbial control.	Up to K2
CLO3	Elaborate the concepts of microbial cells in terms of growth, division, specialization, motility and interaction.	Up to K2
CLO4	Demonstrate the methods for the isolation of bacteria, fungi and algae.	Up to K3
CLO5	Exhibit the practical skills in the use of tools, technologies and methods common to microbiology.	Up to K2

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	1	2	2	3	3
CLO2	2	3	3	2	2
CLO3	2	2	2	2	3
CLO4	3	3	3	3	2
CLO5	2	2	2	2	2

Advance application – 3, Intermediate level – 2, Basic level – 1.

Mapping of course outcome with Programme outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	3	2	2
CLO2	2	3	2	2	2
CLO3	1	2	3	3	3
CLO4	2	3	2	2	2
CLO5	2	2	2	3	3

Advance application – 3, Intermediate level – 2, Basic level – 1

Course designers:

1. Dr. S. Sree Gayathri

DEPARTMENT OF MICROBIOLOGY				CLASS: I B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core Practical	20U2RMP2	Major Practical - II	2	3	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives:

1. To gain competence in the broad scientific theory and application of techniques associated with molecular biology and microbial genetics.
2. To identify the basic microbial metabolism.
3. To explore different stages of mitosis, meiosis and to isolate genomic DNA.
4. To study bacterial taxonomy by using bacterial morphology and biochemical tests.
5. To cultivate fungi by slide culture method

Course Learning Outcomes:

On successful completion of the programme, the students will be able to

1. Familiarize with the basic techniques associated with microbial taxonomy
2. Develop and apply the protocols for basic experimental work in the field of cell and molecular biology
3. Outline the most significant molecular and cell based methods used today to extend their knowledge of biology
4. Illustrate the stages of mitosis and meiosis
5. Isolate the genomic and plasmid DNA from bacteria.

S.No.	Experiments
1.	Mitosis in onion root meristem - Squash technique.
2.	Chromosomal behaviour and Meiosis in flower bud- <i>Rhoeo.sp.</i> - Squash technique.
3.	Isolation of chloroplast from spinach leaves.
4.	Isolation and Demonstration of plasmid DNA from bacteria.
5.	Isolation and Demonstration of genomic DNA from bacteria.
6.	Collection and identification of algae
7.	Study of colony characteristics of Bacteria.
8.	Study of bacterial taxonomy by using biochemical tests.
9.	Fungi slide culture technique
10.	Measurement of fungal growth rate – colony diameter method

Books for Reference

1. Cooper, G.M and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C; Sinauer Associates, MA.
2. Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley & Sons, Inc. New Jersey.
3. De Robertis, EDP and De Robertis, EMF. (2006). Cell and Molecular Biology. 8th edition. Lipincott Williams and Wilkins, Philadelphia.
4. Gunasekaran, P. (2008). Laboratory Manual in Microbiology, New Age International (P) Ltd. Publishers, New Delhi.
5. Brown, T.A. (1998). Molecular Biology Lab; Gene Analysis, Academic Press, London.

Web Resources

1. <https://www.biocourseware.com>
2. <https://www.microbiologyonline.com>
3. <https://www.ncbi.nlm.nih.gov/>
4. <https://www.introduction to microbiology culture.m.youtube.com>
5. <https://www.practical microbiology.m.youtube.com>

Rationale for nature of the course

Student become competent in the application of techniques associated with molecular biology. Identifying various physiological processes and molecular characterization of microorganisms. The taxonomical position of microbes can be determined based on the morphological and biochemical characteristics.

Activities having direct bearing on skill development/ employability/entrepreneurship

- Able to isolate and analyse the genomic DNA from prokaryotes and eukaryotes.
- Knowledge gained could be applied for further studies.
- Classify microorganisms based on its morphology and cultural characteristics.

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

CLOs	Course Learning Outcomes	Knowledge Level
	<i>On successful completion of the programme, the students will be able to</i>	
CLO1	Familiarize with the basic techniques associated with microbial taxonomy	Up to K1
CLO2	Develop and apply the protocols for basic experimental work in the field of cell and molecular biology	Up to K2
CLO3	Outline the most significant molecular and cell based methods used today to extend their knowledge of biology	Up to K2
CLO4	Illustrate the stages of mitosis and meiosis	Up to K3
CLO5	Isolate the genomic and plasmid DNA from bacteria.	Up to K2

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	2	3
CLO2	2	3	2	3	2
CLO3	3	3	3	2	3
CLO4	2	2	2	2	2
CLO5	3	2	2	2	3

Advance application – 3, Intermediate level – 2, Basic level – 1.

Mapping of course outcome with Programme outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	3	2	2
CLO2	2	3	2	2	3
CLO3	3	2	3	3	2
CLO4	2	3	2	2	3
CLO5	2	2	2	2	2

Advance application – 3, Intermediate level – 2, Basic level – 1.

Course designers:

1. Dr. S. Sree Gayathri

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Allied	20U3RAP1	Ancillary Practical I	1	2	40	60	100

Nature of Course			
Knowledge and skill	✓		Employability oriented
Skill oriented			Entrepreneurship oriented

Course Objectives:

1. To familiarize with general microbiology techniques.
2. To know the methods of sterilization of media and glassware.
3. To explain the methods of cultivation of microbes.
4. To identify the morphology of microbes by staining methods
5. To explore antibiogram of bacteria

Course Learning Outcomes:

On successful completion of the programme, the students will be able to

1. Demonstrate the practical skills in the use of tools, technologies and methods common to microbiology.
2. Prepare various culture media, brief various physical and chemical means of sterilization.
3. Acquaint general bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and algae.
4. Identify bacteria, fungi and algae
5. Determine the antibiogram of bacteria

S.No.	Experiments
1.	Handling of Microscope
2.	Microscopic observation of bacteria –Simple and Differential staining (Gram and Acid Fast)
3.	Microscopic observation of bacterial structures – spore staining and capsule staining (positive and negative)
4.	Motility Test – Hanging drop method
5.	Microscopic observation of fungi–Lactophenol cotton blue staining
6.	Microscopic observation of algae
7.	Sterilization methods – moist heat, dry heat, filtration and radiation.
8.	Preparation of culture media –solid (selective and differential) and liquid
9.	Isolation of single colonies on solid media – Slant, Streak –Simple and Quadrant
10.	Antibiotic sensitivity test – Kirby –Bauer method

Books for Study

1. Aneja, K.R. (2005). Experiments in Microbiology, Plant pathology and Biotechnology. 4th Edition, New Age International Publishers, Chennai.
2. James G Cappuccino and Natalie Sherman. (2004). Microbiology: A Laboratory Manual. 6th Edition, Pearson Education, USA.

Books for Reference

1. Ashok, R. (2000). Antimicrobials in Laboratory Medicine, B.I. Churchill Livingstone, New Delhi.
2. Collee, J.G., Fraser, A.G., Marmion B.P. and Simmons. A. (2007). Mackie and McCartney Practical Medical Microbiology. Elsevier, New York.
3. Ranjan Kumar De, (2007). Diagnostic Microbiology (For DMLT Students). Jaypee Brothers publishing, New Delhi.
4. Gunasekaran, P. (2008). Laboratory Manual in Microbiology. New Age International (P) Ltd., New Delhi.

Web Resources

1. <https://www.biocourseware.com/iphone/ghistory/index.htm>
2. <https://www.microbiologynutsandbolts.co.uk/normal-flora.html>
3. <https://www.microbiologyinfo.com/category/basic-microbiology>

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Rationale for nature of the course

Practical skills on various microbiological techniques form the basis of biotechnological experiments. Isolation, screening, identification and characterization of various types of microorganisms and its significance in clinical, environmental, industrial processes paved the way for novel biotechnological inventions. Understanding the nature, growth requirements and characteristics of microorganisms helps to explore its economic importance in the field of biotechnology.

Activities having direct bearing on skill development/ employability/entrepreneurship

- Providing practical insight on microscopic observation, differentiation and identification of various microbes
- Imparting hands-on skills related to basic microbiological and pure culture techniques

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

CLOs	Course Learning Outcomes <i>On completion of this course the students will be able to</i>	Knowledge Level
CLO-1	Demonstrate the practical skills in the use of tools, technologies and methods common to microbiology.	Up to K2
CLO-2	Prepare various culture media, brief various physical and chemical means of sterilization.	Up to K3
CLO-3	Acquaint general bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and algae.	Up to K3
CLO-4	Identify bacteria, fungi and algae	Up to K1
CLO-5	Determine the antibiogram of bacteria	Up to K3

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	1	2	2	1	2
CLO2	2	1	2	1	2
CLO3	2	1	2	2	2
CLO4	3	2	2	1	2
CLO5	2	1	2	3	2

Advance application–3

Intermediate level –2

Basic level –1

Mapping of course outcome with Programme outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	3	1	3
CLO2	2	3	2	1	2
CLO3	2	2	3	2	3
CLO4	3	3	2	1	2
CLO5	2	2	3	3	3

Advance application – 3,

Intermediate level – 2,

Basic level – 1.

LESSON PLAN

Experiment Number	Description	Staff	Hours	Mode
1	Handling of Microscope		3	Practical demo and learning
2	Staining methods: Simple and Gram's staining. Differentiate bacteria based on shape and arrangements Observe minute cells under microscope. Understand the chemical and theoretical basics of differential staining procedures.		3	
3	Staining methods: Negative, capsule and endospore staining. Observe special structures of cells under microscope.		3	Group lab work
4	Motility Test – Hanging drop method		3	Joint productive activity
5	Microscopic observation of fungi–Lactophenol cotton blue staining		3	Lecturing and discussion
6	Microscopic observation of algae		3	Group lab work
7	Principle, methods of sterilization and safety measures. Discuss laboratory safety guidelines (Rules and Regulations) and basic instrumental requirements. Instructions for potential laboratory hazards (physical, chemical and microbiological) Idea about specific types of sterilization (dry heat, moist heat, cold sterilization)		3	Group lab work
8	Preparation of media. To understand media and its types. To become familiar with media preparation (agar plate, slant, broth) . To cultivate microorganisms.		3	Group lab work
9	Pure culture techniques: streak plate, spread plate and pour plate. To purify microorganisms from mixed culture. To learn different types of streaking techniques. Isolate mutagenic or converted microorganisms by using differential new procedures.		3	Group lab work
10	Antibiotic sensitivity test – Kirby –Bauer method		3	Group lab work
Total			30 Hrs	

Course designers

1. Dr. S. Sree Gayathri

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Allied	20U4RAP1	Ancillary Practical II	1	2	40	60	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives:

1. To familiarize with milk and water quality techniques
2. To know the isolation and identification of nitrogen fixing bacteria from root nodules
3. To explain the methods of enumeration of microbes
4. To identify the bacterial and fungal plant pathogens
5. To explore wine production

Course Learning Outcomes:

On successful completion of the programme, the students will be able to

1. Demonstrate the milk and water quality techniques
2. Isolate and identify nitrogen fixing bacteria from root nodules
3. Experiment with microbial ecology and its interaction
4. Isolate and identify bacteria, fungi and algae
5. Determine the role of bacteria in environment and industrial processes

S.No.	Experiments
1.	Methylene Blue Reductase Test
2.	Resazurin dye reduction test
3.	Isolation of Nitrogen fixing bacteria from root nodules of legumes
4.	Enumeration of bacteria from soil
5.	Enumeration of fungi from soil
6.	Examination of plant diseases – Bacterial diseases of Plants – bacterial blight of rice and citrus canker
7.	Examination of plant diseases –Fungal diseases of Plants –leaf spot of rice and rust of sorghum
8.	MPN test
9.	Antibiosis – Plate method using soil
10.	Production of wine (demo)

Books for Study

1. Aneja, K.R. (2005). Experiments in Microbiology, Plant pathology and Biotechnology. 4th Edition, New Age International Publishers, Chennai.
2. James G Cappuccino and Natalie Sherman. (2004). Microbiology: A Laboratory Manual. 6th Edition, Pearson Education, USA.

Books for Reference

1. Ashok, R. (2000). Antimicrobials in Laboratory Medicine, B.I. Churchill Livingstone, New Delhi.
2. Collee, J.G., Fraser, A.G., Marmion B.P. and Simmons. A. (2007). Mackie and McCartney Practical Medical Microbiology. Elsevier, New York.
3. Ranjan Kumar De, (2007). Diagnostic Microbiology (For DMLT Students). Jaypee Brothers publishing, New Delhi.
4. Gunasekaran, P. (2008). Laboratory Manual in Microbiology. New Age International (P) Ltd., New Delhi.

Web Resources

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2. <https://www.microbiologynutsandbolts.co.uk/normal-flora.html>
3. <https://www.microbiologyinfo.com/category/basic-microbiology>

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Rationale for nature of the course

Practical skills on various microbiological techniques form the basis of biotechnological experiments. Isolation, screening, identification and characterization of various types of microorganisms and its significance in clinical, environmental, industrial processes paved the way for novel biotechnological inventions. Understanding the nature, growth requirements and characteristics of microorganisms helps to explore its economic importance in the field of biotechnology.

Activities having direct bearing on skill development/ employability/entrepreneurship

- Providing practical insight on quality of milk and water.
- Characterization of microbes present in environmental samples and exploring its ecological consequences.

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

On completion of this course the students will be able to

CLOs	Course Learning Outcomes <i>On completion of this course the students will be able to</i>	Knowledge Level
CLO-1	Demonstrate the milk and water quality techniques.	Up to K2
CLO-2	Isolate and identify nitrogen fixing bacteria from root nodules.	Up to K3
CLO-3	Experiment with microbial ecology and its interaction	Up to K3
CLO-4	Isolate and identify bacteria, fungi and algae	Up to K1
CLO-5	Determine the role of bacteria in environment and industrial processes.	Up to K3

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	1	2	2	3	2
CLO2	2	2	3	2	2
CLO3	2	3	2	3	2
CLO4	3	3	2	3	2
CLO5	2	3	2	3	2

Advance application–3

Intermediate level –2

Basic level –1

Mapping of course outcome with Programme outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	3	2	3	2	3
CLO2	2	3	2	2	2
CLO3	2	2	3	2	3
CLO4	3	3	2	2	2
CLO5	2	2	3	3	3

Advance application – 3,

Intermediate level – 2,

Basic level – 1.

LESSON PLAN

Experiment Number	Description	Staff	Hours	Mode
1	Methylene Blue Reductase Test Add Sample and Dye Incubate and Observe results		3	Practical demo and learning
2	Resazurin dye reduction test Add Sample and Dye Incubate and Observe results		3	Practical demo learning
3	Isolation of Nitrogen fixing bacteria from root nodules of legumes Isolate bacteria from root nodules. Identify morphology.		3	Group lab work
4	Enumeration of bacteria from soil Isolate soil bacteria Enumerate and Identify morphology.		3	Joint productive activity
5	Enumeration of fungi from soil Isolate soil fungi Enumerate and Identify morphology.		3	Lecturing and discussion
6	Examination of plant diseases – Bacterial diseases of Plants – bacterial blight of rice and citrus canker		3	Group lab work
7	Examination of plant diseases –Fungal diseases of Plants –leaf spot of rice and rust of sorghum		3	Group lab work
8	MPN test. Prepare media and Sterilize Inoculate and Incubate Observe the results		3	Group lab work
9	Antibiosis – Plate method using soil		3	Group lab work
10	Production of wine (demo)		3	Group lab work
Total			30 Hrs	

Course designers

1. Mr. P. Sasikumar

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Allied	20U3RAC1	Basic Microbiology	4	4	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives:

1. To impart basic knowledge on history of microbiology
2. To learn and relate the structural variation among the micro-organisms.
3. To emphasize the significance of beneficial microbes
4. To enable the students to explore the methods for the control of pathogenic microbes.
5. To understand various aspects of classical Microbiology and fundamental concepts in practical microbiological techniques that forms the basis for any biotechnology application.

Course Learning Outcomes:

On successful completion of the programme, the students will be able to

1. Explain the fundamental concepts; describe the history and development of microbiology.
2. Apply various staining techniques to differentiate and identify the microorganisms.
3. Identify the basic growth requirements of bacteria and demonstrate the practical skills in isolation, cultivation and preservation of microorganisms.
4. Apply suitable methodologies to control the growth of microbes by various sterilization techniques and by the use of other chemical agents
5. Compare and contrast the structural organization and economic importance of fungi, algae, viruses and protozoa.

Unit	Description	Hours	K-level	CLO
I	Unit I: Introduction and History of Microbiology Discovery of microorganisms- Contributions of Leeuwenhoek, Louis Pasteur, Edward Jenner, Robert Koch, Elie Metchnikoff and Fleming. Classification based on Carl Woese (The three domains) and Robert H. Whittaker (Five Kingdom system).	12 hrs	Up to K2	1
II	Unit - II: Structural organization and Staining of Microbes Types of bacteria based on morphology and flagella. Ultrastructure of bacteria (eg. <i>E. coli</i>)- cell wall, cell membrane, flagella, fimbriae, capsule, pili, endospore and cysts. Staining techniques – Simple, differential and special staining; Fungal staining. Microscopy – parts, principle and working mechanism of Bright field and Dark field microscope.	12 hrs	Up to K3	2

III	Unit - III: Growth and Culturing Techniques Nutritional requirements –factors affecting growth - determination of growth, growth curve - media and its types (natural, synthetic, selective, differential and enrichment media). Culture techniques – pure culture methods (direct plating, serial dilution technique, streak plate, spread plate, pour plate, stab culture, slant culture), anaerobic culture - preservation of cultures.	12 hrs	Up to K3	3
IV	Unit - IV: Control of microbes Sterilization, disinfection, sanitization, antisepsis. Physical methods- dry heat, moist heat, UV light, ionizing radiation, filtration, HEPA filter, Tyndallisation, Pasteurization. Chemical methods-Mode of action and uses of: halogen and halogen compounds, compounds of heavy metals, phenols and its derivatives, alcohol, detergents. Chemosterilant gases (formaldehyde, ethylene oxide, beta propiolactone).	12 hrs	Up to K3	4
V	Unit - V: Types of Microbes and their Economic Importance General characteristics, morphology, ultra structure and economic importance of Algae – <i>Chlamydomonas</i> and <i>Anabaena</i> . Fungi- <i>Aspergillus niger</i> and <i>Saccharomyces cerevisiae</i> . Virus- HIV and T4 bacteriophage, Virions and Prions. Protozoa- <i>Amoeba</i> , <i>Plasmodium</i> .	12 hrs	Up to K4	5

Total 60 Hours

Books for Study

1. Dubey, R.C. and Maheswari, D.K. (2005). A text book of Microbiology. Revised Multicolour Edition. S. Chand & Company Limited, New Delhi.
2. Pelczar, T.R., Chan, E.C.S. and Kreig, N.R. (2006). Microbiology. 5th Edition. Tata McGraw – Hill, New Delhi.

Books for Reference

1. Prescott, L.M., Harley, J.P. and Klein, D.A. (2005). Microbiology. 6th Edition. Tata McGraw – Hill, New Delhi.
2. Moat, A.G. and Foster, J.W. (2002). Microbial Physiology. 3rd Edition. John Wiley & Sons, New York.
3. Boyd, R.F. (1984). General Microbiology. Times Mirror / Mosby College Publishers, UK.
4. Purohit, S.S. (2005). Microbiology – Fundamentals and Applications. Student Edition Publishers, Jodhpur.
5. Schlegel, H.G. (1993). General Microbiology. 7th Edition. Cambridge University Press, UK.

Web Resources

1. <https://microbiologyinfo.com/category/basic-microbiology/>
2. <https://www.britannica.com/science/microbiology>
3. <https://www.youtube.com/watch?v=oEvUbWPWVqw>
4. https://www.youtube.com/watch?v=gKA_VLC4-jQ&list=PLzju0_wImbUfJsCfSHyeB1iZ95PsTp85v

Rationale for nature of the course

Microorganisms play indispensable role in the field of biotechnology as they act as a main carrier for all biotechnological techniques. For any biotechnological application, understanding theoretical and practical aspects in microbiology becomes essential. It helps to realize the significance of beneficial microbes in various life processes.

Activities having direct bearing on skill development/ employability/entrepreneurship

Applying technical skills to differentiate and identify microorganisms
Exploring theoretical and practical aspects for isolation, cultivation, preservation and control of microorganisms
Imparting knowledge on economic importance of various microorganisms

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

On completion of this course the students will be able to

CLOs	Course Learning Outcome	Knowledge Level
CLO-1	Explain the fundamental concepts; describe the history and development of microbiology.	Up to K2
CLO-2	Apply various staining techniques to differentiate and identify the microorganisms.	Up to K3
CLO-3	Identify the basic growth requirements of bacteria and demonstrate the practical skills in isolation, cultivation and preservation of microorganisms.	Up to K3
CLO-4	Apply suitable methodologies to control the growth of microbes by various sterilization techniques and by the use of other chemical agents	Up to K3
CLO-5	Compare and contrast the structural organization and economic importance of fungi, algae, viruses and protozoa.	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	1	1	1	1	1
CLO2	3	2	1	3	3
CLO3	3	3	2	3	3
CLO4	3	3	2	3	3
CLO5	3	3	2	3	1

Advance application – 3,

Intermediate level – 2,

Basic level – 1.

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	3	1	1	1	1
CLO2	3	2	1	2	3
CLO3	3	3	3	3	3
CLO4	3	3	2	3	2
CLO5	3	3	2	3	1

Advance application – 3,

Intermediate level – 2,

Basic level – 1.

Learning Outcome Based Education & Assessment (LOBE) - Blue Print Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

LESSON PLAN

Units	Description	Staff	Hours	Mode
I Introduction and History of Microbiology	Introduction, History of Microbiology, Discovery of microorganisms		2	Chalk and talk
	Contributions of Leeuwenhoek, Louis Pasteur, Edward Jenner , Robert Koch, Elie Metchnikoff and Fleming		6	Screening of educational videos
	Classification based on Carl Woese (The three domains) and Robert H. Whittaker (Five Kingdom system)		4	Chalk and talk
II Structural organization and Staining of Microbes	Bacteria, types of bacteria based on morphology and flagella		2	PPT
	Ultrastructure of bacteria (eg. <i>E.coli</i>)- cell wall, cell membrane, flagella, fimbriae, capsule, pili, endospore and cysts		3	Screening of educational videos
	Staining techniques – Simple, differential and special staining; Fungal staining		4	Screening of educational videos
	Microscopy – parts, principle and working mechanism of simple and compound microscope		3	PPT
III Growth and Culturing Techniques	Growth of bacteria– nutritional requirements –factors affecting growth - determination of growth, growth curve		3	Chalk and talk
	Media and its types (natural, synthetic, selective, differential and enrichment media)		3	Quiz
	Culture techniques –pure culture methods (direct plating, serial dilution technique, streak plate, spread plate, pour plate, stab culture, slant culture)		4	Screening of educational videos
	Anaerobic culture, preservation of cultures		2	
IV Control of microbes	Sterilization, Disinfection, sanitization, antisepsis.		3	PPT
	Physical methods- dry heat, moist heat, UV light, ionizing radiation, filtration, HEPA filter, Tyndallisation, Pasteurization.		4	Chalk and talk
	Chemical methods-Mode of action and uses of: halogen and halogen compounds, compounds of heavy metals, phenols and its derivatives, alcohol, detergents. Chemosterilant gases (formaldehyde, ethylene oxide, beta propiolactone)		5	Chalk and talk

V Types of Microbes and their Economic Importance	General characteristics, morphology, ultra structure and economic importance of Algae – <i>Chlamydomonas</i> & <i>Anabaena</i>		3	Seminar, Group discussion
	General characteristics, morphology, ultra structure and economic importance of Fungi- <i>Aspergillus niger</i> and <i>Saccharomyces cerevisiae</i> .		3	Seminar, Group discussion
	General characteristics, morphology, ultra structure and economic importance of Virus- HIV and T4 bacteriophage, Brief study on Virions and Prions		3	Seminar, Group discussion
	General characteristics, morphology, ultra structure and economic importance of Protozoa- <i>Amoeba</i> , <i>Plasmodium</i>		3	Seminar, Group discussion
Total			60 Hrs	

Course designers : 1. Dr. P. Kiruthika Lakshmi

DEPARTMENT OF MICROBIOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Allied	20U4RAC2	Applied Microbiology	4	4	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives:

1. To understand the concept of microbial contamination and spoilage of foods and their preservation and microbiological production of foods.
2. To study beneficial microbes in soil and control of plant diseases.
3. To analyze the microbes in environment and water contamination.
4. To know the biopharmaceuticals and their production.
5. To identify the principles of industrially important microorganisms and the process of production of industrially important products.

Course Learning Outcomes:

On successful completion of the programme, the students will be able to

1. Comprehend the concept of microbial contamination and spoilage of foods and their preservation and microbiological production of foods.
2. Discuss beneficial microbes in soil and control plant diseases.
3. Analyze the microbes in environment and water contamination.
4. Distinguish the production of biopharmaceuticals and antibiotics.
5. Categorize the microorganisms of industrial importance and industrial production of products.

Unit	Description	Hours	K-level	CLO
I	Unit - I: Food Microbiology Microorganisms of food spoilage and their sources. Contamination and Spoilage of different foods - fruits, vegetables, milk, meat, fish and canned foods. General account of food preservation. Microbiological production of fermented foods – bread, cheese, yogurt. Microorganisms as food – SCP.	12Hrs	Up to K2	1
II	Unit - II: Soil and Agricultural Microbiology Soil microflora. Plant growth-promoting microorganisms. Biofertilizers – <i>Rhizobium</i> , <i>Azolla</i> and Mycorrhizae. Bacterial and fungal diseases of Plants – bacterial blight of rice, citrus canker, leaf spot of rice and rust of sorghum. Biopesticides – <i>Bacillus thuringiensis</i> , Nuclear polyhedrosis virus (NPV), <i>Trichoderma</i> .	12Hrs	Up to K3	2

III	Unit - III: Environmental Microbiology Microbial interactions – mutualism, commensalism, antagonism, competition, parasitism, predation. Microbiology of potable and polluted waters. <i>E. coli</i> and <i>Streptococcus faecalis</i> as indicators of water pollution. Biogeochemical cycles-Nitrogen, Phosphorous and Sulphur.	12Hrs	Up to K4	3
IV	Unit - IV: Pharmaceutical Microbiology Microbial drugs and edible vaccines. Biopharmaceuticals- source and production methods - cytokines, haemopoietic growth factors, hormones and therapeutic enzymes. Industrial production of antibiotics (penicillin).	12Hrs	Up to K3	4
V	Unit - V: Industrial Microbiology Microorganisms of industrial importance – yeasts, moulds, bacteria, actinomycetes. Screening and isolation of industrially-important microorganisms. Industrial production of alcohols (ethyl alcohol), beverages (beer and wine), enzymes (amylases), and organic acids (citric acid).	12Hrs	Up to K3	5

Total 60 Hrs.

Books for Study

1. Frazier, W.C. and Westhoff, D.C. (1988). Food Microbiology, Mc Graw Hill, New York.
2. Rangaswami, G. and Bhagyaraj, D.J. (2001). Agricultural Microbiology, 2nd Edition, Prentice Hall of India, New Delhi.
3. Subba Rao, N.S. (1999). Soil Microorganisms and Plant Growth. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Patel, A.H. (1984). Industrial Microbiology. Mac Milan India Ltd., Hyderabad.
5. Vijaya Ramesh. K (2004). Environmental Microbiology. 1st Edition, MJP Publishers, Chennai

Books for Reference

1. Jay, J.M. (1996). Modern Food Microbiology. Chapman and Hall, New York.
2. Ray, B. (1996). Fundamentals of Food Microbiology. CRC Press, USA.
3. Adams, M.R. and Moss, M.O. (1996). Food Microbiology. New Age International (P) Ltd, New Delhi.
4. Atlas, R.M. and Bartha, R. (1998). Microbial Ecology - Fundamentals and Applications. Addison Wesley Longman, Inc., USA
5. Banwart, G.J. (1987). Basic Food Microbiology. CBS Publishers and Distributors, New Delhi.
6. Cassida, L.E. (1968). Industrial Microbiology. Wiley Eastern Ltd. & New Age International Ltd., New Delhi.
7. Reed, G. (Ed.) (1987). Prescott & Dunn's Industrial Microbiology. 4th Edition. CBS Publishers & Distributors, New Delhi.

Web Resources

1. <https://www.periobasics.com/basic-microbiology>.
2. <https://www.microbiologynutsandbolts.co.basic-concepts>.
3. <https://www.microbiologyinfo.com/category/basic-microbiology>
4. [https://www. Microbiology - Overview -youtube.com](https://www.Microbiology-Overview-youtube.com)
5. [https://www. Introduction to microbiology. youtube.com](https://www.Introduction to microbiology. youtube.com)

Rationale for nature of the course

This course provides special emphasis on the application of knowledge about microorganisms in various life processes. Significant role of microorganisms in various sectors like industries, agriculture, medicine, environment etc. attracted the biotechnologist to manipulate the microorganisms and to generate products of commercial importance.

Activities having direct bearing on skill development/ employability/entrepreneurship

- Applying potential microorganisms in food and dairy industries
- Exploring the role of microorganisms in bioremediation, ecological recycling
- Appraise the significance of microorganisms in pharmaceutical and agricultural sectors

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

CLOs	Course Learning Outcome	Knowledge Level
CLO1	Comprehend the concept of microbial contamination and spoilage of foods and their preservation and microbiological production of foods.	Up to K2
CLO2	Discuss beneficial microbes in soil and control plant diseases.	Up to K3
CLO3	Analyze the microbes in environment and water contamination.	Up to K4
CLO4	Distinguish the production of biopharmaceuticals and antibiotics.	Up to K3
CLO5	Categorize the microorganisms of industrial importance and industrial production of products.	Up to K3

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	1	1	1	2
CLO2	1	2	1	1	2
CLO3	2	1	1	2	1
CLO4	1	2	1	1	2
CLO5	2	1	2	3	2

Advance application–3

Intermediate level –2

Basic level –1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	3	3	1	2	3
CLO2	2	2	1	3	2
CLO3	3	2	1	3	3
CLO4	3	2	2	2	3
CLO5	3	2	2	3	3

Advance application – 3,

Intermediate level – 2,

Basic level – 1.

Learning Outcome Based Education & Assessment (LOBE)
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Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

LESSON PLAN

Units	Description	Staff	Hours	Mode
I Food Microbiology	a) Microorganisms of food spoilage and their sources.		1	Chalk and Talk
	b) Contamination and Spoilage of fruits,		1	
	c) Contamination and Spoilage of vegetables,		1	
	d) Contamination and Spoilage of milk,		2	
	e) Contamination and Spoilage of meat,		1	
	f) Contamination and Spoilage of fish		1	
	g) Contamination and Spoilage of canned foods.		1	
	h) General account of food preservation.		1	
	i) Microbiological production of fermented foods – bread, cheese, yogurt.		2	
	j) Microorganisms as food – SCP.		1	
II Soil and Agricultural Microbiology	a) Soil microflora.		1	Chalk and Talk
	b) Plant growth-promoting microorganisms.		1	
	c) Biofertilizers – <i>Rhizobium</i>		2	
	d) <i>Azolla</i>		1	
	e) Mycorrhizae		2	
	f) Bacterial diseases of Plants – bacterial blight of rice and citrus canker		1	
	g) Fungal diseases of Plants –leaf spot of rice and rust of sorghum		1	
	h) Biopesticides – <i>Bacillus thuringiensis</i>		2	
	i) Nuclear polyhedrosis virus (NPV) and <i>Trichoderma</i> .		1	
III Environmental Microbiology	a) Microbial interactions – mutualism, commensalism,		2	Chalk and Talk & PPT
	b) Antagonism, competition, parasitism, predation.		2	
	c) Microbiology of potable and polluted waters.		2	
	d) <i>E. coli</i> and <i>Streptococcus faecalis</i> as indicators of water pollution.		2	
	e) Biogeochemical cycles-Nitrogen,		2	
	f) Phosphorous and sulphur cycles.		2	
IV Pharmaceutical Microbiology	a) Microbial drugs and edible vaccines.		2	PPT & Chalk and Talk
	b) Biopharmaceuticals- source and production method of cytokines		2	
	c) Source and production method of haemopoetic		2	
	d) Source and production method of hormones		2	
	e) Source and production method of therapeutic		2	
	f) Industrial production of antibiotics (penicillin).		2	
V Industrial Microbiology	a) Microorganisms of industrial importance – yeasts, moulds, bacteria, actinomycetes. Screening and isolation of industrially-important microorganisms.		3	PPT
	b) Industrial production of alcohols (ethyl alcohol)		3	
	c) Industrial production of beverages (beer and wine)		2	
	d) Industrial production of enzymes (amylases)		2	
	e) Industrial production of organic acids (citric acid).		2	
		Total	60 Hrs	

Course designer : 1. Mr. P. Sasikumar

IUG Ratifications

Course Code	Course Title	Nature of the course	Rationale	Activities having direct bearing on Skill development / Employability /Entrepreneurship
20U1RMC1	General Microbiology	Knowledge & Skill	This course has proved to be one of the most important and basic discipline in microbiology. A fundamental understanding about the interaction of microorganisms in various fields of microbiology. It also deals with important discoveries that led to development of microbiology.	Identify the contributions of various scientists in the field of microbiology. Explore the methods of cultivation and identification of microbes. Compare and contrast between antimicrobials and antiseptics
20U1RMC2	Basic Techniques in Microbiology	Knowledge & Skill	The course introduces about various techniques used in microbiology. It provides basic understanding about the functioning of various biological equipment. It provides knowledge about the methods of sterilization, growth of microbes and their identification of microbes.	Preparation of growth media and cultivation of microbes. Screening and identification of microbes. Handling of biological equipment
20U2RMC3	Microbial Taxonomy	Knowledge & Skill	Microbial Taxonomy deals with three important disciplines like classification, nomenclature and identification of microbes thus enabling to explore microbes and their taxonomical position in microbial world. A universal language of classification system can be understood.	Identify and prepare phylogenetic tree. Understand the similarities and differences among microbes. Explore the economic importance of microbes

20U2RMC4	Cell and Molecular Biology	Knowledge & Skill	Cell and molecular biology which studies the structure and function of the basic unit of life. The field explores the relationships between cell processes and reactions, macromolecules and gene control pathway. The study of molecular cell biology enables scientists to understand how cell programs and reactions function normally as well as the relationships between those processes and gene expression.	Students will be able to understand and integrate knowledge of chemical and biological principles of living systems. Students will develop quantitative skills in order to collect, analyse and interpret experimental data. Understanding How Genes are Inherited via Meiosis and Fertilization.
20U1RMP1	Major Practical I	Skill oriented	The course familiarizes different concepts in general microbiology techniques and to develop a sufficient background to students about the growth of microbes. The ubiquitous nature and characteristics of microbes, different media for culturing microorganisms will be focussed.	Students will be able to observe ubiquitous nature of microbes through microscope. Handle various tools, instruments and apply the same for the identification of microbes. Identify and differentiate various microorganism based on their characteristics features.
20U2RMP2	Major Practical II	Skill oriented	Student become competent in the application of techniques associated with molecular biology. Identifying various physiological processes and molecular characterization of microorganisms. The taxonomical position of microbes can be determined based on the morphological and biochemical characteristics.	Able to isolate and analyse the genomic DNA from prokaryotes and eukaryotes. Knowledge gained could be applied for further studies. Classify microorganisms based on its morphology and cultural characteristics.

20U3RAP1	Allied Practical I	Knowledge & Skill	Practical skills on various microbiological techniques form the basis of biotechnological experiments. Isolation, screening, identification and characterization of various types of microorganisms and its significance in clinical, environmental, industrial processes paved the way for novel biotechnological inventions. Understanding the nature, growth requirements and characteristics of microorganisms helps to explore its economic importance in the field of biotechnology.	Providing practical insight on microscopic observation, differentiation and identification of various microbes. Imparting hands-on skills related to basic microbiological and pure culture techniques
20U4RAP2	Allied Practical II	Knowledge & Skill	Practical skills on various microbiological techniques form the basis of biotechnological experiments. Isolation, screening, identification and characterization of various types of microorganisms and its significance in clinical, environmental, industrial processes paved the way for novel biotechnological inventions. Understanding the nature, growth requirements and characteristics of microorganisms helps to explore its economic importance in the field of biotechnology.	Providing practical insight on quality of milk and water. Characterization of microbes present in environmental samples and exploring its ecological consequences.
20U3RAC1	Basic Microbiology	Knowledge & Skill	Microorganisms play indispensable role in the field of biotechnology as they act as a main carrier for all biotechnological techniques. For any biotechnological application, understanding theoretical and practical	Applying technical skills to differentiate and identify microorganisms. Exploring theoretical and practical aspects for isolation,

			aspects in microbiology becomes essential. It helps to realize the significance of beneficial microbes in various life processes.	cultivation, preservation and control of microorganisms. Imparting knowledge on economic importance of various microorganisms
20U4RAC2	Applied Microbiology	Knowledge & Skill	This course provides special emphasis on the application of knowledge about microorganisms in various life processes. Significant role of microorganisms in various sectors like industries, agriculture, medicine, environment etc. attracted the biotechnologist to manipulate the microorganisms and to generate products of commercial importance.	Applying potential microorganisms in food and dairy industries Exploring the role of microorganisms in bioremediation, ecological recycling Appraise the significance of microorganisms in pharmaceutical and agricultural sectors

The Madura College, Madurai
Department of Microbiology

Vision:

The microbiology department seeks to achieve the global needs with highly qualified microbiologists capable of dealing with premium process and applications which will profoundly influence existing paradigm of agriculture, industry, health care and restoration of environment providing sustainable competitive edge of presence society.

Mission:

- To offer quality education in microbiology programme, to enhance intellectual foundation and preparation of students for life in a complex dynamic technological world.
- To provide graduate and research programmes in microbiology as core major in various fields such as medical, agricultural, environmental, biochemistry, biostatistics, bio informatics to prepare students with experimental learning which may build professional careers.
- A service for peoples, government agencies and industries that require expert advice about microorganisms and the roles they play in our health, economy and sustainability of our natural resources.
- To inculcate the values of honesty, responsibility and sensibility for our department students.

The Graduate Attributes

- a. Communication skills
- b. Research related skills
- c. Team work
- d. Knowledge
- e. Global Perspective
- f. Critical thinking
- g. Problem solving
- h. Analytical reasoning
- i. Scientific reasoning
- j. Reflective thinking
- k. Digital literacy
- l. Multicultural competence

Programme Educational Objectives (PEOs)

The objectives of this programme are:

PEOs	Programme Educational Objectives
PEO-1	To provide a sound exposure to students about the theory and practical aspects of microbiology for attaining academic excellence in the field of microbiology.
PEO-2	To equip students with adequate research knowledge and techniques for successful career in the field of research, industries and for pursuing higher education.
PEO-3	To analyze and interpret scientific data, to solve technical, conceptual, scientific problems and to develop effective communication skills for dissemination of research outcomes.
PEO-4	To attain leadership skills and to inculcate entrepreneurship among the students so as to start their own ventures in the field of microbiology and shall be able to develop industrial networks.
PEO-5	To make students able to attain social responsibility and to develop environmentally sustainable technologies for addressing various ethical and societal issues.

PROGRAMME OUTCOMES FOR M.Sc. GRADUATES

At the end of the programme the graduates will be able to

PO1	Employ and implement their knowledge and practical understanding in the field of science to solve various ethical, societal and environmental issues.
PO2	Attain leadership quality, to work independently and to perform collaborative scientific research as a team with effectiveness and responsibility.
PO3	Communicate effectively with other peer research groups and to write scientific articles proficiently
PO4	Engage themselves in interdisciplinary scientific research and to derive at sustainable solutions
PO5	Acquire knowledge on various advancements of science and to create themselves as an entrepreneur

Qualification for Admission

Candidate who has passed the B.Sc. degree in any Life Sciences: Microbiology/ Applied Microbiology/ Industrial Microbiology/ Botany/ Zoology/ Biochemistry/ Biotechnology/ Bioinformatics/ Biology of Madurai Kamaraj university or an examination of any other university accepted by the syndicate as equivalent thereto shall be eligible for admission to M.Sc. Degree Course in Microbiology.

Duration of the Course

The students shall undergo prescribed course of study for the period of two academic years consisting of four semesters under CBCS semester pattern with outcome based education.

Medium of Instruction: English.

System: Choice Based Credit System with Outcome Based Model.

EVALUATION (THEORY)

Internal (Formative)	: 25 marks
External (Summative)	: 75 marks
Total	: 100 marks

Continuous Internal Assessment: 25 Marks

Components	Marks
Test (Average of two tests) Conducted for 40 marks and converted into 10 marks)	10
Assignment	5
Quiz/ Documentation/ Case lets/ ICT based Assignment/ Mini Projects	5
Seminar	5
Total	25

BLUE PRINT FOR INTERNAL ASSESSMENT - I
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

S.No	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)	Total
			MCQs		Short Answers				
			No. of Questions	K- Level	No. of Questions	K-Leve			
1	CLO 2	Up to K3	2	K1& K2	1	K1	2 (K2&K2)	2(K2/K3)	7
2	CLO 3	Up to K4	2	K1& K2	2	K2	2 (K3&K3)	1(K4)	7
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	10
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

BLUE PRINT FOR INTERNAL ASSESSMENT - II
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

S.No	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)	Total
			MCQs		Short Answers				
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 4	Up to K3	2	K1& K2	1	K1	2 (K2&K2)	2	7
2	CLO 5	Up to K4	2	K1& K2	2	K2	2 (K3&K3)	1(K4)	7
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	10
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K-Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks Without choice	Consolidated
K1	2	2		--	4	6.67	50
K2	2	4	10	10	26	43.33	
K3	-	-	10	10	20	33.33	33
K4	-	-	-	10	10	16.67	17
Total Marks	4	6	20	30	60	100.00	100%

Question Paper Pattern for External Examination: 75 Marks

Section	Marks
A- Multiple Choice Questions(10 X 1mark)	10
B- Short answer type (5 X 2 mark)	10
B- Either/Or type(5X 5 marks)	25
C- Open Choice type (3out of 5 X10 marks)	30
Total	75

EVALUATION (PRACTICAL)

Internal (Formative)	: 40 marks
External (Summative)	: 60 marks
Total	: 100 marks

Question Paper Pattern for Internal practical examination (Major): 40 marks and External Practical Examination (Major) :60 Marks

Item	Internal	External
Practicals	40	60
	10 Marks : Observation & Record 30 Marks : Average of best two out of three tests	10 Marks : Viva voce 50 Marks : Practical Examinations
Project	60 => 40 Marks by Guide ; 20 Marks by Dept	40
	Guide Evaluation: 10 Marks for Student's ability and interest 10 Marks for Regularity and Punctuality 20 Marks for Quality of the work and Presentation Dept Evaluation: (Min (No.) 50% of faculty must be present) 10 Marks for Presentation using ICT tools 10 Marks for Quality and Publication/presentation in seminar/conferences	External Evaluation : 10 Marks for the Report 30 Marks for Presentation, Quality of work and Viva-voce

Irrespective of external examinations passing minimum is 50% for Post Graduate Courses and in total, aggregate of 50%.

The curriculum is revised to suit the changing trends by propagation of ideas ensuring professional growth through innovative method of teaching. The curriculum is strengthened through the latest amendments and revisions as per UGC norms.

The Madura College (Autonomous), Madurai-625011
Department of Microbiology
Curriculum structure for M.Sc Microbiology to be implemented from 2021-2022

Sem.	Course	Subject Code	Course Title	Contact hours/Week	Credits
I	Core -1	21P1RMC1	Microbial Taxonomy	5	4
	Core -2	21P1RMC2	Biochemistry	5	4
	Core -3	21P1RMC3	Microbial Physiology	5	4
	Major Elective- 1	21P1RME1	Bioinstrumentation	5	4
	Practical- 1	21P1RMP1	Lab in Microbial Taxonomy and Biochemistry	4	4
	Practical- 2	21P1RMP2	Lab in Microbial Physiology and Bioinstrumentation	4	4
	NME -1	21P1RNM1	Microbial World	2	2
			Total	30	26
II	Core -4	21P2RMC4	Cell and Molecular Biology	5	4
	Core -5	21P2RMC5	Microbial Genetics	5	4
	Core -6	21P2RMC6	Immunology	5	4
	Major Elective- 2	21P2RME2	Research Methodology	5	4
	Practical- 1	21P2RMP1	Lab in Cell and Molecular Biology and Microbial Genetics	4	4
	Practical- 2	21P2RMP2	Lab in Immunology and Research Methodology	4	4
	NME -2	21P2RNM2	Food and Dairy Microbiology	2	2
			Total	30	26
III	Core -7	21P3RMC7	Clinical Microbiology	5	4
	Core -8	21P3RMC8	Agricultural Microbiology	5	4
	Core -9	21P3RMC9	Industrial Microbiology	5	4
	Major Elective- 3	21P3RME3	Nanotechnology	5	4
	Practical- 3	21P3RMP3	Lab in Clinical Microbiology and Agricultural Microbiology	4	4
	Practical- 4	21P3RMP4	Lab in Industrial Microbiology and Nanotechnology	4	4
			Total	28	24
IV	Core -10	21P4RMC10	Environmental Microbiology	5	4
	Core -11	21P4RMC11	Microbial Biotechnology	5	4
	Core -12	21P4RMC12	Genomics and Proteomics	5	4
	Major Elective- 4	21P4RME4	Entrepreneurial skill in Microbiology	5	4
	Practical- 3	21P4RMP3	Lab in Environmental Microbiology and Microbial Biotechnology	4	4
	Practical- 4	21P4RMP4	Lab in Genomics and Proteomics	4	4
	Project	21P4RPR1			6
			Total	28	30

DEPARTMENT OF MICROBIOLOGY				CLASS: I M.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core - 1	21P1RMC1	Microbial Taxonomy	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives 1. To recollect history, classification and diversity of microbes 2. To differentiate various groups of bacteria 3. To outline the unique features and reproduction of fungi 4. To understand the classification and significance of algae 5. To gain knowledge about classification and general characteristics of viruses
Course Learning Outcomes <i>On successful completion of the programme, the students will be able to</i> 1. Classify the microorganisms 2. Compare and contrast prokaryotes and eukaryotes 3. Interpret the characteristics and significance of fungi 4. Compare algal and cyanobacterial members 5. Explain the classification and nomenclature of viruses

Unit	Description	Hours	K-level	CLO
I	Unit I – Classification and diversity of microorganisms History, diversity of microorganisms and contributions of Indian scientists in the field of microbial classification. Systems of classification - Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility. Principles of taxonomical classification of Eubacteria (Bacteria and Archaea). Major characteristics used in taxonomy - cultural, morphological, biochemical, physiological, genetic and molecular characteristics. Numerical Taxonomy (Taxometrics) and Chemotaxonomy. Assessing microbial phylogeny – chronometers, phylogenetic trees, r-RNA, DNA and proteins as indicators of phylogeny.	15Hrs	Up to K2	1

II	Unit II – Taxonomy of bacteria Bergey's system of classification of bacteria. Nomenclature of bacteria. Structure and functions of Bacterial cellwall (Gram positive and Gram negative), slime layer, capsule, pili, flagella and other inclusions bodies. Ultra structure of bacteria- <i>Streptococcus</i> sp., <i>Corynebacterium</i> sp., <i>Pseudomonas</i> sp. Characteristics and types of Archaeabacteria. Unique features of Mycoplasma. Structure, formation and significance of bacterial endospores (<i>Bacillus</i>).	15Hrs	Up to K3	2
III	Unit III - Taxonomy of fungi Classification of fungi (Alexopoulos and Mims). General characteristics of fungi - habitat, distribution, nutritional requirements, ultra structure of thallus, cell wall structure, asexual reproduction, sexual reproduction and significance. Life cycles - Ascomycetes (<i>Aspergillus</i>), Deuteromycetes (<i>Candida</i>), Zygomycetes (<i>Mucor</i>) and Basidiomycetes (<i>Agaricus</i>). Endophytes.	15Hrs	Up to K3	3
IV	Unit IV - Taxonomy of algae Classification of algae by Fritsch. General characteristics of algae – occurrence and thallus organization. Ultra structure, pigments, flagella, food reserves and vegetative, asexual reproduction, sexual reproduction and significance - Chlorophyta (<i>Ulothrix</i>), Chrysophyta (<i>Diatoms</i>), Rhodophyta (<i>Gracillaria</i>) and Cyanophyta (<i>Spirulina</i> , <i>Nostoc</i> , <i>Oscillatoria</i> , <i>Synechococcus</i> , <i>Chroococcus</i>).	15Hrs	Up to K4	4
V	Unit V - Taxonomy of viruses Classification of Viruses - Structure-based classification, International Committee on Taxonomy of Viruses (ICTV) and Baltimore classification. Definition and concept of viroids, virusoids, satellite viruses and Prions. General characteristics, nomenclature, morphology and reproduction - Bacteriophage (T4 and Lambda), Animal viruses (Polio, SARS and Corona), Plant viruses (TMV and CMV), Mycophage and Cyanophage.	15Hrs	Up to K4	5

Total 75 Hours

Books for study:

1. Pelczar, Jr. M.J., Chan, E.C.S. and Kreig, N.R. (2006). Microbiology. 5th Edition. McGraw Hill Inc., New York.
2. Madigan, M.T. and Martinko, J.M. (2014). Brock Biology of Micro-organisms. 14th Edition. Parker J. Prentice Hall International, Inc., New Jersey.

Books for reference:

1. Prescott, L.M., Harley, J.P. and Klein, D.A. (2005). Microbiology. McGraw Hill Inc., New York.
2. Boyd, R.F. (1991). General Microbiology. 2nd Edition. Times Mirror/Moshy College Publishing, Virginia.
3. Atlas, R.M. (1997). Principles of Microbiology. 2nd Edition. W.M.T.Brown Publishers, Iowa.

4. Black, J.G. (2008). Microbiology: Principles and Explorations. 7th Edition. Prentice Hall, US.
5. Srivastava, S. and Srivastava, P.S. (2003). Understanding Bacteria. Kluwer Academic Publishers, Dordrecht.
6. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. (2005). General Microbiology. 5th Edition. McMillan, London.
7. Tortora, G.J., Funke, B.R. and Case, C.L. (2008). Microbiology: An Introduction. 9th Edition. Pearson Education, London.
8. Willey, J.M., Sherwood, L.M. and Woolverton, C.J. (2013). Prescott's Microbiology. 9th Edition. McGraw Hill Higher Education, New York.

Web resources:

1. <https://microbenotes.com/classification-of-bacteria/>
2. https://www.brainkart.com/article/Ultrastructure-of-a-Bacterial-cell_32841/
3. <https://www.toppr.com/guides/biology/biological-classification/kingdom-fungi/>
4. <https://www.toppr.com/guides/biology/plant-kingdom/algae/>
5. <https://www.sciencedirect.com/topics/immunology-and-microbiology/virus-classification>
6. <https://www.youtube.com/watch?v=8IJRzcPC9wg>

Rationale for nature of the course

Microbial Taxonomy deals with three important disciplines like classification, nomenclature and identification of microbes thus enabling to explore microbes and their taxonomical position in microbial world. A universal language of classification system can be understood.

Activities having direct bearing on skill development/ employability/entrepreneurship

Identify and prepare phylogenetic tree
Understand the similarities and differences among microbes
Explore the economic importance of microbes

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

CLOs	Course Learning Outcomes	Knowledge Level
CLO1	Classify the microorganisms	Up to K2
CLO2	Compare and contrast prokaryotes and eukaryotes	Up to K3
CLO3	Interpret the characteristics and significance of fungi	Up to K3
CLO4	Compare algal and cyanobacterial members	Up to K4
CLO5	Explain the classification and nomenclature of viruses	Up to K4

Mapping of Course Learning Outcomes with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	3	2	1	1	2
CLO2	2	2	2	2	2
CLO3	2	2	3	3	2
CLO4	2	3	3	3	2
CLO5	3	2	2	3	3

Advance application – 3 Intermediate level – 2

Basic level – 1

Mapping of Course Outcome with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5
CLO1	2	3	1	2	3
CLO2	3	3	2	2	3
CLO3	3	2	3	2	3
CLO4	3	2	3	3	3
CLO5	2	2	3	2	3

Advance application – 3 Intermediate level – 2

Basic level – 1

Learning Outcome Based Education & Assessment (LOBE)

Blue Print

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K2	2	K2 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K3	2	K3 & K3	1	K1	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K3	2	K3 & K3	1	K2	2 (K2&K2)	1(K3)
4.	CLO 4	Up to K4	2	K4& K4	1	K2	2 (K4&K4)	1(K4)
5.	CLO 5	Up to K4	2	K1& K1	1	K3	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	35 %
K2	2	4	10	10	26	21.67	
K3	4	2	10	20	36	30	30%
K4	2	-	20	20	42	35	35%
Total Marks	10	10	50	50	120	100.00	100%

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

LESSON PLAN

Units	Description	Staff	Hours	Mode
I Classification and diversity of microorganisms	a) History, diversity of microorganisms and contributions of Indian scientists in field of Microbial classification.		3	Chalk and Talk
	b) Systems of classification Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility.		4	
	c) Principles of taxonomical classification of Eubacteria (Bacteria and Archaea). Major characteristics used in taxonomy: cultural, morphological, biochemical, physiological, genetic and molecular characteristics; Numerical Taxonomy (Taxometrics) and Chemotaxonomy.		5	
	d) Assessing Microbial Phylogeny- chronometers. phylogenetic trees, r-RNA, DNA and proteins as indicators of phylogeny.		3	
II Taxonomy of bacteria	a) Bergey's system of classification of bacteria. Nomenclature of bacteria.		4	Chalk and Talk
	b) Structure and functions of Bacterial cell wall (Gram positive, Gram negative),		3	
	c) Slime layer, capsule, pili, flagella and other inclusions bodies. Ultra structure of bacteria- <i>Streptococcus</i> sp. <i>Corynebacterium</i> sp. and <i>Pseudomonas</i> sp.		2	
	d) Characteristics and types of Archaeobacteria. Unique features of Mycoplasma		4	
	e) Structure, formation and significance of bacterial endospores (<i>Bacillus</i>).		2	

III Taxonomy of fungi	a) Classification of fungi (Alexopoulos and Mims).		3	Chalk and Talk
	b) General characteristics of fungi - habitat, distribution, nutritional requirements, ultra- structure of thallus, cell wall structure, asexual reproduction, sexual reproduction and significance.		5	
	c) Life cycles - Ascomycetes (<i>Aspergillus</i>), Deuteromycetes (<i>Candida</i>)		4	
	d) Zygomycetes (<i>Mucor</i>), Basidiomycetes (<i>Agaricus</i>). Endophytes.		3	
IV Taxonomy of algae	a) Classification of algae by Fritsch.		3	Chalk &Talk, PPT
	b) General characteristics of algae – occurrence and thallus organization.		3	
	c) Ultra-structure, pigments, flagella, food reserves vegetative, asexual and sexual reproduction and significance - Chlorophyta (<i>Ulothrix</i>), Chrysophyta (<i>Diatoms</i>)		3	
	d) Ultra-structure, pigments, flagella, food reserves vegetative, asexual and sexual reproduction and significance - Rhodophyta (<i>Gracillaria</i>) and Cyanophyta - <i>Spirulina</i> , <i>Nostoc</i>		3	
	e) Ultra-structure, pigments, flagella, food reserves vegetative, asexual and sexual reproduction and significance - <i>Oscillatoria</i> , <i>Synechococcus</i> , <i>Chroococcus</i> .		3	
V Taxonomy of viruses	a) Classification of Viruses - Structure-based classification, International Committee on Taxonomy of Viruses (ICTV) and Baltimore classification.		4	Chalk &Talk, PPT
	b) Definition and concept of viroids, virusoids, satellite viruses and Prions		2	
	c) General characteristics, nomenclature, morphology and reproduction – Bacteriophage (T4 and Lambda),		2	
	d) Animal viruses (Polio, SARS and Corona)		3	
	e) Plant viruses (TMV, CMV), Mycophage and Cyanophage.		4	

Course designers:

1. Mrs.K.Rajeswari

DEPARTMENT OF MICROBIOLOGY				CLASS: I M.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major core - 2	21P1RMC2	Biochemistry	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To know the bioenergetics and high energy compounds
2. To recognize different types of carbohydrates and their properties
3. To gain information about the properties and classification of amino acids and enzymes.
4. To familiarize with the properties and functions of lipids.
5. To differentiate between DNA and RNA.

Course Learning Outcomes

On successful completion of the programme, the students will be able to

1. Explain the bioenergetics process and functions of enzymes.
2. Outline the classification and properties of carbohydrates.
3. Determine the structure and properties of amino acid and enzyme.
4. Classify the types and functions of Lipids.
5. Analyze the quantity of Nucleic acid.

Unit	Description	Hours	K- level	CLO
I	Unit - I Bioenergetics Concept of free energy, standard free energy, determination of Gibb's free energy (ΔG) for a reaction. Relationship between equilibrium constant and standard free energy change, biological standard state and standard free energy change in coupled reactions. Biological oxidation-reduction reactions, redox potentials, relation between standard reduction potentials and free energy change (derivations and numericals included). High energy phosphate compounds – introduction, phosphate group transfer, free energy of hydrolysis of ATP and sugar phosphates along with reasons for high ΔG . Energy change.	15Hrs	Up to K2	1

II	Unit- II Carbohydrates Definition and classification of carbohydrates, linear and ring forms (Haworth formula). Physical properties-mutarotation and kilianicynohydrin synthesis. Chemical properties – Oxidation, reduction,osazone formation. Monosaccharides- glucose and fructose. Disaccharides – sucrose and lactose. Oligosaccharides. Polysaccharide - starch, cellulose and hemicellulose, pectin.	15Hrs	Up to K3	2
III	Unit- III Proteins and Enzymes Structure, classification, physical and chemical properties of aminoacids - amphoteric nature, isoelectric point, isoelectric pH and zwitter ion. Proteins - classification, physical and chemical properties and structural organization of proteins- primary, secondary, tertiary and quaternary. Enzyme - general characteristics and IUB enzyme classification. Mechanism of enzyme action. Enzyme kinetics -Michaelis - Menton equation and its significance in enzyme kinetic studies. Lineweaver-Burkeplot and Haldane-Briggs relationship.	15Hrs	Up to K3	3
IV	Unit- IV Lipids Definition, classification, biological functions, physical, and chemical properties. Simple lipids - triglycerides, steryl esters, and wax esters. Compound lipids – phospholipids, glycolipids. lipoproteins. Derived lipids - steroids, sterols and terpenes. Saturated fatty acids - butyric and stearic acid. Unsaturated fatty acids - linoleic and palmitic acid. Biosynthesis of lipids– cholesterol. Oxidation of fatty acid – α and β .	15Hrs	Up to K4	4
V	Unit- V Nucleic acids Definition, structure of purines and pyrimidines. Nucleosides and nucleotides. Different forms of DNA. Double helical model of DNA (Watson and Crick), properties - cot curve and cot value, T _m , hypo and hyper chromicity and its biological significance. Structure, occurrence and biological functions of RNA -tRNA, mRNA and rRNA. Differences between DNA and RNA. Quantification of Nucleic Acid.	15Hrs	Up to K4	5

Total 75 Hours

Books for Study

1. Murray, R.K. and Grammer, D.K. (1990). Harper's Biochemistry. 25th Edition, McGraw Hill Publication, New York.
2. Satyanarayana, U. and Chakrapani, U. (2017). Biochemistry. 5th Edition. Books & Allied Ltd. Kolkata.
3. Jain. J.L., Jain, S. and Jain, N. (2016). Biochemistry. 7th edition, S. Chand & Co., Ltd. New Delhi.
4. David, B.D., Delbecco, R., Eisen, H.N. and Ginsburg, H.S. (1990). Microbiology. 5th Edition. Harper & Row. New York.

Books for Reference

1. Voet, D. and Voet, J.G. (2010). Biochemistry. 4th Edition. John Wiley and Sons, New Jersey.
2. Engel, P. (1986). Enzyme Kinetics. 2nd Edition. John Wiley and Sons. Inc., New York.
3. Dixon and Webb. (1979). Enzymes, 3rd Edition. Academic Press, New York.
4. Nelson, D.L. and Cox, M. (2017). Lehninger Principles of Biochemistry, 7th Edition, WH Freeman publisher, USA.

Web Resources

1. <https://www.sciencedirect.com/book/9780123884251/bioenergetics>
2. <https://microbenotes.com/carbohydrates-structure-properties-classification-and-functions/>
3. <https://www.thoughtco.com/amino-acid-373556>
4. <https://microbenotes.com/lipids-properties-structure-classification-and-functions/>
5. <https://biologydictionary.net/nucleic-acid/>

Rationale for Nature of the course

The goal of this course is to understand the basic building blocks of living organisms, introduce the structure and properties of various biomolecules and to emphasize on the association between structure and function of various biomolecules. This course highlights on the concepts involved in the mechanism of enzyme action and to understand the significance of vitamins as vital ingredient of life.

Activities having direct bearing on skill development/ employability/entrepreneurship

To provide knowledge on biomolecules and their significance in the metabolism

To know about the structure of biomolecules found in cells, to determine their structures.

To inculcate the formulation of biomolecules such as enzymes, hormones and vitamins in drug designing.

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

CLOs	Course Learning Outcome	Knowledge Level
CLO1	Explain the bioenergetics process and functions of enzymes.	Up to K2
CLO2	Outline the classification and properties of carbohydrates.	Up to K3
CLO3	Determine the structure and properties of amino acid and enzyme.	Up to K3
CLO4	Classify the types and functions of Lipids.	Up to K4
CLO5	Analyze the quantity of Nucleic acid.	Up to K4

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	2	2
CLO2	2	2	2	2	3
CLO3	3	2	3	2	3
CLO4	2	2	2	3	2
CLO5	2	3	3	3	2

Advance application–3 Intermediate level –2 Basic level –1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	3	3	2
CLO2	2	2	2	2	2
CLO3	3	3	2	2	2
CLO4	2	2	2	1	2
CLO5	2	1	2	3	2

Advance application–3 Intermediate level –2 Basic level –1

Learning Outcome Based Education & Assessment (LOBE)

Blue Print

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K2	2	K2 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K3	2	K3 & K3	1	K1	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K3	2	K3 & K3	1	K2	2 (K2&K2)	1(K3)
4.	CLO 4	Up to K4	2	K4& K4	1	K2	2 (K4&K4)	1(K4)
5.	CLO 5	Up to K4	2	K1& K1	1	K3	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	35 %
K2	2	4	10	10	26	21.67	
K3	4	2	10	20	36	30	30%
K4	2	-	20	20	42	35	35%
Total Marks	10	10	50	50	120	100.00	100%

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

LESSON PLAN

Units	Description	Staff	Hours	Mode
I Bioenergetics	a) Concept of free energy, standard free energy, determination of Gibb's free energy(ΔG) for a reaction.		2	Chalk and Talk
	b) Relationship between equilibrium constant and standard free energy change, biological standard state & standard free energy change in coupled reactions.		4	
	c) Biological oxidation-reduction reactions, redox potentials, relation between standard reduction potentials & free energy change (derivations and numericals included).		5	
	d) High energy phosphate compounds – introduction, phosphate group transfer, free energy of hydrolysis of ATP and sugar phosphates along with reasons for high ΔG . Energy charge.		4	
II Carbohydrates	a) Definition and classification of carbohydrates, linear and ring forms (Haworth formula)		2	Chalk and Talk
	b) Physical properties-mutarotation and kiliani cynohydrin synthesis.		2	
	c) Chemical properties – Oxidation, reduction, osazone formation.		3	
	d) Monosaccharides- glucose and fructose.		3	
	e) Disaccharides – sucrose and lactose, Oligosaccharides.		2	
	f) Polysaccharide - starch, cellulose and hemicellulose, pectin.		3	
III Proteins and Enzymes	a) Structure, classification, physical and chemical properties of aminoacids - amphoteric nature, isoelectric point, isoelectric pH and zwitter ion.		3	Chalk and Talk & PPT
	b) Proteins - classification, physical and chemical properties and structural organization of proteins-primary, secondary, tertiary and quaternary.		3	
	c) Enzyme - general characteristics and IUB enzyme classification.		3	
	d) Mechanism of enzyme action.		2	
	e) Enzyme kinetics -Michaelis - Menton equation and its significance in enzyme kinetic studies.		2	
	f) Lineweaver- Burkeplot and Haldane-Briggs relationship.		2	

Units	Description	Staff	Hours	Mode
IV Lipids	a) Definition, classification, biological functions, physical, and chemical properties.		2	PPT & Chalk and Talk
	b) Simple lipids - triglycerides, sterol esters, and wax esters.		2	
	c) Compound lipids – phospholipids, glycolipids. lipoproteins.		2	
	d) Derived lipids - steroids, sterols and terpenes.		2	
	e) Saturated fatty acids - butyric and stearic acid.		2	
	f) Unsaturated fatty acids - linoleic and palmitic acid.		2	
	g) Biosynthesis of lipids – cholesterol.		1	
	h) Oxidation of fatty acid – α and β .		2	
V Nucleic acid	a) Definition, structure of purines and pyrimidines. Nucleosides and nucleotides.		3	Chalk and Talk & PPT
	b) Different forms of DNA.		2	
	c) Double helical model of DNA (Watson and Crick), properties - cot curve and cot value, T_m , hypo and hyper chromicity and its biological significance.		4	
	d) Structure, occurrence and biological functions of RNA -tRNA, mRNA and rRNA.		3	
	e) Differences between DNA and RNA.		1	
	f) Quantification of Nucleic Acid.		2	
Total			75 Hours	

Course designers

1. Mrs. N.Sumathy

DEPARTMENT OF MICROBIOLOGY				CLASS: I M.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core - 3	21P1RMC3	Microbial Physiology	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To understand microbial growth and nutrition
2. To understand the concept of photosynthesis and bioluminescence
3. To know the concept of catabolism and catabolic pathways in microbes
4. To gain knowledge about the microbial anabolic pathways and nitrogen metabolism
5. To know about anaerobic respiration and microbial stress response

Course Learning Outcomes

On successful completion of the programme, the students will be able to

1. Outline the concept of microbial growth and nutrition.
2. Define the basic concept of photosynthesis and bioluminescence.
3. Summarize the concept of catabolism and catabolic pathways in microbes
4. Interpret the microbial anabolic pathways and nitrogen metabolism
5. Illustrate anaerobic respiration and microbial stress response

Unit	Description	Hours	K- level	CLO
I	Unit- I Microbial Growth and Nutrition Growth of Bacteria - phases of growth, batch culture, continuous culture, diauxic growth and synchronous culture - induction of synchrony and growth kinetics. Factors affecting microbial growth. Classification of organisms based on carbon, energy and electron sources. Microbial nutrition – Nutritional requirements and types of bacteria – phototrophs and chemotrophs, autotrophs and heterotrophs, organotrophs and lithotrophs - photoorganotrophs and chemolithotrophs (ammonia, nitrate sulphur, hydrogen, iron oxidizing bacteria). Nutrient transport mechanisms- Passive diffusion, facilitated diffusion, active transport, group translocation and specific transport system.	15 hrs	Up to K2	1

II	Unit- II Bacterial Photosynthesis Bacterial Photosynthesis- general types of microbial photosynthesis - oxygenic and anoxygenic. Structure of photosynthetic pigments – chlorophylls, bacteriochlorophyll, carotenoids and phycobilins. Photosynthetic bacteria - green sulphur and purple bacteria. Light reaction in aerobic oxygenic phototrophic bacteria. Light reaction in anaerobic anoxygenic phototrophic bacteria (Green and Purple bacteria). CO ₂ fixation – Calvin cycle. Bioluminescence - Process and application.	15 hrs	Up to K3	2
III	Unit –III Metabolism Basic concepts of metabolism, oxidation – reduction reactions, Energy generation by anaerobic metabolism – glycolysis, pentose phosphate pathway, Entner- Doudoroff (ED) pathway, Fermentation - alcoholic and lactic acid fermentation – homolactic, heterolactic and mixed acid fermentation with examples. Energy generation by aerobic metabolism - TCA cycle, glyoxylate pathway and electron transport chain, mechanism of ATP synthesis – chemiosmosis, Pasteur effect.	15 hrs	Up to K3	3
IV	Unit –IV Anabolism and Nitrogen metabolism Glycogenesis, gluconeogenesis and amphibolic nature of TCA cycle -production of biosynthetic products. Biosynthetic pathway of peptidoglycan. Nitrogen Metabolism- Sources of nitrogen, Nitrogen fixation - non symbiotic and symbiotic nitrogen fixation. Nitrification, denitrification, Nitrate and ammonia assimilation pathways, Nitrogen cycle. Diazotrophs of nitrogen fixation, structure of nitrogenase complex. Regulation of nitrogenase complex by oxygen and combined nitrogen sources. Nif genes and their regulation.	15 hrs	Up to K4	4
V	Unit- V Anaerobic respiration and microbial stress response Anaerobic respiration. Nitrogen, sulphur, iron and hydrogen oxidation. Methanogenesis. Microbial stress responses (extremophiles) - osmotic stress and osmoregulation, aerobic to anaerobic transitions, oxidative stress, pH stress and acid tolerance, thermal stress and heat shock response, nutrient stress and starvation stress, stringent response.	15 hrs	Up to K4	5

Total 75 Hours

Books for Study:

1. Moat, A.G. and Foster, J.W. (2009). Microbial Physiology. 4th Edition. John Wiley & Sons, New York.
2. Atlas, R.M. (1997). Principles of Microbiology. 2nd Edition. WCB/McGraw-Hill Co., USA.

Books for Reference:

1. Hall, D.O. and Rao, K.K. (1994). Photosynthesis. 5th Edition. Cambridge University press, UK.
2. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. (1986). General Microbiology. 5th Edition. Macmillan Education Ltd., London.
3. Dubey, R.C. and Maheswari, D.K. (2005). A Text book of microbiology. S. Chand & Company Ltd., New Delhi.
4. Salle, A.J. (1992). Fundamentals Principles of Bacteriology. 7th Edition. McGraw Hill Publishing Co. Ltd., New York.
5. Sundararajan, S. (2003). Microbial Physiology. Anmol Publication, New Delhi.

Web Resources:

1. http://www.chris-anthony.co.uk/pdf_files/presentations/IntroductionWeb.pdf
2. <https://www.youtube.com/watch?v=NYMTeqpr6JI>
3. <https://www.youtube.com/watch?v=ei6Z7orCpPk>

Rationale for nature of the course

Microbial physiology provides information on sources of energy and its utilization by microorganisms. Microorganisms play important role in environment as producers, consumers and decomposers. These are the only group of organisms which takes part in all three important stages of ecosystem. Understanding microbial physiology has greater application in industry, developing medicine and even in agriculture.

Activities having direct bearing on skill development/employability/entrepreneurship:

Microbial physiology has traditionally played a very important role in both fundamental research and in industrial applications of microorganisms.

The classical approach in microbial physiology is to analyze the role of individual components (genes or proteins) in the overall cell function.

It is possible to optimize industrial fermentations through introduction of directed genetic modification - an approach referred to as metabolic engineering.

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

	Course Learning Outcome	Knowledge Level
CLO1	Outline the concept of microbial growth and nutrition.	Up to K2
CLO2	Define the basic concept of photosynthesis and bioluminescence.	Up to K3
CLO3	Summarize the concept of catabolism and catabolic pathways in microbes	Up to K3
CLO4	Interpret the microbial anabolic pathways and nitrogen metabolism	Up to K4
CLO5	Illustrate anaerobic respiration and microbial stress response	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	1	1	1	1	3
CLO2	1	1	1	2	2
CLO3	1	2	1	1	3
CLO4	2	2	2	1	2
CLO5	2	2	2	2	2

Advance application–3

Intermediate level –2

Basic level –1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	1	1	1	1	1
CLO2	1	1	1	1	1
CLO3	1	1	1	1	1
CLO4	1	2	2	2	2
CLO5	2	2	2	2	2

Advance application–3

Intermediate level –2

Basic level –1

Learning Outcome Based Education & Assessment (LOBE)

Blue Print

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K2	2	K2 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K3	2	K3 & K3	1	K1	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K3	2	K3 & K3	1	K2	2 (K2&K2)	1(K3)
4.	CLO 4	Up to K4	2	K4& K4	1	K2	2 (K4&K4)	1(K4)
5.	CLO 5	Up to K4	2	K1& K1	1	K3	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	35 %
K2	2	4	10	10	26	21.67	
K3	4	2	10	20	36	30	30%
K4	2	-	20	20	42	35	35%
Total Marks	10	10	50	50	120	100.00	100%

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

LESSON PLAN

UNITS	DESCRIPTION	STAFF	HOURS	MODE
I Microbial Growth and Nutrition	a) Growth of Bacteria: phases of growth, growth kinetics - batch culture, continuous culture, diauxic growth and synchronous culture - induction of synchrony and growth kinetics		3	Chalk and Talk
	b) Factors affecting microbial growth		3	
	c) Classification of organisms based on carbon, energy and electron sources		3	
	d) Nutrition – nutritional requirements and types of bacteria – phototrophs and chemotrophs, autotrophs and heterotrophs, organotrophs and lithotrophs - photoorganotrophs and chemolithotrophs (ammonia, nitrate sulphur, hydrogen, iron oxidizing bacteria).		3	
	e) Nutrient transport mechanisms- Passive diffusion, Facilitated diffusion, Active transport, Group translocation and Specific transport system.		3	
II Bacterial Photosynthesis	a) Bacterial Photosynthesis- General types of microbial photosynthesis - oxygenic and anoxygenic		2	Chalk and Talk
	b) Structure of photosynthetic pigments – chlorophylls, bacteriochlorophyll, carotenoids and phycobilins		2	
	c) Photosynthetic bacteria - green sulphur and purple. Light reaction in aerobic oxygenic phototrophic bacteria		2	
	d) Light reaction in anaerobic an-oxygenic phototrophic bacteria (Green and Purple bacteria)		3	
	e) CO ₂ fixation – Calvin cycle		3	
	f) Bioluminescence - Process and application		3	

III Metabolism	a) Basic concepts of metabolism, Oxidation – reduction reactions		3	Chalk and Talk & PPT
	b) Energy generation by anaerobic metabolism – glycolysis, pentose phosphate pathway, Entner- Doudoroff (ED) pathway		4	
	c) Fermentation-alcoholic-lactic acid fermentation-Homolactic and Heterolactic and Mixed acid fermentation with examples		4	
	d) Energy generation by Aerobic metabolism - TCA cycle, glyoxylate pathway and electron Transport chain, Mechanism of ATP synthesis – Chemiosmosis, Pasteur effect		4	
IV Anabolism and Nitrogen metabolism	a) Glycogenesis, Gluconeogenesis and Amphibolic nature of TCA cycle - production of biosynthetic products		3	PPT & Chalk and Talk
	b) Biosynthetic pathway of peptidoglycan		3	
	c) Nitrogen Metabolism- Sources of nitrogen, Nitrogen fixation: Non symbiotic and symbiotic nitrogen fixation. Nitrification, denitrification, Nitrate and ammonia assimilation pathways		4	
	d) Nitrogen cycle. Diazotrophs of nitrogen fixation, Structure of nitrogenase complex. Regulation of nitrogenase complex by oxygen and combined nitrogen sources. Nif genes and their regulation		5	
V Anaerobic respiration and microbial stress response	a) Anaerobic Respiration. Nitrogen, sulphur, iron and hydrogen oxidation.		3	PPT
	b) Methanogenesis.		2	
	c) Microbial stress responses (extremophiles)- Osmotic stress and osmoregulation, Aerobic to anaerobic transitions, oxidative stress, pH stress and acid tolerance		5	
	d) thermal stress and heat shock response, nutrient stress and starvation stress, stringent response		5	
Total			75 Hours	

Course designers

1. Dr.P.N.Rajarajan

DEPARTMENT OF MICROBIOLOGY				CLASS: I M.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Elective - 1	21P1RME1	Bioinstrumentation	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	✓

Course Objectives

1. To learn theoretical background and practical skills in microscopy
2. To impart knowledge on principles and applications of various instruments used in biology
3. To understand the working mechanism and to characterize biomolecules using spectroscopic techniques
4. To enable the students to explore the methods for separation of biomolecules
5. To emphasize the importance of radioisotopes in biology and its proficient handling

Course Learning Outcomes

On successful completion of the programme, the students will be able to

1. Demonstrate the working mechanism and usage of different microscopes
2. Describe the principle and applications of various instruments used in biology
3. Apprise spectroscopic data for laboratory and project work
4. Separate and determine different components present in biological samples using appropriate separation techniques
5. Categorize, determine the dose limits and safety aspects for various radioisotopes

Unit	Description	Hours	K-level	CLO
I	Unit-I Microscopy Principle, working mechanism and applications of light microscope – bright field, dark field, phase contrast and fluorescence. Electron microscopy - transmission electron microscope (TEM) and scanning electron microscope (SEM), energy dispersive x-ray analysis (EDX), scanning tunneling microscopy (STM), atomic force microscopy (AFM), confocal microscopy. Cytophotometry, flow cytometry and micrometry. Sample preparation for microscopy.	15 hrs	Up to K2	1

II	Unit-II Basic laboratory instruments Principle, working mechanism and applications of laminar air flow, incubator, hot air oven, autoclave, Quebec colony counter, sonicator and lyophilizer. Centrifugation and types - clinical, differential, density gradient and ultra centrifugation. Sedimentation velocity, sedimentation coefficient, relative centrifugal force (RCF) and revolutions per minute (RPM).	15 hrs	Up to K3	2
III	Unit-III Spectroscopy Principle, working mechanism and applications of colorimeter, spectrophotometer- visible, ultraviolet, Fourier transform infrared spectroscopy (FTIR), flame photometer, Raman and atomic absorption spectrophotometer (AAS), fluorescence spectroscopy, X-ray diffraction (XRD), nuclear magnetic resonance (NMR) and electron spin resonance (ESR) spectroscopy.	15 hrs	Up to K3	3
IV	Unit-IV Separation techniques Chromatography- Principle, working mechanism and applications of gel filtration, ion exchange, affinity chromatography, gas chromatography (GC) and high performance liquid chromatography (HPLC), gas chromatography-mass spectrometry (GC-MS), liquid chromatography-mass spectrometry (LC-MS). Electrophoresis- Principle, working mechanism (isoelectric focusing, isotachopheresis) and applications of agarose gel electrophoresis, SDS-PAGE, native PAGE, counter current electrophoresis, immune electrophoresis, pulse field gel electrophoresis (PFGE), denaturing gradient gel electrophoresis (DGGE). Gel documentation, fluorescence activated cell sorting (FACS).	15 hrs	Up to K4	4
V	Unit-V Radioisotopic techniques Radioactive isotopes - radioactive decay and half life period, effect of radiation on biological system, use of radioisotopes in biology, radioactive labelling, principle and application of tracer techniques, detection and measurement of radioactivity using ionization chamber, proportional chamber, Geiger- muller and scintillation counters, autoradiography and its applications. Radiation dosimetry and safety aspects of radio isotopic techniques.	15 hrs	Up to K4	5

Total 75 Hours

Books for Study:

1. Jeyaraman, J. (1985). Laboratory Manual in Biochemistry, Wiley Eastern Ltd, New Delhi.
2. Roy, R.N. (1996). A Textbook of Biophysics. New Central Book Agency (P) Ltd., Calcutta.
3. Veerakumari, L. (2009). Bioinstrumentation. MJP Publishers, Chennai.
4. Plummer, D.T. (1998). An Introduction to Practical Biochemistry. 3rd Edition. Tata McGraw Hill, New Delhi.

Books for Reference:

1. Alonso, A. and Arrondo, J.L.R. (2006). Advanced Techniques in Biophysics. Springer, UK.
2. Boyer, R.F. (1993). Modern Experimental Biochemistry. 2nd Edition. Benjamin-Cummings Publishing Company, California.
3. Chatwal, G.R., Anand, S.K. and Sham, K. (2005). Instrumental Methods of Chemical Analysis. Himalaya Publishing House, New Delhi.
4. Ghatak, K.L. (2011). Techniques and Methods in Biology. PHI Learning Pvt. Ltd. New Delhi
5. Palanichamy, S. and Shanmugavelu, M. (2011). Principles of Biophysics, 2nd Edition. Palani Paramount Publications, Palani.
6. Palanivel, P. (2000). Laboratory Manual for Analytical Biochemistry & Separation Techniques. 4th Edition. School of Biotechnology, Madurai Kamaraj University, Madurai.
7. Sandhu, G.S. (1990). Research Techniques in Biological Sciences. Anmol Publications, New Delhi.
8. Sawhney, S.K. and Singh, R. (2000). Introductory Practical Biochemistry. Narosa Publishing House, New Delhi.

Web Resources:

1. <https://microbenotes.com/category/instrumentation/>
2. <https://www.biologydiscussion.com/biochemistry>
3. <https://www.youtube.com/watch?v=wxrAELeXlek>
4. <https://www.youtube.com/watch?v=myoIF-h1kKI>

Rationale for nature of the course

Basic understanding of contemporary bioinstrumentation is essential for its application in the laboratory. It is useful for handling, analyzing and interpreting various biological samples. Hands-on experience pertaining to biological equipments is mandatory in the field of quality control, testing, diagnosis and research.

Activities having direct bearing on skill development/ employability/entrepreneurship

Imparting knowledge and technical skills to handle and maintain different equipments in clinical and molecular biology laboratories.

Applying the techniques related to quality control in various industrial sectors and research units.

Fabrication of minor equipments, marketing and servicing of laboratory equipments.

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

CLOs	Course Learning Outcome	Knowledge Level
CLO1	Demonstrate the working mechanism and usage of different microscopes	Up to K2
CLO2	Describe the principle and applications of various instruments used in biology	Up to K3
CLO3	Apprise spectroscopic data for laboratory and project work	Up to K3
CLO4	Separate and determine different components present in biological samples using appropriate separation techniques	Up to K4
CLO5	Categorize and discriminate dosage and safety aspects for various radioisotopes	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	1	1	2
CLO2	3	3	2	3	2
CLO3	3	3	3	3	3
CLO4	3	3	3	3	3
CLO5	2	2	2	2	2

Advance application – 3

Intermediate level – 2

Basic level – 1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	3	1	2	1	3
CLO2	3	1	1	1	3
CLO3	3	3	3	3	3
CLO4	3	3	3	3	3
CLO5	1	2	2	2	1

Advance application – 3

Intermediate level – 2

Basic level – 1

Learning Outcome Based Education & Assessment (LOBE)

Blue Print

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K2	2	K2 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K3	2	K3 & K3	1	K1	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K3	2	K3 & K3	1	K2	2 (K2&K2)	1(K3)
4.	CLO 4	Up to K4	2	K4& K4	1	K2	2 (K4&K4)	1(K4)
5.	CLO 5	Up to K4	2	K1& K1	1	K3	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	35 %
K2	2	4	10	10	26	21.67	
K3	4	2	10	20	36	30	30%
K4	2	-	20	20	42	35	35%
Total Marks	10	10	50	50	120	100.00	100%

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

LESSON PLAN

UNITS	DESCRIPTION	STAFF	HOURS	MODE
I Microscopy	a) Principle, working mechanism and applications of light microscope- bright field and dark field microscope		3	Chalk and Talk, PPT, Quiz
	b) Phase contrast and fluorescence microscope		2	
	c) Electron microscopy- Transmission electron microscope (TEM) and scanning electron microscope (SEM), energy dispersive x-ray analysis (EDX)		3	
	d) Scanning tunneling microscopy (STM), atomic force microscopy (AFM), confocal microscopy		3	
	e) Cytophotometry, flow cytometry		2	
	f) Micrometry, sample preparation for microscopy		2	
II Basic laboratory Instruments	a) Principle, working mechanism and applications of laminar air flow, incubator, hot air oven		4	Chalk and Talk, PPT, Quiz
	b) Autoclave, Quebec colony counter, sonicator and lyophilizer		4	
	c) Centrifugation and types - clinical, differential, density gradient and ultra centrifugation		4	
	d) Sedimentation velocity, sedimentation coefficient, relative centrifugal force (RCF) and revolutions per minute (RPM)		3	
III Spectroscopy	a) Principle, working mechanism and applications of colorimeter, spectrophotometer- visible, ultraviolet, Fourier transform infrared spectroscopy (FTIR)		4	Chalk and Talk, Seminar, Screening of educational videos
	b) Flame photometer, Raman and atomic absorption spectrophotometer (AAS)		4	
	c) Fluorescence spectroscopy, X-ray diffraction (XRD)		4	
	d) Nuclear magnetic resonance (NMR) and electron spin resonance (ESR) spectroscopy		3	
IV Separation	a) Chromatography- Principle, working mechanism and applications of gel filtration,		3	PPT, Seminar,

UNITS	DESCRIPTION	STAFF	HOURS	MODE
Techniques	ion exchange, affinity chromatography			Screening of educational videos
	b) Gas chromatography (GC) and high performance liquid chromatography (HPLC), gas chromatography–mass spectrometry (GC-MS), liquid chromatography–mass spectrometry (LC–MS)		3	
	c) Electrophoresis- Principle, working mechanism (isoelectric focusing and isotachopheresis) and applications of agarose gel electrophoresis, SDS-PAGE, native PAGE		3	
	d) Counter current electrophoresis, immuno-electrophoresis, pulse field gel electrophoresis (PFGE), denaturing gradient gel electrophoresis (DGGE)		4	
	e) Gel documentation and fluorescence activated cell sorting (FACS)		2	
V Radioisotopic techniques	a) Radioactive isotopes - radioactive decay and half life period, effect of radiation on biological system		3	Chalk and talk, PPT, Group discussion
	b) Use of radioisotopes in biology, radioactive labelling, principle and application of tracer techniques		4	
	c) Detection and measurement of radioactivity using ionization chamber, proportional chamber, Geiger- muller and scintillation counters, autoradiography and its applications		5	
	d) Radiation dosimetry and safety aspects of radio isotopic technique		3	
Total			75 Hours	

Course designers

1. Dr.P.Kiruthika Lakshmi

DEPARTMENT OF MICROBIOLOGY				CLASS: I M.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Practical -I	21P1RMP1	Lab in Microbial Taxonomy and Biochemistry	4	4	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To recall the basic techniques in microbiology.
2. To explore methods of cultivation of microbes
3. To partially characterize the microorganisms.
4. To understand various microbial staining techniques.
5. To quantify various biomolecules.

Course Learning Outcomes

On successful completion of the programme, the students will be able to

1. Recall the fundamental techniques in the field of microbiology.
2. Analyze the morphology of microorganisms under microscope.
3. Determine physiological characteristics of microorganisms.
4. Estimate the quantity of carbohydrates and proteins.
5. Measure the quantity of DNA.

S.No.	Experiments
1.	Pure culture technique: Streak plate, pour plate, spread plate, decimal dilution.
2.	Motility demonstration: Hanging drop preparation, wet mount, semi-solid agar.
3.	Staining techniques : Smear preparation, Simple staining, Gram's staining, Acid fast staining, Spore staining, Capsule Staining (positive and negative)
4.	Physiological characteristics - IMVIC test, H ₂ S production, Oxidase, Catalase, Urease test, Gelatin liquefaction. Carbohydrate fermentation.
5.	Qualitative and quantitative analysis of Carbohydrates (glucose, fructose and starch)
6.	Qualitative and quantitative analysis of Proteins and DNA
7.	Separation of amino acids by paper chromatography and thin layer chromatography
8.	Pure culture technique: Streak plate, pour plate, spread plate, decimal dilution.
9.	Motility demonstration: Hanging drop preparation, wet mount, semi-solid agar.
10.	Staining techniques : Smear preparation, Simple staining, Gram's staining, Acid fast staining, Spore staining, Capsule Staining (positive and negative)

Books for study:

1. Cappuccino, J.H. and Sherman, N. (2007). Microbiology- A Lab Manual. 7th Edition. The Benjamin Publishing Company, Singapore.
2. Gunasekaran, P. (2008). Laboratory Manual in Microbiology. New Age International (P) Ltd. Publishers, New Delhi.
3. Jayaraman, J. (2011). Laboratory Manual in Biochemistry. 2nd Edition. New Age International (P) Ltd. Publishers, New Delhi.
4. Kannan, N. (1996). Laboratory Manual in General Microbiology. 1st Edition, Palani Paramount Publications, Tamil Nadu.

Books for Reference

1. Madigan, M.T. and Martinko, J.M. (2014). Brock Biology of Microorganisms. 14th Edition. Prentice Hall International Inc., USA.
2. Aneja, K.R. (2003). Experiments in Microbiology: Plant Pathology and Tissue Culture. Wishwa Prakashan, New Delhi.
3. Plummer, D.T. (1987). An introduction to Practical Biochemistry. 3rd Edition. Tata McGraw Hill, New Delhi.
4. Work, T.S. and Work, E. (1978). Laboratory Techniques in Biochemistry and Molecular Biology. North-Holland Publishing Company, Holland.
5. Khan, N.A. (2014). Laboratory Manual of Biochemistry. Daya Publishing House, Daryaganj.
6. Pierce, B.E. and Leboffe, M.J. (2010). Microbiology: Laboratory Theory & Application. 3rd Edition. Morton Pub. Co., USA.

Web Resources

1. <https://microbiologyinfo.com/category/basic-microbiology/>
2. <https://microbiologyinfo.com/category/staining-techniques/>
3. <https://microbiologyinfo.com/category/culture-media/>
4. <https://microbiologyinfo.com/category/biochemistry/>
5. <https://www.youtube.com/watch?v=zqaxWR1DT0Y>
6. <https://www.youtube.com/watch?v=rhTh8LYYBcQ>

Rationale for nature of the course

Student become competent in the application of techniques associated with molecular biology. Identifying various physiological processes and molecular characterization of microorganisms. The taxonomical position of microbes can be determined based on the morphological and biochemical characteristics. The goal of this course is to understand the basic building blocks of living organisms, introduce the structure and properties of various biomolecules and to emphasize on the association between structure and function of various biomolecules.

Activities having direct bearing on skill development/ employability/entrepreneurship

Able to isolate and analyse the genomic DNA from prokaryotes and eukaryotes. Knowledge gained could be applied for further studies.

Classify microorganisms based on its morphology and cultural characteristics.

Providing knowledge on biomolecules, and their significance in the metabolism

Exploring the structure of biomolecules found in cells, to determine their structures.

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

CLOs	Course Learning Outcome	Knowledge Level
CLO1	Recall the fundamental techniques in the field of microbiology.	Up to K2
CLO2	Analyze the morphology of microorganisms under microscope.	Up to K4
CLO3	Determine physiological characteristics of microorganisms.	Up to K4
CLO4	Estimate the quantity of carbohydrates, DNA and proteins.	Up to K2
CLO5	Separation of amino acids by chromatography technique	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	3	2	1	3
CLO2	2	3	3	2	3
CLO3	2	3	3	1	3
CLO4	2	3	3	2	3
CLO5	2	3	3	2	3

Advance application–3

Intermediate level –2

Basic level –1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	2	2	3
CLO2	2	2	2	2	3
CLO3	2	3	3	2	3
CLO4	2	2	2	2	3
CLO5	2	2	2	2	3

Advance application–3

Intermediate level –2

Basic level –1

Course designers

1. Mrs. K. Rajeswari

2. Mrs. N. Sumathy

DEPARTMENT OF MICROBIOLOGY				CLASS: I M.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours /week	CIA	Ext	Total
I	Major Practical-II	21P1RMP2	Lab in Microbial Physiology and Bioinstrumentation	4	4	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To provide a basic knowledge on the core principles of microbial Physiology.
2. To understand the microbial growth kinetics and understanding different physiological phenomenon.
3. To apply and handle the various instruments for their routine laboratory work.
4. To demonstrate the methods of algal measurements
5. To verify the Beer's Law using colorimeter

Course Learning Outcomes

On successful completion of the programme, the students will be able to

1. Illustrate bacterial growth by turbidity method
2. Calculate glucose uptake by microbes
3. Apply oxidation and fermentation techniques
4. Demonstrate photosynthetic pigments and their estimation
5. Standardize Beer-Lambert's law

S.No.	Experiments
1.	Measurement of microbial growth- turbidity method
2.	Isolation of Photosynthetic bacteria
3.	Glucose uptake by <i>E. coli</i> / <i>Saccharomyces cerevisiae</i> [Active and Passive diffusion]
4.	Demonstration of utilization of sugars by oxidation and fermentation techniques.
5.	Extraction and estimation of photosynthetic pigments (bacterial and blue green algae)
6.	Separation of molecules using density gradient centrifugation technique
7.	Measurement of pH of various biological samples using pH meter
8.	Counting of microbial colonies with Quebec colony counter
9.	Measurement of algal cell using micrometry technique
10.	Verification of Beer's Law using colorimeter

Books for study

1. Kannan, N. (1996). Laboratory Manual in General Microbiology. 1st Edition. Palani Paramount Publications, Tamil Nadu.
2. Benson, H.J. (1998). Microbiological Applications- Laboratory Manual in General Microbiology. 7th International Edition, McGraw-Hill, Boston.
3. Jayaraman, J. (2011). Laboratory Manual in Biochemistry. 2nd Edition. New Age International (P) Ltd. Publishers, New Delhi.

Books for Reference

1. Madigan, M.T. and Martinko, J.M. (2014). Brock Biology of Microorganisms. 14th Edition. Prentice Hall International Inc., USA.
2. Moat, A.G. and Foster, J.W. (2009). Microbial Physiology. 4th Edition. John Wiley & Sons, New York.
3. Reddy, S.R. and Reddy, S.M. (2005). Microbial Physiology. Scientific Publishers, India.
4. Gottschalk, G. (1986). Bacterial metabolism. 2nd Edition. Springer, Verlag.
5. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. (2005). General Microbiology. 5th Edition. McMillan, London.
6. Willey, J.M., Sherwood, L.M. and Woolverton, C.J. (2013). Prescott's Microbiology. 9th Edition. McGraw-Hill, Boston.
7. Plummer, D.T. (1987). An Introduction to Practical Biochemistry. 3rd Edition. Tata McGraw Hill, New Delhi.
8. Switzer, R.L. and Garrity, L.F. (1999). Experimental Biochemistry. 3rd Edition. WH Freeman and Co., New York.

Web Resources

1. <http://science.umd.edu/classroom/bsci424/BSCI223WebSiteFiles/LectureList.htm>
2. <https://microbiologysociety.org/why-microbiology-matters.html>
3. <https://open.umn.edu/opentextbooks/textbooks/404>
4. <https://microbiologyinfo.com/top-and-best-microbiology-books/>
5. https://en.wikipedia.org/wiki/Blue%E2%80%93white_screen
6. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC169282/>

Rationale for nature of the course

Hands on training on microbial physiology have greater application in industry, developing medicine and even in agriculture. Technical skills related to bioinstrumentation are essential for its application in the laboratory. It is useful for handling, analyzing and interpreting various biological samples. Hands-on experience pertaining to biological equipments is mandatory in the field of quality control, testing, diagnosis and research.

Activities having direct bearing on skill development/employability/entrepreneurship:

Experiments related to Microbial physiology have traditionally played a very important role in both fundamental research and in industrial applications of microorganisms.

It is Possible to optimize industrial fermentations through introduction of directed genetic modification - an approach referred to as metabolic engineering.

Applying the techniques related to quality control in various industrial sectors and research units.

Fabricating minor equipments, marketing and servicing of laboratory equipments.

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

CLOs	Course Learning Outcomes	Knowledge Level
CLO1	Illustrate bacterial growth by turbidity method	Up to K2
CLO2	Calculate glucose uptake by microbes	Up to K3
CLO3	Apply oxidation and fermentation techniques	Up to K3
CLO4	Demonstrate photosynthetic pigments and their estimation	Up to K4
CLO5	Standardize Beer-Lambert's law	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	1	2
CLO2	3	2	2	1	1
CLO3	1	1	2	2	1
CLO4	1	2	1	1	1
CLO5	2	3	2	1	2

Advance application – 3,

Intermediate level – 2,

Basic level – 1.

Mapping of course outcome with Programme outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	1	1	2
CLO2	3	2	1	2	2
CLO3	1	1	2	1	1
CLO4	2	1	1	2	2
CLO5	3	2	3	2	1

Advance application – 3,

Intermediate level – 2,

Basic level – 1.

Course designers:

1. Dr. P.N.Rajarajan

2. Dr. P.Kiruthika Lakshmi

DEPARTMENT OF MICROBIOLOGY				CLASS: I PG				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	NME 1	21P1RNM1	Microbial World	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To know the structure and nomenclature of microorganisms
2. To impart basic knowledge on history of microbiology.
3. To identify the uses of environmentally friendly microorganisms
4. To know the beneficial aspects of microbes
5. To study harmful aspects of microbes

Course Learning Outcome

On successful completion of the programme, the students will be able to

1. Explain the morphological and cultural characteristics of microorganisms
2. Understand the contributions of scientists in the field of microbiology
3. Summarize the application of microorganisms in bioremediation
4. Understand the beneficial aspects of microbes
5. Classify the harmful microbial characteristics

Unit	Description	Hours	K Level	CLO
I	Unit I - Basic structure and properties of microorganisms Introduction – types, structure and properties of microorganisms- bacteria, fungi, microscopic algae, protozoan and viruses.	6 hrs	Up to K2	1
II	Unit II - Contribution of scientists in the field of microbiology History of Microbiology – Anton van Leeuwenhock – spontaneous generation of organisms, contributions by Redi, Spallanzani, Louis Pasteur, Robert Koch, Edward Jenner and Alexander Fleming in the field of Microbiology.	6 hrs	Up to K2	2

III	Unit III – Interaction of microbes with environment Role and significance of microbes in the environment – superbugs, Biogeochemical cycle, Biogas, Bio-fertilizer, Biological control, Bio-remediation.	6 hrs	Up to K2	3
IV	Unit IV – Significant aspects of microbes Beneficial aspects of microbes- any four important uses and its economical importance with specific examples from Algae, Fungi and Bacteria.	6 hrs	Up to K2	4
V	Unit V – Adverse effects of microbes Harmful aspects of microbes – any four harmful effects of Fungi, Bacteria and viruses with specific examples.	6 hrs	Up to K2	5

Total 30hrs

Books for study:

1. Pelczar, Jr. M.J., Chan, E.C.S. and Kreig, N.R. (2006). Microbiology. 5th Edition. McGraw Hill Inc., New York.
2. Dubey, R.C. (2004). Basic Microbiology, S.Chand Publications, New Delhi.

Reference Books:

1. Hurst, C.J., Crawford, R.L., Garland, J.L., Lipson, D.A. and Mills, A.L. (2002). Manual of Environmental Microbiology, 2nd Edition. ASM Press, New Delhi.
2. Atlas, R.A. (1995). Principles of Microbiology. Mosby Publications, USA.
3. Madigan, M.T. and Martinko, J.M. (2014). Brock Biology of Microorganisms. 14th Edition. Prentice Hall International Inc., USA.

Web resources

1. <https://microbiologyinfo.com/category/basic-microbiology/>
2. <https://microbiologyinfo.com/category/basic-microbiology/>
3. <https://www.britannica.com/science/microbiology>

Rationale for nature of the course

Microorganisms play a vital role in nutrient cycling, biodegradation, climate changes and in making life-saving drugs and manufacture of biofuels. Bio-treatment of waste has become environmentally friendly alternative to other options. Microbes are also known to cause deadly disease and cause an adverse impact on other living organisms.

Activities having direct bearing on skill development/ employability/entrepreneurship

Determination of the morphological characteristic of microorganisms.

Categories environmental friendly microbes

Microbial adverse effects on other life

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

On completion of this course the students will be able to

CLOs	Course Learning Outcome	Knowledge Level
CLO-1	Explain the morphological and cultural characteristics of microorganisms	Up to K2
CLO-2	Understand the contributions of scientists in the field of microbiology	Up to K2
CLO-3	Summarize application of microorganisms in bioremediation	Up to K2
CLO-4	Understand the beneficial aspects of microbes	Up to K2
CLO-5	Classify the harmful microbial characteristics of microbes	Up to K2

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	1	1
CLO2	2	3	3	2	2
CLO3	1	1	2	1	1
CLO4	1	2	1	1	2
CLO5	1	1	1	2	1

Advance application – 3,

Intermediate level – 2,

Basic level – 1.

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	1	2	1	2	1
CLO2	2	2	3	3	2
CLO3	1	2	1	2	1
CLO4	2	1	2	1	1
CLO5	1	1	1	2	1

Advance application – 3,

Intermediate level – 2,

Basic level – 1.

LESSON PLAN

Units	Description	Staff	Hours	Mode
I Basic structure and properties of microorganisms	a) Introduction – types, structure and properties of microorganisms		1	Chalk and Talk
	b) Types, structure and properties of bacteria, fungi		2	PPT
	c) Types, structure and properties of microscopic algae, protozoan and viruses.		3	PPT
II Contribution of scientists in the field of microbiology	a) History of Microbiology — spontaneous generation of organisms.		1	Chalk and talk
	b) Contributions by Anton van Leeuwenhock, Redi, in the field of Microbiology.		2	PPT
	c) Spallanzani, Louis Pasteur, Robert Koch in the field of Microbiology.		2	Chalk and Talk
	d) Edward Jenner and Alexander Fleming in the field of Microbiology.		2	Lecture
III Interaction of microbes with environment	a) Role and significance of microbes in the environment – superbugs.		1	PPT
	b) Role and significance of microbes in the environment –biogeochemical cycle.		1	Chalk and Talk
	c) Role and significance of microbes in the environment – biogas, bio-fertilizer.		2	Lecture
	d) Role and significance of microbes in the environment – biological control, bio-remediation.		2	PPT
IV Significant aspects of microbes	a) Beneficial aspects of microbes- any four important uses and its economical importance with specific examples from Algae.		2	Chalk and talk
	b) Beneficial aspects of microbes- any four important uses and its economical importance with specific examples from Fungi.		2	PPT
	c) Beneficial aspects of microbes- any four important uses and its economical importance with specific examples from Bacteria		1	Chalk and Talk
V Adverse effects of microbes	a) Harmful aspects of microbes – any four harmful effects of Fungi with specific examples.		2	PPT
	b) Harmful aspects of microbes – any four harmful effects of Bacteria with specific examples.		2	Lecture
	c) Harmful aspects of microbes – any four harmful effects of viruses with specific examples.		2	Chalk and Talk
Total			30 Hours	

Learning Outcome Based Education & Assessment (LOBE)
Formative Exam – Blue Print (CIA I & II)
Articulation Mapping - K Levels with Courses Learning Outcomes (CLOs)

CLOs	K- Level	Section A		Section B		Section C	
		Short Answers		(Either/or Choice)		(Open Choice)	
		No. of Questions	K- Level	No. of Questions	K- Level	No. of Questions	K- Level
CLO x	Up to K2	1	K1	1	K2/K2	1	K1
CLO y	Up to K2	2	K1	1	K2/K2	2	K1
No. of Questions to be asked		3		2		3	
No. of Questions to be answered		3		2		2	
Marks for each question		2		7		10	
Total Marks for each section		6		14		20	

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels (CIA I & II)

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	6	-	30	-	36	56.25	100
K2	-	28	-	-	28	43.75	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	6	14	30	-	64	100.00	100%

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K-Level	Section – A		Section – B		Section – C	
			Short Answers		(Either / or Choice)		(Open Choice)	
			No. of Questions	K-Level	No. of Questions	K-Level	No. of Questions	K-Level
1	CLO 1	Up to K2	1	K1	1	K2/K2	1	K1
2	CLO 2	Up to K2	1	K1	1	K2/K2	1	K1
3	CLO 3	Up to K2	1	K1	1	K2/K2	1	K1
4	CLO 4	Up to K2	1	K1	1	K2/K2	1	K1
5	CLO 5	Up to K2	1	K1	1	K2/K2	1	K1
No. of Questions to be asked			5		5		5	
No. of Questions to be answered			5		5		3	
Marks for each question			2		7		10	
Total Marks for each section			10		35		30	

Distribution of Section-Wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (No Choice)	Section D (No Choice)	Total Marks	% of Marks (without choice)	Consolidated
K1	10	-	50	-	60	46.15	100
K2	-	70	-	-	70	53.85	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	10	35	50	-	130	100.00	100

Course designers:

1. Mrs. K. Rajeswari

DEPARTMENT OF MICROBIOLOGY				CLASS: I M.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core - 4	21P2RMC4	Cell and Molecular Biology	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	✓

Course Objectives

1. To recall the structure and functions of cell organelles, appreciate the need of cell division in growth and perpetuation of a species
2. To compare the structure and types of DNA
3. To differentiate transcription in prokaryotes and eukaryotes
4. To explain the protein synthesis and post translational modifications
5. To analyze the significance of mutation in the evolution of species

Course Learning Outcomes

On successful completion of the programme, the students will be able to

1. Compare the structure of cell organelles with their function and explain the importance of cell division in organisms
2. Illustrate the different types of DNA
3. Distinguish the transcription in prokaryotes and eukaryotes
4. Compile the protein synthesis and Post translational modifications
5. Justify the significance of mutation in the evolution of species

Unit	Description	Hours	K- level	CLO
I	Unit I Cells and Cell Cycle Structure, composition and function of cell and cell organelles – cell membrane, nucleus, nucleolus, endoplasmic reticulum, golgi apparatus, ribosomes, lysosomes, mitochondria, chloroplast, peroxisomes, microtubules. Cell cycle-(G0, G1, G2, S and M phases) and its checkpoints. Cell division- Mitosis and Meiosis.	15 hrs	Up to K2	1
II	Unit II Structure and Replication of DNA Structure and properties of DNA. Different forms of DNA-A, B and Z, Supercoiling of DNA. DNA replication – enzymes involved mechanism and types of DNA replication-conservative, semiconservative and dispersive. Modes of replication -Q mode, D model, rolling circle model, Bidirectional and Unidirectional.	15 hrs	Up to K3	2

III	Unit III Transcription Components and function of RNA polymerase. Transcription in prokaryotes - initiation, elongation, and termination. Transcription in eukaryotes - RNA polymerase –promoters, enhancers and silencers. Post transcriptional modifications- splicing, addition of 5'cap, creation of poly AAA and RNA editing. Antisense RNA technique and its applications.	15 hrs	Up to K3	3
IV	Unit IV Translation Genetic code. Wobble hypothesis. Functions of tRNA, rRNA, mRNA. Protein synthesis- initiation, elongation and termination. Post translational modifications- phosphorylation, glycosylation, ubiquitination, nitrosylation, methylation, acetylation, lipidation and proteolysis. Molecular chaperons.	15 hrs	Up to K4	4
V	Unit V Mutation Mutation - spontaneous and induced types of mutation- substitutions, deletions, insertions missense, nonsense, insertion, deletion, duplication, frameshift, repeat expansion. Mutagens- physical, chemical and biological mutagens. Molecular mechanisms of mutagenesis, Methods of directed mutagenesis. Repair mechanism- photo reactivation and SOS.	15 hrs	Up to K4	5

Total 75 hours

Books for study:

1. Old, R.S. and Primrose, S.B. (1995). Principles of Gene manipulation. 5th Edition. Blackwell Scientific Publication, London.
2. Click, B.R. and Pasternat, J.J. (1994). Molecular Biotechnology. ASM press. Washington DC.

Books for reference:

1. Lewin, B. (1997). Genes VI. Oxford University Press, London.
2. David, B.D., Delbecco, R., Eisen, H.N. and Ginsburg, H.S. (1990). Microbiology. 5th Edition. Harper & Row, New York.

Web Resources

1. https://bio.libretexts.org/Bookshelves/Cell_and_Molecular_Biology
2. <https://web.uri.edu/cmb/cell-and-molecular-biology/>
3. <https://www.nature.com/scitable/topic/cell-biology-13906536/>
4. <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/cell-biology>
5. <https://www.microscopemaster.com/cell-biology.html>

Rationale for nature of the course

Cell and molecular biology course will help to understand the structure and function of the basic unit of life. This field explores the relationships between cell processes and reactions, macromolecules and gene control pathway. The study of molecular cell biology enables students to understand how cell programs and reactions function normally as well as the relationships between those processes and gene expression.

Activities having direct bearing on skill development/ employability/entrepreneurship

Students will be able to understand and integrate knowledge of chemical and biological principles of living systems.

Students will develop quantitative skills in order to collect, analyse and interpret experimental data.

Understanding how genes are inherited through meiosis and fertilization.

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

CLOs	Course Learning Outcome	Knowledge Level
CLO1	Compare the structure of cell organelles with their function and explain the importance of cell division in organisms	Up to K2
CLO2	Illustrate the different types of DNA	Up to K3
CLO3	Distinguish the transcription in prokaryotes and eukaryotes	Up to K3
CLO4	Compile the protein synthesis and Post translational modifications	Up to K4
CLO5	Justify the significance of mutation in the evolution of species	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	1	3	2	3
CLO2	1	1	1	2	2
CLO3	2	2	1	1	3
CLO4	2	2	2	1	2
CLO5	2	2	2	2	2

Advance application–3

Intermediate level –2

Basic level –1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	1	1	1	1	1
CLO2	1	1	1	1	1
CLO3	1	1	1	1	1
CLO4	1	2	2	2	2
CLO5	2	2	2	2	2

Advance application–3

Intermediate level –2

Basic level –1

Learning Outcome Based Education & Assessment (LOBE)

Blue Print

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K2	2	K2 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K3	2	K3 & K3	1	K1	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K3	2	K3 & K3	1	K2	2 (K2&K2)	1(K3)
4.	CLO 4	Up to K4	2	K4& K4	1	K2	2 (K4&K4)	1(K4)
5.	CLO 5	Up to K4	2	K1& K1	1	K3	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	35 %
K2	2	4	10	10	26	21.67	
K3	4	2	10	20	36	30	30%
K4	2	-	20	20	42	35	35%
Total Marks	10	10	50	50	120	100.00	100%

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

LESSON PLAN

UNITS	DESCRIPTION	STAFF	HOURS	MODE
I Composition of cells	a) Cell membrane, Nucleus, Nucleolus		3	Chalk and Talk PPT
	b) Endoplasmic Reticulum, Golgi apparatus, Lysosomes, Microtubules.		3	
	c) Mitochondria, Chloroplast, Peroxisomes,		3	
	d) Cell cycle G1,G2,S and Mitosis		3	
	e) Meiotic cell division.		3	
II Nucleic acid DNA	a) Structure and Properties of DNA. Different forms of DNA-A, B and Z		3	Chalk and Talk PPT
	b) Supercoiling of DNA .		2	
	c) DNA replication – Enzymes involved, mechanism		3	
	d) Types of DNA replication-conservative, semiconservative		3	
	e) Dispersive-Q mode, D model, rolling circle model, Bi and uni directional		4	
III Transcription	a) Transcription in prokaryotes RNA polymerase structure-promoters-initiation, elongation, and termination.		5	Chalk and Talk & PPT
	b) Transcription in eukaryotes-RNA polymerase-promoters-enhancers and silencers.		3	
	c) Post transcriptional modifications. splicing, addition of 5'cap,creation of poly AAA,RNA editing.		4	
	d) Antisense RNA technique and its applications.		3	
IV Nucleic acid RNA	a) Genetic code, Wobble hypothesis.		3	PPT & Chalk and Talk
	b) Structure of t RNA, r RNA, m RNA		5	
	c) Protein synthesis- initiation, elongation and termination.		2	
	d) Post translational modifications.		5	
V Mutation	a) Mutation: Spontaneous and Induced types of mutation		3	PPT &Chalk and Talk
	b) Types of mutation-substitutions, deletions, insertionsMissense, Nonsense, Insertion, Deletion, Duplication, Frameshift, Repeat expansion.		3	
	c) Mutagens- physical, chemical and biological mutagens. physical mutagens and chemical mutagens.		3	
	d) Molecular Mechanisms of mutagenesis, Methods of directed mutagenesis. .		2	
	e) Repair mechanism- Photoreactivation, SOS		2	
	f) Molecular chaperons.		2	
Total			75 Hours	

Course designers : Dr. A. P. AshaKannan

DEPARTMENT OF MICROBIOLOGY				CLASS: I M.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core - 5	21P2RMC5	Microbial Genetics	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	✓

Course Objectives

1. To understand history of microbial genetics and mutation
2. To understand the basic concepts of bacterial genetics
3. To know the importance of phage genetics
4. To gain knowledge about transposable elements and their roles
5. To know about mechanisms of gene expression in bacteria

Course Learning Outcomes

On successful completion of the programme, the students will be able to

1. Outline the history of microbial genetics and mutation
2. Delineate the basic concepts of bacterial genetics
3. Predict the significance of phage in genetics
4. Interpret the roles of transposable elements in microorganisms
5. Elaborate the mechanisms of gene expression in microbes

Unit	Description	Hours	K- level	CLO
I	Unit I – History and Mutation History of microbial genetics. Mendel's laws of heredity. Mutations and genetic analysis - useful phenotypes in bacteria and phage. Luria and Delbruck experiment. Newcombe - Isolation of Auxotrophic mutants - positive and negative selection of mutants. Complementation - allelism and cis/trans tests. Population genetics.	15 hrs	Up to K2	1
II	Unit II – Bacterial Genetics Bacterial conjugation - F ⁺ , F ⁻ Hfr strains. Genetic mapping with Hfr crosses. F ⁻ prime factors. Complementation test using F ⁻ prime factors. Conjugation in <i>Streptomyces</i> and role of Pheromones in plasmid transfer in <i>Enterococcus faecalis</i> . Transformation – definition, competence induction, mechanism of DNA uptake in <i>E.coli</i> . <i>Bacillus sp.</i> and <i>Haemophilus sp.</i> Recombination and its mechanisms.	15 hrs	Up to K3	2

III	Unit III Phage Genetics Phage biology - virulent and temperate bacteriophages (T7, M13 and P1), gene expression of lambda phage during lytic and lysogenic cycles, phage crosses, recombination and complementation tests with phages. T4 RII locus mapping. Generalized transduction and specialized transduction. Co-transduction. Mapping of bacterial markers.	15 hrs	Up to K3	3
IV	Unit IV Transposable Elements Contributions of Barbara McClintock. Transposable genetic elements – IS elements, transposons and their types (Tn3, Tn5, Tn9, Tn10 and μ phage). Identification of transposons. Mechanism of transposition. Transposable elements in eukaryotes –maize, AC and DS elements, spm, dspm, p and copia elements in <i>Drosophila</i> and retro transposons.	15 hrs	Up to K4	4
V	Unit V Gene Expression Regulation of gene expression- negative regulation (<i>lac</i> and <i>gal</i> operon). Positive regulation (<i>trp</i> and <i>ara</i> operon). Role of RNA molecules in gene regulations. Regulatory mechanisms in <i>E.coli</i> - catabolite regulation, tRNA and rRNA regulation (stringent control).	15 hrs	Up to K4	5

Total 75 Hours

Books for study:

1. Lodish, H., Daerck, B.A., Zipsury, S.L., Marsudaisa, P. and Darnel, J. (1995). Molecular cell biology. W.H.Freeman & Colorado Ltd., US.
2. Gardner, E.J., Simmons, M.J. and Snustad, P.D. (2008). Principles of genetics. 8th Edition. John Wiley & sons. Inc., New York.

Books for Reference:

1. Maloy, S.R., Cronan, Jr. J.E. and Freifelder. D. (1994). Microbial Genetics. Jones and Barlett publishers, Massachusetts.
2. Jocelyn, E., Krebs, J.E., Goldstein, E.S. and Kilpatrick, S.T. (2017). Lewin's GENES XII. Jones and Bartlett Publishers, Massachusetts.

Web Resources:

1. <https://www.ncbi.nlm.nih.gov/genome/microbes/>
2. <https://www.mdpi.com/journal/genes/sections/MGG>
3. <https://bmcmicrobiol.biomedcentral.com/articles/sections/microbial-genetics-genomics-and-proteomics>
4. <https://www.nature.com/subjects/microbial-genetics>

Rationale for nature of the course

This course introduces the basic concepts of bacterial genetics to understand genetic make up, gene transfer and mutation. It explores the importance of phage genetics and to gain knowledge about

transposable elements and their roles. The mechanisms of gene expression in bacteria can also be used for constructing genetic map.

Activities having direct bearing on skill development/ employability/entrepreneurship

Isolation and identification of mutants in bacteria

Construct genetic make up

Induce mutation and understand repair systems in living organisms

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

CLOs	Course Learning Outcome	Knowledge Level
CLO1	Outline the history of microbial genetics and mutation	Up to K2
CLO2	Delineate the basic concepts of bacterial genetics	Up to K3
CLO3	Predict the significance of phage in genetics	Up to K3
CLO4	Interpret the roles of transposable elements in microorganisms	Up to K4
CLO5	Elaborate the mechanisms of gene expression in microbes	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	3	3	2	3	3
CLO2	2	2	2	2	2
CLO3	2	2	3	2	3
CLO4	2	3	2	2	2
CLO5	2	2	2	3	2

Advance application – 3

Intermediate level – 2

Basic level – 1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	1	2	2	1
CLO2	2	2	2	2	3
CLO3	2	2	1	1	2
CLO4	2	2	2	2	2
CLO5	3	2	2	2	2

Advance application – 3

Intermediate level – 2

Basic level – 1

Learning Outcome Based Education & Assessment (LOBE)

Blue Print

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K2	2	K2 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K3	2	K3 & K3	1	K1	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K3	2	K3 & K3	1	K2	2 (K2&K2)	1(K3)
4.	CLO 4	Up to K4	2	K4& K4	1	K2	2 (K4&K4)	1(K4)
5.	CLO 5	Up to K4	2	K1& K1	1	K3	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	35 %
K2	2	4	10	10	26	21.67	
K3	4	2	10	20	36	30	30%
K4	2	-	20	20	42	35	35%
Total Marks	10	10	50	50	120	100.00	100%

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

LESSON PLAN

UNITS	DESCRIPTION	STAFF	HOURS	MODE
I History and Mutation	a) History of microbial genetics. Mendel's laws of heredity.		2	Chalk and Talk
	b) Mutations and genetic analysis		2	
	c) Useful phenotypes in bacteria and phage		2	
	d) Luria and Delbruck experiment		3	
	e) Newcombe-Isolation of Auxotrophic mutants		2	
	f) Positive and negative selection of mutants		2	
	g) Complementation-Allelism and cis/trans tests. Population genetics.		2	
II Bacterial Genetics	a) Bacterial conjugation: F+, F- Hfr strains		2	Chalk and Talk
	b) Genetic mapping with Hfr crosses.		2	
	c) F- prime factors		2	
	d) Complementation test using F-prime factors-conjugation in <i>Streptomyces</i>		2	
	e) Role of Pheromones in plasmid transfer in <i>Enterococcus faecalis</i>		2	
	f) Transformation - definition – competence induction - mechanism of DNA uptake in <i>E.coli</i>		2	
	g) mechanism of DNA uptake in <i>Bacillus sp</i> and <i>Haemophilus sp</i>		1	
	h) Recombination and its mechanisms		2	

UNITS	DESCRIPTION	STAFF	HOURS	MODE
III Phage Genetics	a) Phage biology - virulent and temperate bacteriophages (T7, M13 and P1)		3	Chalk and Talk & PPT
	b) gene expression of lambda phage during lytic and lysogenic cycles		2	
	c) phage crosses, recombination and complementation tests with phages		2	
	d) T4 RII locus mapping		2	
	e) Generalized transduction and specialized transduction		2	
	f) Co-transduction		2	
	g) Mapping of bacterial markers		2	
IV Transposable Elements	a) Contributions of Barbara McClintock.		3	PPT & Chalk and Talk
	b) Transposable genetic elements – IS elements, transposons and their types (Tn3, Tn5, Tn9, Tn10 and μ phage)		3	
	c) Identification of transposons.		3	
	d) Mechanism of transposition		3	
	e) Transposable elements in eukaryotes –maize, AC and DS elements, spm, dspm, p and copia elements in <i>Drosophila</i> and retro transposons		3	
V Gene Expression	a) Regulation of gene expression- negative regulation (<i>lac</i> operon).		3	PPT
	b) Regulation of gene expression- negative regulation (<i>gal</i> operon).		3	
	c) Positive regulation (<i>trp</i> operon).		2	
	d) Positive regulation (<i>ara</i> operon).		2	
	e) Role of RNA molecules in gene regulations.		2	
	f) Regulatory mechanisms in <i>E.coli</i> - catabolite regulation, tRNA and rRNA regulation (stringent control).		3	
Total			75 Hours	

Course designers

1. Mr. P. Sasikumar

DEPARTMENT OF MICROBIOLOGY				CLASS: I M.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Core - 6	21P2RMC6	Immunology	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To describe the basic knowledge about immunity, organs and cells involved in immunity.
2. To demonstrate the mechanisms involved in initiation of specific immune responses and antibody diversity.
3. To detect the reaction by immune system leading to autoimmune, hypersensitive conditions and its consequences.
4. To assess the various serological diagnostic techniques based on antigen – antibody interaction.
5. To gain knowledge about immunologic processes governing graft rejection and therapeutic modalities for immune suppression in transplantation.

Course Learning Outcomes

On successful completion of the programme, the students will be able to

1. Summarize the fundamental concepts of immunity, compare the basic mechanism of innate and acquired immunity; humoral and cell mediated immunity.
2. Demonstrate the various antibodies and complement system
3. Analyze the significance of Major Histocompatibility Complex in terms of immune response and Realize how the MHC molecules functions.
4. Explain the interaction between the immune system and pathogens and allergic reactions.
5. Define the properties of cancer cells, immune recognition of tumors, immune evasion of cancers and basis of transplantations.

Unit	Description	Hours	K-level	CLO
I	Unit I - Introduction to Immunology History, Immunity- types-innate immunity (active, passive exposure), acquired (active, passive exposure). Cell mediated immunity and Humoral immunity. Immune system- Primary and Secondary lymphoid organs-lymph node, spleen, thymus, bone marrow, lymphoid tissues- GALT (Gut Associated Lymphoid Tissue), MALT (Mucosa Associated Lymphoid Tissue) SALT (Skin Associated Lymphoid Tissue). Immunoreactive cells-structure and functions-macrophages, granulocytes, NK cells, T and B lymphocytes – origin, development, differentiation, lymphocyte subpopulation in humans.	15 hrs	Up to K2	1

II	Unit II – Antigens and Immunoglobulins Antigens and immunogenicity- terminologies and definition- antigen, immunogen, haptens, super antigen, tolerant, epitope, paratope. Features associated with antigenicity and immunogenicity. Basis of antigen specificity. Antigen processing and presentation to T- lymphocytes. Immunoglobulins (IgA, IgD, IgG, IgE, IgM)- structure, types, distribution, biological and chemical properties - Theories of antibody production- its regulation and diversity. Production of monoclonal and polyclonal antibodies. Complement system – mode of activation- classical, alternate and lectin pathways, biological functions.	15 hrs	Up to K3	2
III	Unit III – Immune responses and Immune disorders Immune response – primary and secondary. Physiology of acquired immune response – various phases of HI, CMI – cellmediated cytotoxicity. Autoimmunity–Systemic-Rheumatoid arthritis-Multiple sclerosis-Systemic lupus erythematosus (SLE). Hypersensitivity – types (Types I, II, III and IV) and mechanisms.Immuno-induction, immunosuppression, immuno-tolerance, immuno-potentiation. Role of cytokines, lymphokines and chemokines., Immunodeiciency-AIDS (HIV infection).	15 hrs	Up to K3	3
IV	Unit - IV: Antigen-Antibody reactions Antigen – Antibody reactions –serological methods-Quantification (dilution, titer method), strength of antigen-antibody interactions (affinity, avidity), Lattice hypothesis or prozone phenomenon, Immunological tests- Blood group types- ABO system, agglutination- direct and indirect agglutination tests, types-slide, tube, coomb's, passive- latex, haemagglutination, precipitation tests- precipitation in gels, precipitation curve, tube/ring precipitation test, immunodiffusion tests-gel diffusion (Oudin, Radial, Ouchterlony).	15 hrs	Up to K4	4
V	Unit - V: Transplantation immunology and Immunodiagnosis Tumor and Transplantation Immunology – MHC – types and importance- distribution and function. Immunologic Basis of Graft Rejection -Allograft rejection –cells involved– GVHD – Prevention of graft rejection. Tumor Antigens –Immunity to tumor-Tumor evasion mechanisms-Immunodiagnosis – Tumor therapy. Vaccines - Immunization schedule.	15 hrs	Up to K4	5

Total 75 Hrs

Books for Study:

1. Roitt, I.M. (1998). Essentials of Immunology. Blackwell Scientific Publishers, London.
2. Kuby, J. (1994) Immunology, 2nd Edition, W.H. Freeman and Company, New York.
3. Leffel, Donnenberg, A. and Rose, W. (1997). Hand book of Human Immunology. Boca Raton Fla: C.R.C Press. Boca Raton, United States.
4. Abbas, A.K., Lichtman, A.M. and Pober, J.S. (1997). Cellular and Molecular immunology 3rd Edition W.B. Saunders, United States.
5. Ananthanarayanan, R. and Panicker, J.C.K. (1994). Text book of Microbiology. Orient Longman, Hyderabad, India.

Books for Reference:

1. Clark, W.R. (1991). The experimental foundations of modern immunology. John Wiley and Sons Inc., New York.
2. Brooks, G.F., Carroll, K.C., Butel, J.S., Morse, S.A., Melnick, J. and Adelberg. (2007). Medical Microbiology. 24th Edition. McGraw Hill Publication, New York.
3. Baron, E.J. and Tenenbaum, S.M. (1995). Diagnostic Microbiology. Blackwell Scientific Company, New Jersey.

Web Resources:

1. <https://onlinelibrary.wiley.com/journal/13652567>
2. <http://www.helmsberg.at/immunology.pdf>
3. <http://www.mednotes.net/notes/immunology/>
4. <https://www.nejm.org/medical-research/autoimmune-disease%20Course%20Learning%20Outcomes/>

Rationale for Nature of the course

Immunology deals with physiological functioning of the immune system in states of both health and disease as well as malfunctions of the immune system in immunological disorders like allergies, hypersensitivities, immune deficiency, transplant rejection and autoimmune disorders. It deals with physical, chemical and physiological characteristics of the components of immune system *in vitro*, and *in vivo*. Immunology has a vast array of uses in several disciplines of science and medical sciences.

Activities having direct impact on Skill development/Employability / Entrepreneurship

Identifying immunology related diseases and developing research initiatives for early detection.
Providing skills to work with professional regulatory bodies regarding clinical research.
Hands-on training for designing drugs and to perform serological diagnosis.

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

On completion of this course the students will be able to

CLOs	Course Learning Outcome	Knowledge Level
CLO-1	Summarize the fundamental concepts of immunity, compare the basic mechanism of innate and acquired immunity; humoral and cell mediated immunity.	Up to K2
CLO-2	Demonstrate the various antibodies and complement system	Up to K3
CLO-3	Analyze the significance of Major Histocompatibility Complex in terms of immune response and Realize how the MHC molecules functions.	Up to K3
CLO-4	Explain the interaction between the immune system and pathogens and allergic reactions.	Up to K4
CLO-5	Define the properties of cancer cells, immune recognition of tumors, immune evasion of cancers and basis of transplantations.	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	1	2	2	1	1
CLO2	2	2	3	2	1
CLO3	3	2	1	2	2
CLO4	1	1	1	2	1
CLO5	1	3	3	1	1

Advance application – 3, Intermediate level – 2, Basic level – 1.

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	1	2	2	1	2
CLO2	2	1	1	2	2
CLO3	1	2	2	1	1
CLO4	1	2	1	2	1
CLO5	2	2	1	2	1

Advance application – 3, Intermediate level – 2, Basic level – 1.

Learning Outcome Based Education & Assessment (LOBE)

Blue Print

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K2	2	K2 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K3	2	K3 & K3	1	K1	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K3	2	K3 & K3	1	K2	2 (K2&K2)	1(K3)
4.	CLO 4	Up to K4	2	K4& K4	1	K2	2 (K4&K4)	1(K4)
5.	CLO 5	Up to K4	2	K1& K1	1	K3	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	35 %
K2	2	4	10	10	26	21.67	
K3	4	2	10	20	36	30	30%
K4	2	-	20	20	42	35	35%
Total Marks	10	10	50	50	120	100.00	100%

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

LESSON PLAN

Units	Description	Staff	Hours	Mode
I Introduction to Immunology	a) Introduction- immunity- types-innate, acquired (active, passive exposure).		2	Chalk and Talk
	b) Cell mediated immunity and Humoral immunity.		2	PPT
	c) Organs of immune system: Primary and Secondary lymphoid organs- lymph node, spleen, thymus, bone marrow.		3	PPT
	d) Lymphoid tissues- GALT (Gut Associated Lymphoid Tissue), MALT (Mucosa Associated Lymphoid Tissue) SALT (Skin Associated Lymphoid Tissue).		3	Chalk and Talk
	e) Immunoreactive cells- structure and functions. macrophages, granulocytes, NK cells		2	Lecture
	f) T and B lymphocytes. Phagocytosis		3	PPT
II Antigens and Immunoglobulins	a) Antigen - types, properties. Hapten, adjuvants		3	Chalk and talk
	b) Immunoglobulins – Basic structure and classes – (IgG, IgA, IgM, IgD, IgE) and functions.		4	PPT
	c) Immunotechnology – hybridoma and monoclonal , polyclonal antibodies,		4	Lecture
	d) Complement system – mode of activation- classical, alternate and lectin pathways, biological functions.		4	Chalk and Talk
III Immune responses and immune disorders	a) Physiology of acquired immune response – various phases of HI, CMI – cell mediated cytotoxicity		4	PPT
	b) Hypersensitivity reactions - types, Antibody mediated (Type- I, Type II, Type III) and Cell mediated (Type- IV)		4	Chalk and Talk
	c) Autoimmunity–organspecific-Systemic-Rheumatoid arthritis-Multiple sclerosis-Systemic lupus erythematosus (SLE).		3	Lecture
	d) Immuno-induction, immunosuppression, immuno-tolerance, immuno-potential. Role of cytokines, lymphokines and chemokines.		4	Chalk and Talk

IV Antigen-Antibody reactions and Immunological techniques	a) Antigen – Antibody reactions – serological methods- Quantification (dilution, titer method).		2	PPT
	a) Strength of antigen-antibody interactions (affinity, avidity), Lattice hypothesis or prozone phenomenon		3	Chalk and Talk
	b) Immunological tests- Blood group (ABO), agglutination- direct and indirect agglutination tests, types-slide, tube, coomb's, passive- latex, haemagglutination.		3	Lecture
	c) Precipitation tests- precipitation in gels, precipitation curve, tube/ring precipitation test.		4	Chalk and Talk
	d) Immunodiffusion tests-gel diffusion (Oudin, Radial, Ouchterlony)		3	PPT
V Transplantation immunology and Immunodiagnosis	a) MHC – structure of MHC I and MHC II.		3	Chalk and talk
	b) Transplantation Immunology – Immunologic Basis of Graft Rejection		4	PPT
	c) Allograft rejection –cells involved– GVHD – Prevention of graft rejection.		3	Lecture
	d) Immunity to tumor-Tumor evasion mechanisms-Immunodiagnosis – Tumor therapy.		4	Chalk and Talk
	e) Vaccines - immunization schedule.		1	PPT
Total			75 Hours	

Course designers

1. Dr. S.Sree Gayathri

DEPARTMENT OF MICROBIOLOGY				CLASS: I M.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Elective - 2	21P2RME2	Research Methodology	4	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	✓

Course Objectives

1. To understand the basic principles of research
2. To present the report in the prescribed format
3. To develop creative thinking and analytical skills
4. To analyze scientific results using biostatistical tools
5. To gain knowledge in basic computer softwares

Course Learning Outcomes

On successful completion of the programme, the students will be able to

1. Understand the basic concepts of research methodology and scientific writing
2. Analyze the Research Problem & Hypothesis making for the scientific problem
3. Explain research, research methods, preparation of research reports, research articles, books, book chapters, impact factors, citation index.
4. Apply concepts of biostatistics and computers, analysis and interpretation of data, writing of thesis, and preparation of manuscript for publication.
5. Analyze the basic concepts of statistical and other softwares

Unit	Description	Hours	K-level	CLO
I	Unit - I: Research Methodology Research Methodology – Introduction, importance, identification of research areas. Review of Literature- documentation and scientific writing. Writing of research proposal, Preparation of research paper and review articles, thesis writing and graphical abstract.	15Hrs	Up to K2	1
II	Unit- II: Formulation of Research Problem and Hypothesis Research Problem – meaning, sources, theory and facts. Criteria of a good research problem. Definition and statement of the problem, delimitation of the problem. Hypothesis – meaning, importance, types, sources, characteristics of a valid hypothesis. Formulation and verification of hypothesis.	15Hrs	Up to K3	2

III	Unit- III: Scientific Writing Steps in scientific writing - format of the research report. Referencing – use of quotations and bibliography compilation. Guidelines for preparing the research article. International Standard Serial Number (ISSN), International Standard Book Number (ISBN), impact factor, citation index, downloading index, h-index, i-index, Google scholar, Scopus, Thomson & Reuters, Web of Science and Science Citation Index (SCI) and Web of Science (WOS). Plagiarism.	15Hrs	Up to K3	3
IV	Unit- IV Biostatistics Principles and practice of statistical methods in biological research – data collection and presentation of data. Measures of central tendency - mean, median, mode, sampling and its types, correlation co-efficient, standard deviation, student ‘t’ test, chi-square test. Analysis of variance (ANOVA) and its uses.	15Hrs	Up to K4	4
V	Unit- V Basic Computer and Software Basics of computers – types, servers, operating systems – Windows, UNIX and Linux. Plagiarism checking softwares. Phylogenetic analysis – Molecular Evolutionary Genetics Analysis (MEGA) and PHYLogeny Inference Package (PHYLP). Statistical softwares - Statistical Package for the Social Sciences (SPSS), Graph pad prism and ‘R’ software. Bibliography softwares – Mendeley. PRIDE (PRoteomics IDentification database).	15Hrs	Up to K4	5

Total 75 Hours

Books for study

1. Arora, P.N. and Malhon, P.K. (1996). Biostatistics. Imalaya Publishing House, Mumbai.
2. Gurumani, N. (2007). Research Methodology. MJP Publishers, Chennai.
3. Ramadass, P. and Aruni, A.W. (2009). Research and Writing - Across the Disciplines. MJP Publishers, Chennai.

Books for reference

1. Kothari, C.R. (2004). Research Methodology: Methods and Techniques. New Age International Publishers, New Delhi.
2. Miles, M.B., Huberman, A.M. and Saldana, J. (2018). Qualitative data analysis: A methods sourcebook. Sage publications, California.
3. Strauss, A.L. (1990). Basics of Qualitative Research. Sage publications, California.

Web Resources

1. https://books.google.co.in/books?id=BS8rDAAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
2. <https://thesis.extension.harvard.edu/biology-research-methods>
3. <https://online-learning.harvard.edu/series/data-analysis-life-sciences>

Rationale for nature of the course

Enables the students to familiarize with research methods used in various fields of microbiology. It is a very important part of our publications as it justifies the significance and novelty of the study. It contributes to the level of professional development of the researcher. It eliminates the gap existing in the pool of scientific literature

Activities having direct bearing on skill development/ employability/entrepreneurship

Identify, justify and critically appraise the use of specific methods when used in the scientific literature. Analyse data in and present it in a written report using appropriate academic style.

To identify the problems in scientific research and to rectify the same.

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

CLOs	Course Learning Outcome	Knowledge Level
CLO1	Understand the basic concepts of research methodology and scientific writing	Up to K2
CLO2	Analyze the Research Problem & Hypothesis making for the scientific problem	Up to K3
CLO3	Explain research, research methods, preparation of research reports, research articles, books, book chapters, impact factors, citation index.	Up to K3
CLO4	Apply concepts of biostatistics and computers, analysis and interpretation of data, writing of thesis, and preparation of manuscript for publication.	Up to K4
CLO5	Analyze the basic concepts of statistical and other softwares	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	1	1	1	2	1
CLO2	1	2	2	2	1
CLO3	2	2	2	3	3
CLO4	3	3	3	3	3
CLO5	3	3	3	3	3

Advance application–3

Intermediate level –2

Basic level –1

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	1	1	1	1	1
CLO2	1	1	1	1	1
CLO3	2	2	2	2	1
CLO4	2	2	2	3	2
CLO5	3	2	3	3	2

Advance application–3

Intermediate level –2

Basic level –1

Learning Outcome Based Education & Assessment (LOBE)

Blue Print

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K2	2	K2 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K3	2	K3 & K3	1	K1	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K3	2	K3 & K3	1	K2	2 (K2&K2)	1(K3)
4.	CLO 4	Up to K4	2	K4& K4	1	K2	2 (K4&K4)	1(K4)
5.	CLO 5	Up to K4	2	K1& K1	1	K3	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33	35 %
K2	2	4	10	10	26	21.67	
K3	4	2	10	20	36	30	30%
K4	2	-	20	20	42	35	35%
Total Marks	10	10	50	50	120	100.00	100%

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

LESSON PLAN

Units	Description	Staff	Hours	Mode
I Research Methodology	a) Research Methodology – Introduction, importance, identification of research areas.		5	Chalk and Talk and PPT Presentation
	b) Review of Literature- documentation and scientific writing.		6	
	c) Writing of research proposal, Preparation of research paper and review articles, thesis writing and graphical abstract.		4	
II Formulation of Research Problem and Hypothesis	a) Research Problem – meaning, sources, theory and facts.		4	Chalk and Talk, PPT Presentation
	b) Criteria of a good research problem. Definition and statement of the problem, delimitation of the problem.		6	
	c) Hypothesis – meaning, importance, types, sources, characteristics of a valid hypothesis. Formulation and verification of hypothesis.		5	

III Scientific Writing	a) Steps in Scientific Report writing- Format of the Research report- Mechanics of Report writing Referencing		4	Chalk and Talk & PPT
	b) Use of quotations- and Bibliography compilation Guidelines for preparing an article		4	
	c) International Standard Serial Number (ISSN), International Standard Book Number (ISBN), impact factor, citation index, downloading index, h-index, i-index, Google scholar, Scopus, Thomson & Reuters		3	
	d) Web of Science and Science Citation Index (SCI) of Web of Science (WOS). Plagiarism		4	
IV Biostatistics	a) Principles and practice of statistical methods in biological research – Data collection, presentation of Data		5	PPT & Chalk and Talk
	b) Measures of central tendency - Mean, Median, Mode, Correlation co-efficient, Standard deviation, student 't' test, chi-square test.		5	
	c) Analysis of variance (ANOVA) and its uses.		5	
V Basic Computer and Software	a) Basics of computers – types, servers, operating systems – Windows, UNIX and Linux. Plagiarism checking softwares.		5	PPT & Chalk and Talk
	b) Phylogenetic analysis – Molecular Evolutionary Genetics Analysis (MEGA) and PHYLogeny Inference Package (PHYLP).)		5	
	c) Statistical softwares - Statistical Package for the Social Sciences (SPSS), Graph pad prism and 'R' software. Bibliography softwares – Mendeley. PRIDE (PRoteomics IDentification database).		5	
Total			75 Hours	

Course designers

1. Dr. K. Kannan

DEPARTMENT OF MICROBIOLOGY				CLASS: I M.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Practical-I	21P2RMP1	Lab in Cell and Molecular Biology and Microbial Genetics	4	4	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. To employ methods of DNA isolation and demonstration
2. To illustrate different methods for mutant isolation
3. To demonstrate bacterial conjugation process
4. To evaluate the life cycle of phage
5. To estimate the phage particles

Course Learning Outcomes

On successful completion of the programme, the students will be able to

1. Describe the key concepts in DNA isolation and demonstration
2. Illustrate the significance of bacterial mutants
3. Apply scientific principles in the interpretation of yeast mutants
4. Demonstrate life cycle of phage
5. Demonstrate titration of phage particles

S.No.	Experiments
1.	Isolation of Chromosomal DNA from <i>E. coli</i>
2.	Isolation of plasmid DNA from bacteria
3.	Isolation of spontaneous mutants Drug resistant mutants by replica plate technique and gradient plate technique.
4.	Enrichment of auxotrophic mutant by Ampicillin treatment.
5.	Isolation of mutants using UV and NTG mutagenesis.
6.	Isolation of Petite mutants of Yeast.
7.	T7 phage lysate preparation and titration.
8.	Transformation of <i>E.coli</i> with plasmids (pUC 18/pBR322).
9.	Bacterial conjugation (Hfr X F-).
10.	P1 lysate preparation and P1 transduction.

Books for study:

1. Chaitanya, K.V. (2013). Cell and Molecular Biology: A Lab Manual. PHI Learning, New Delhi.
2. Ausubel, F.M., Roger, B., Kingston, R.E., Moore, D.A., Seidman, J.G., Smith, J.A. and Kelvin, S. (1992). Short Protocols in Molecular Biology. 3rd Edition. John Wiley & Sons Inc., New York.
3. Berger, S.L. and Kimmel, R. (1987). Guide to Molecular Cloning Techniques. Academic Press, Inc., New York.

Books for Reference:

1. Brown, T.A. (1998). Molecular Biology Lab; Gene Analysis. Academic Press, London.
2. Malov, S.R. (1990). Experimental Techniques in Bacterial Genetics. Jones and Bartlett Publishers, Boston.
3. Miller, J.H. (1992). A Short Course in Bacterial Genetics: A Lab Manual & Hand Book for *E. coli* and related Bacteria. Cold spring Harbor Lab press, New York.
4. Rajamanickam, C. (2001). Experimental protocols in basic molecular biology, Osho Scientific Publications, Madurai.
5. Sambrook, I., Fritsch, E.F. and Maniatis, T. (1989). Molecular Cloning 1, 2, 3 - A Laboratory Manual. 2nd Edition. Cold Spring Laboratory Press, USA.

Web Resources

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2581910/>
2. <https://microbiologybook.org/mayer/ab-ag-rx.htm>
3. https://www.ebi.ac.uk/interpro/potm/2005_2/Page2.htm
4. [https://www.nejm.org/medical-research/autoimmune-disease%20Course%20Learning%20Outcomes%20\(CLO\)](https://www.nejm.org/medical-research/autoimmune-disease%20Course%20Learning%20Outcomes%20(CLO))

Rationale for nature of the course

This course introduces the methods of DNA isolation and demonstration. It also introduces methods of mutant isolation. The life cycle of phage and estimation of phage particles can be explored to understand phage genetics. It demonstrates gene transfer through conjugation process.

Activities having direct bearing on skill development/ employability/entrepreneurship

Employ methods of DNA isolation and demonstration
Illustrate different methods for mutant isolation
Demonstrate bacterial conjugation process
Evaluate the life cycle of phage
Estimate the phage particles

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

CLOs	Course Learning Outcomes	Knowledge Level
CLO1	Describe the key concepts in DNA isolation and demonstration	Up to K1
CLO2	Illustrate the significance of bacterial mutants	Up to K2
CLO3	Apply scientific principles in the interpretation of yeast mutants	Up to K3
CLO4	Demonstrate life cycle of phage	Up to K4
CLO5	Demonstrate titration of phage particles	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	1	2
CLO2	3	2	2	1	1
CLO3	1	1	2	2	1
CLO4	1	2	1	1	1
CLO5	2	3	2	1	2

Advance application – 3, Intermediate level – 2, Basic level – 1.

Mapping of course outcome with Programme outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	1	1	2
CLO2	3	2	1	2	2
CLO3	1	1	2	1	1
CLO4	2	1	1	2	2
CLO5	3	2	3	2	1

Advance application – 3, Intermediate level – 2, Basic level – 1.

Course designers:

1. Dr. A. P. Asha Kannan

2. Mr. P. Sasikumar

DEPARTMENT OF MICROBIOLOGY				CLASS: I M.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Practical-II	21P2RMP2	Lab in Immunology and Research Methodology	4	4	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1. Immunological techniques help to understand and acquire a wide knowledge on immunity and immune system.
2. Brief about different immunological techniques.
3. Employ laboratory techniques that basically develop the preanalytical, analytical and post analytical skills for the performance of the tests.
4. Analyze the suitable statistical program for research experiments
5. Evaluate the significance of difference using statistical tools

Course Learning Outcomes

On successful completion of the programme, the students will be able to

1. Describe an understanding of the key concepts in immunology
2. Illustrate the salient features of antigen antibody reaction and its uses in diagnostics and various other studies
3. Apply scientific principles in the interpretation of immunological responses and data
4. Demonstrate suitable statistical program for research experiments
5. Explain the significance of difference using statistical tools

S.No.	Experiments
1.	Identification of blood cells and Differential Count
2.	Total RBC and WBC Count
3.	Separation of plasma and serum from the blood sample (demonstration).
4.	Identification of human blood groups. (ABO and Rh)
5.	Widal test for typhoid fever
6.	Immunodiffusion by Ouchterlony, Radial method.
7.	Immuno-electrophoresis.
8.	Student' t' test using suitable statistical method
9.	Identification of significance of difference and analysis of data using ANOVA
10.	Plagiarism checker (demonstration).

Books for study

1. Carpenter, D.L. (1975). Immunology and Serology. 3rd Edition. W.B. Saunders Company, London.
2. Garvey, J.S., Cremer, N.E. and Sussdorf, D.H. (1977). Methods in Immunology. A Laboratory Text for Instruction and Research. 3rd Edition. The Benjamin Cummings Publishing Company Advanced Book Program, London.
3. Banerjee, P.K. (2007). Introduction to Biostatistics. S.Chand and Company Publications, New Delhi.

Books for Reference

1. Hudson, L. and Hay, F.C. (1989). Practical Immunology. 3rd Edition, Blackwell scientific Publications, Oxford.
2. Myers, R.L. (1989). Immunology: A Laboratory Manual. Wm. C.Brown Publishers. Dubuque, Iowa.
3. Rastogi, S.C. (1996). Immunodiagnostics Principles and Practice. New Age International (P) Ltd., New Delhi.
4. Talwar, G.P. (1983). A Hand Book of Practical Immunology. Vikas Publishing House Pvt. Ltd., New Delhi.
5. Talwar, G.P. and Gupta, S.K. (1992). A Hand Book of Practical and Clinical Immunology. Vol. 1 -2. CBS Publishers & Distributors, Delhi.
6. Turgeon, M.L. (1990). Immunology and Serology in Laboratory Medicine. The C.V. Mosby Company, Baltimore.
7. Pillai, R.S.N. and Bagavathi, V. (2010). Statistics theory and practice. S. Chand and Company Publications, New Delhi.

Web Resources

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2581910/>
2. https://www.ebi.ac.uk/interpro/potm/2005_2/Page2.html/
3. <https://www.nejm.org/medical-research/autoimmune-disease%20Course%20Learning%20Outcomes/>
4. <https://onlinelibrary.wiley.com/journal/13652567>

Rationale for Nature of the course

The effective treatment of any ailments depends on degree of accuracy in the disease diagnosis. Immunological techniques play a critical role in the field of medical diagnosis and immunotherapy. A clear insight on the understanding the immunological background is mandatory for analysis and interpretation of serological assay. Statistical evaluation of post analytical data helps to authenticate the reliability of the results.

Activities having direct impact on Skill development/Employability / Entrepreneurship

Hands on experience in various serological test.

Performing haemogram test and blood group identification.

Testing the significance of experimental results using statistical analysis.

Pedagogy

Demonstration and practical session.

Course Learning Outcomes (CLO)

On the completion of the course the student will be able to

CLOs	Course Learning Outcomes	Knowledge Level
CLO1	Describe an understanding of the key concepts in immunology	Up to K2
CLO2	Illustrate the salient features of antigen antibody reaction and its uses in diagnostics and various other studies	Up to K2
CLO3	Apply scientific principles in the interpretation of immunological responses and data	Up to K3
CLO4	Demonstrate suitable statistical program for research experiments	Up to K4
CLO5	Explain the significance of difference using statistical tools	Up to K4

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	1	2
CLO2	3	2	2	1	1
CLO3	1	1	2	2	1
CLO4	1	2	1	1	1
CLO5	2	3	2	1	2

Advance application – 3, Intermediate level – 2, Basic level – 1.

Mapping of course outcome with Programme outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	2	2	1	1	2
CLO2	3	2	1	2	2
CLO3	1	1	2	1	1
CLO4	2	1	1	2	2
CLO5	3	2	3	2	1

Advance application – 3, Intermediate level – 2, Basic level – 1.

Course designers:

1. Dr. S.Sree Gayathri

2. Dr. K. Kannan

DEPARTMENT OF MICROBIOLOGY				CLASS: I M.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	NME-2	21P2RNM2	Food and Dairy Microbiology	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1. To understand the significance of microorganisms in food and the factors affecting microbial growth
2. To explain the sources and components of food and their preservation techniques.
3. To illustrate the spoilage mechanisms in foods and identify control methods of deterioration and spoilage
4. To describe the effects of fermentation in food production and its influence on quality and status of the food product.
5. To understand food-borne diseases and food quality control

Course Learning Outcomes

On successful completion of the programme, the students will be able to

1. Outline the role of microorganisms in the production of food and factors influencing their growth and survival.
2. Discuss about various principles involved in food preservation techniques.
3. Classify and describe the characteristics of important pathogens and spoilage microorganisms in foods.
4. Summarize the production and recovery processes of various fermented foods.
5. Discuss the rationale for the use of standard methods and procedures for the microbiological analysis of food sanitation.

Unit	Description	Hours	K- level	CLO
I	Unit – I Food as a substrate for microbes Food as a substrate for microorganisms – microorganisms in food: molds, yeast and bacteria – factors affecting the growth of microorganisms in food.	6 hrs	Up to K2	1
II	Unit – II Food spoilage Spoilage of food - vegetables, eggs, milk and milk products, meat and meat products, sea foods (fish) and canned foods.	6 hrs	Up to K2	2

III	Unit – III Food-borne diseases and food sanitation Food borne infections and intoxications – bacterial and non-bacterial – investigation of food borne diseases – microbiology in food sanitation. Quality control of food.	6 hrs	Up to K2	3
IV	Unit – IV Food preservation Principles of food preservation – general principles and application methods – asepsis, removal of microorganisms- anaerobic conditions, high temperature, low temperature, drying and food additives.	6 hrs	Up to K2	4
V	Unit – V Fermented food products Fermented foods - pickled cucumber, sauerkraut – bread, cheese, vinegar, fermented dairy products. Spoilage of fermented dairy products.	6 hrs	Up to K2	5

Total 30 Hours

Books for Study:

1. Frazier, W.C. and Westhoff, D.C. (2008). Food Microbiology, 4th Edition. McGraw Hill Publishing Co., New Delhi.
2. Bamforth, C.W. (2005). Food, fermentation and Microorganisms. 1st Edition. Black well Science, USA.

Books for Reference:

1. Doyle, M.P., Buchanan, R.L. (2013). Food microbiology- Fundamentals and frontiers. 4th Edition. ASM Press, USA.
2. James, J.M., Martin, L. J., David, G. A. (2005). Modern Food Microbiology. 7th Edition. Springer Publishers, New York.
3. Robinson, R.L. (2012). Dairy Microbiology. Milk and milk products. 3rd Edition. Willey Publishers, USA.

Web Resources:

1. <https://www.sciencedirect.com/food-microbiology>
2. <https://www.omicsonline.org/scholarly/food-microbiology>
3. <https://www.youtube.com/watch?v=raZlcOCdrlw>
4. <https://www.youtube.com/watch?v=6o6wPyqPjsA>

Rationale for nature of the course

Microorganisms play a vital role in foods spoilage and also find the maximum exploitation in the production of food and food products. The course includes various factors involved in microbial growth in food. Moreover, incidence of microorganisms in food represents a major challenge for public health due to their ability to cause food poisoning. Food preservation aims at inactivating and controlling the growth of spoilage and pathogenic microorganisms, insuring shelf-stable and healthy foods.

Activities having direct bearing on skill development/ employability/entrepreneurship

Determination of food quality

Production and recovery of various fermented foods

Microbiological analysis of food sanitation

Pedagogy

Chalk and talk, PPT, Group discussion, Seminar, Screening of educational videos and quiz

Course Learning Outcomes (CLO)

On completion of this course the students will be able to

CLOs	Course Learning Outcome	Knowledge Level
CLO-1	Outline the role of microorganisms in the production of food and factors influencing their growth and survival.	Up to K2
CLO-2	Discuss about various principles involved in food preservation techniques.	Up to K2
CLO-3	Classify and describe the characteristics of important pathogens and spoilage microorganisms in foods.	Up to K2
CLO-4	Summarize the production and recovery processes of various fermented foods.	Up to K2
CLO-5	Discuss the rationale for the use of standard methods and procedures for the microbiological analysis of food sanitation.	Up to K2

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

Mapping of Course Learning Outcome with Programme Specific Outcome

	PSO1	PSO2	PSO3	PSO4	PSO5
CLO1	2	2	2	1	1
CLO2	2	3	3	2	2
CLO3	1	1	2	1	1
CLO4	1	2	1	1	2
CLO5	1	1	1	2	1

Advance application – 3,

Intermediate level – 2,

Basic level – 1.

Mapping of Course Outcome with Programme Outcome

	PO1	PO2	PO3	PO4	PO5
CLO1	1	2	1	2	1
CLO2	2	2	3	3	2
CLO3	1	2	1	2	1
CLO4	2	1	2	1	1
CLO5	1	1	1	2	1

Advance application – 3, Intermediate level – 2, Basic level – 1.

LESSON PLAN

Units	Description	Staff	Hours	Mode
I Food as a substrate for microbes	a) Food as a substrate for microbial growth		2	Chalk and Talk
	b) Microbes and their importance in maintenance of food.		2	PPT
	c) Intrinsic and extrinsic factors that affect growth and survival of microbes in foods		2	PPT
II Food spoilage	a) Natural flora and source of contamination of foods in general.		1	PPT
	b) Principles, Spoilage of vegetables, fruits.		1	Chalk and Talk
	c) Spoilage in milk products and bread.		2	Lecture
	d) Spoilage in meat and sea foods.		1	PPT
	e) Spoilage in canned foods.		1	Chalk and Talk
III Food-borne diseases and food sanitation	a) Food borne infections and intoxications – bacterial and non-bacterial		2	PPT
	b) Investigation of food borne disease		2	Lecture
	c) Microbiology in food sanitation and control (HACCP)		2	Chalk and Talk
IV Food preservation	a) Principles and factors influencing food preservation.		1	Chalk and talk
	b) Physical methods - high temperature, low temperature, irradiation, aseptic packaging.		2	PPT

	c) Chemical methods - salt, sugar, benzoates, citric acid, ethylene oxide, nitrate and nitrite.		2	Chalk and Talk
	d) Food additives		1	Lecture
V Fermented food products	a) Fermented foods-Vegetables (sauerkraut)		2	Chalk and talk
	b) Fermented dairy products- yogurt, acidophilus milk, kumiss, kefir, dahi and cheese.		2	PPT
	c) Probiotics: Health benefits, types of microorganisms used, probiotic foods available in market.		1	Chalk and Talk
	d) Spoilage of fermented foods.		1	PPT
Total			30 Hours	

Learning Outcome Based Education & Assessment (LOBE)
Formative Exam – Blue Print (CIA I & II)
Articulation Mapping - K Levels with Courses Learning Outcomes (CLOs)

CLOs	K- Level	Section A		Section B		Section C	
		Short Answers		(Either/or Choice)		(Open Choice)	
		No. of Questions	K- Level	No. of Questions	K- Level	No. of Questions	K- Level
CLO x	Up to K2	1	K1	1	K2/K2	1	K1
CLO y	Up to K2	2	K1	1	K2/K2	2	K1
No. of Questions to be asked		3		2		3	
No. of Questions to be answered		3		2		2	
Marks for each question		2		7		10	
Total Marks for each section		6		14		20	

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels (CIA I & II)

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	6	-	30	-	36	56.25	100
K2	-	28	-	-	28	43.75	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	6	14	30	-	64	100.00	100%

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K-Level	Section – A		Section – B		Section – C	
			Short Answers		(Either / or Choice)		(Open Choice)	
			No. of Questions	K-Level	No. of Questions	K-Level	No. of Questions	K-Level
1	CLO 1	Up to K2	1	K1	1	K2/K2	1	K1
2	CLO 2	Up to K2	1	K1	1	K2/K2	1	K1
3	CLO 3	Up to K2	1	K1	1	K2/K2	1	K1
4	CLO 4	Up to K2	1	K1	1	K2/K2	1	K1
5	CLO 5	Up to K2	1	K1	1	K2/K2	1	K1
No. of Questions to be asked			5		5		5	
No. of Questions to be answered			5		5		3	
Marks for each question			2		7		10	
Total Marks for each section			10		35		30	

Distribution of Section-Wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (No Choice)	Section D (No Choice)	Total Marks	% of Marks (without choice)	Consolidated
K1	10	-	50	-	60	46.15	100
K2	-	70	-	-	70	53.85	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	10	35	50	-	130	100.00	100

Course designers

1. Dr. N.Panneer Selvam

Department of Biotechnology

Revised Curriculum

(Choice Based Credit system with Outcome Based Education)

Academic Year 2020-2021 onwards

III and IV Semesters (II B.Sc. Biotechnology)

Certificate Courses

Department of Biotechnology

Vision

To produce disciplined and competent students of high calibre, to become socially committed and ethically strong to meet the challenges.

Mission

- To foster excellence in the field of biotechnology.
- To adopt proper pedagogical methods to ensure quality education and academic excellence.
- To provide conducive environment for learning following ethical, moral and spiritual values.

Programme Outcomes

At the end of the program the graduates will be able to

PO-1	Integrate learned skills and knowledge derived from the study of the science and other related disciplines, acquiring the necessary depth and breadth required for a disciplinary perspective.
PO-2	Demonstrate proficiency in using disciplinary-appropriate methods for research, critical analysis or creative work and provide scientific solutions to the problems of the society.
PO-3	Communicate conclusions, interpretations, and implications clearly, concisely, and effectively, both orally and in writing for different types of audiences.
PO-4	Articulate and apply values, principles, ethics and ideals derived from an integrated understanding of their areas of study and demonstrate awareness of current societal and environmental challenges and ways of mitigating them.
PO-5	Use modern tools, resources and software and be abreast with the emerging trends in their disciplinary area and practice lifelong learning.

Programme Educational Objectives (PEOs)

The objectives of this programme

PEO-1	Exhibit practical and theoretical knowledge essential for pursuing higher studies
PEO-2	Elaborate basic and advanced laboratory skills necessary for Biotechnology.
PEO-3	Pursue careers in Pharmaceutical and Food Industry etc, and skills required to employ in a biotechnology laboratory or manufacturing facility
PEO-4	Aware of lifelong learning following ethics for professional practice.
PEO-5	Acquire theoretical and practical skills to develop biotech process to meet the demand.

Programme Specific Outcomes (PSOs)

On the successful completion of B.Sc., Biotechnology the students will be able to

	PSOs	Graduate Attributes
PSO-1	Infer knowledge in core concepts, recent developments and laboratory skills in various domains of biotechnology.	• Knowledge on core competency • Modern Tool Usage
PSO-2	Identify the various biological processes in prokaryotic and eukaryotic organisms and make use of skills in biological and computational tools and techniques.	• Life-long learning • Design • Problem analysis
PSO-3	Correlate and apply physio-chemical, biological, computational, biological and chemical principles and techniques in various areas of Biotechnology.	• Problem analysis • Conduct investigations of complex problems • Design & Development of solutions for complex problems • Modern Tool Usage
PSO-4	Exhibit in depth knowledge in various thrust areas of Biotechnology so as to meet the demands in industry and academia.	• Individual and team work • Communication • Life-long learning
PSO-5	Explain the importance of ethics and socio-economic development through Biotechnology.	• Ethics • Environment and sustainability

**Department of Biotechnology
The Madura College
Madurai**

OBE Programme structure for B.Sc., Biotechnology (2020 -2021 onwards)

Semester	Subject	Course	Title of the Course	H	C
I	20U1TLA1	Language-I	Tamil-I/Hindi-I	6	3
	20U1NEN1	English-I	English-I	6	3
	20U1VEN1	VE & PE	Value Education and Professional Ethics	3	3
	20U1CAC1	Ancillary-I Theory 1	Allied Chemistry-I	4	4
	20U1CAP1	Ancillary-I Practicals	Semi-micro qualitative & volumetric analysis	2	1
	20U1LMC1	Major Core-1	Genetics	3	3
	20U1LMC2	Major Core-2	Basics of Biotechnology	3	3
	20U1LMP1	Major Practicals	Major Practicals-I	3	2
				30	22
II	20U2TLA2	Language-II	Tamil-II/Hindi-II	6	3
	20U2NEN2	English-II	English-II	6	3
	20U2EVS1	E & GS	Environmental and Gender Studies	3	3
	20U1CAC2	Ancillary-I Theory 2	Allied Chemistry-II	4	4
	20U1CAP2	Ancillary-I Practicals	Semi-micro qualitative & volumetric analysis	2	1
	20U2LMC3	Major Core-3	General Physiology	3	3
	20U2LMC4	Major Core-4	Bioinstrumentation	3	3
	20U2LMP2	Major Practicals	Major Practicals-II	3	2
		Extension			1
				30	23
III	20U3TLA3	Language-III	Tamil-III/Hindi-III	6	3
	20U3NEN3	English-III	English-III	6	3
	20U3LNM1	NME-I	Introduction to Biotechnology	2	2
	20U3LSM1	SBE-I	Biophysics and Bioenergetics	2	2
	20U3RAC1	Ancillary-II Theory	Basic Microbiology	4	4
	20U3RAP1	Ancillary-II	Lab in Basic Microbiology	2	1
	20U3LMC5	Major Core-5	Biochemistry	5	5
	20U3LMP3	Major Practicals	Major Practicals-III	3	2
				30	22
IV	20U4TLA4	Language-IV	Tamil-IV/Hindi-IV	6	3
	20U4NEN4	English-IV	English-IV	6	3
	20U4LNM2	NME-II	Applied Biotechnology	2	2
	20U4LSM2	SBE-II	Food Processing and Preservation	2	2
	20U4RAC2	Ancillary-II Theory	Applied Microbiology	4	4
	20U4RAP2	Ancillary-II	Lab in Applied Microbiology	2	1
	20U4LMC6	Major Core-6	Cell and Molecular Biology	5	5
	20U4LMP4	Major Practicals	Major Practicals-IV	3	2
				30	22

Semester	Subject	Paper	Title of the paper	H	C
V	20U5LSM3	SBE-III	Bioethics, Biosafety and IPR	2	2
	20U5LMC7	Major Core-7	Immunology	5	5
	20U5LMC8	Major Core-8	Industrial Biotechnology	5	5
	20U5LMC9	Major Core-9	Plant Biotechnology	5	5
	20U5LME1	Major Elective-I [#]	Biostatistics	4	3
	20U5LME2	Major Elective-II [#]	Animal Biotechnology	3	2
	20U5LMP5	Major Practicals	Major Practicals-V	3	2
	20U5LMP6	Major Practicals	Major Practicals-VI	3	2
				30	26
VI	20U6LSM4	SBE-IV	Nanobiotechnology	2	2
	20U6LMC10	Major Core-10	Environmental Biotechnology	5	5
	20U6LMC11	Major Core-11	Recombinant DNA Technology	5	5
	20U6LMC12	Major Core-12	Medical Biotechnology	5	5
	20U6LME3	Major Elective-III [#]	Bioinformatics	4	3
	20U6LME4	Major Elective-IV [#]	Genomics & Proteomics	3	2
	20U6LMP7	Major Practicals	Major Practicals-VII	3	2
	20U6LMP8	Major Practicals	Major Practicals-VIII	3	2
				30	26

[#]Elective Papers for B.Sc., Biotechnology

Semester	Paper	Title of the paper
V	Major Electives I & II	Biostatistics
		Animal Biotechnology
		Forensic Biotechnology
		Pharmaceutical Biotechnology
VI	Major Electives III & IV	Genomics & Proteomics
		Bioinformatics
		Microbial Biotechnology
		Marine Biotechnology

Ancillary Biotechnology Papers for B.Sc., Microbiology

Semester	Subject Code	Paper	Title of the paper	H	C
III	20U3LAC1	Ancillary-I Theory	Concepts in Biotechnology	4	4
	20U3LAP1	Ancillary-I Practicals	Lab in Biotechnology - I	2	1
IV	20U4LAC2	Ancillary-II Theory	Biotechnology in Human Welfare	4	4
	20U4LAP2	Ancillary-II Practicals	Lab in Biotechnology-II	2	1

Evaluation pattern

Theory

	Components	Marks	Total Marks
Internal [Formative]	Test	10	25
	Assignment	5	
	Attendance/Quiz	5	
	Quiz/ Documentation/ Case lets/ ICT based assignments/ Mini Projects	5	
External [Summative]		75	75
Total Marks			100

Question Paper pattern for External examination - Theory (75 marks)

Section		Marks
A	Multiple Choice Questions (10 X 1 mark)	10
B	Short Answer questions (5 X 2 marks)	10
C	Either or Choice questions (5 X 5 marks)	25
D	Open Choice questions – 3 out of 5 (3 X 10 Marks)	30
	Total	75

Practicals

	Components	Marks	Total Marks
Internal [Formative]	Test	20	40
	Observation	10	
	Record	10	
External [Summative]		60	60
Total Marks			100

Question Paper pattern for External examination - Practicals (60 marks)

Section		Marks
I	Major Question (1 X 20 Marks)	20
II	Minor Question (1 X 15 Marks)	15
III	Spotters (4 X 5 marks)	20
IV	Record Notebook	5
	Total	60

Add-on courses for B.Sc. Biotechnology

Semester	Subject Code	Title of the paper	H	C
III	21U3LAD1	Reproductive Biology	2	2
IV	21U4LAD2	Enzyme Technology	2	2

Evaluation pattern for Add-on courses

Internal evaluation : 50 % marks

External evaluation : 50 %marks

Continuous Internal Assessment components	Marks
Assignment (3nos)/mini project)	20 %
Paper presentation/seminar	15 %
Quiz	15 %
Total	50%

External examination duration: 2 hours

Question paper pattern

Part-A Multiple choice type 10 x 1 = 10 marks

Part- B Descriptive type [4 out of 7] 4 x 10 = 40 marks

Self-study courses for B.Sc. Biotechnology

Semester	Subject Code	Title of the paper	H	C
IV	21U4LSS1	Medical Biochemistry		2
IV	21U4LSS2	Evolutionary Biology		2

Evaluation pattern for Self-study courses

Assessment components	Marks
Assignments (minimum 2)	25%
Project/innovative experimental design	25%
Paper presentation/ viva voce	25%
Internal test	25%
Total	100%

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.A. / B.Sc.				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	NME	20U3LNM1	Introduction to Biotechnology	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1	To understand the basic concepts in frontier areas of biotechnology.
2	To provide students with a basic understanding and knowledge of biotechnology
3	To learn the applications of the biotechnology and its products.
4	To inculcate the students on current scenario in biotechnology.

Unit	Description	Hours	K-level	CLO
I	History, importance and scope of Biotechnology Cells – prokaryotic & eukaryotic, animal & plant cells – comparison. Central dogma – definition, Definition – Traditional and modern history of biotechnology, biotechnology in medicine and industries, biotechnology and the environment, biotechnology and agricultural	6	Up to K-2	1
II	Tools of Cloning Genes: definition and structure - Enzymes: restriction endonucleases and ligases. Vectors: definition and types (plasmid and cosmids). Host organisms: prokaryotic – <i>E.coli</i> and eukaryotic organisms – yeast and mouse.	6	Up to K-2	2
III	Transgenic Plants and Animals Transgenic plants: gene transfer methods – particle bombardments, Bt cotton and transgenic tomato, advantages and disadvantages of transgenic plants. Transgenic animal: methods of gene transfer – microinjection, advantages and disadvantages of transgenic animal - Dolly	6	Up to K-2	3
IV	Bio-processing (Fermentation) Definition – Bioreactors: conventional fermenter and its features – Types of fermentation process (Batch, semi-continuous and continuous process) – Downstream process: Separation, concentration, and purification	6	Up to K-2	4
V	Bioethics and biosafety guidelines in Biotechnology Definition - National and International level biosafety regulations - Hazardous materials used in biotechnology (handling and disposal), Intellectual Property Rights (IPR) - Implication of IPRs and agricultural technology – Patents and copyrights	6	Up to K-2	5

Books for Study

1. Satyanarayana. U. 2009. Biotechnology. Books and Allied Pvt. Ltd.
2. Kumaresan. 2015. Biotechnology. Saras Publications.

Books for Reference

1. Balasubramaniam D, CFA Bryce, K Dharmalingam, J Green, KunthalaJayaraman. Concepts in Biotechnology. University Press Reference Book.
2. Dubey RC. 2012. A textbook of Biotechnology. S. Chand Publications.

Web resources

www.nptel.ac.in

www.swayam.gov.in

Rationale for Nature of the course

The modern biotechnology, involving cloning, vaccine production, genetic engineering, genomics and its assisted techniques, is important technological revolutions in the 21st century. The theoretical knowledge helps to understand the concepts and principles of ancient technology not only for biotechnology students but also non-biotechnology students. However the biotechnological techniques also raise much controversial debate about ethics and biosafety among the people. To address this problem and emphasize the various techniques of biotechnology for all under graduates the course is offering as non-major elective paper.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Seminar
- Poster preparation
- Scientific discussion
- Critical thinking and analysis on theoretical concepts

Pedagogy

The teaching methods may include Chalk and talk, PowerPoint, demonstrations, assignments, group discussions and Problem solving

Course content designers

Dr. S. Baskaran

Dr.N. Arul MuthuKumaran

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K – Level
CLO-1	Summarize the historical perspectives of biotechnology	Up to K-2
CLO-2	Relate the tools of genetic engineering with its role.	Up to K-2
CLO-3	Explain the cloning strategies and their applications.	Up to K-2
CLO-4	Outline the bioprocess technology.	Up to K-2
CLO-5	Distinguish the various implications of IPR.	Up to K-2

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	1	2	2	2
CLO-2	3	1	1	1	2
CLO-3	3	2	2	3	1
CLO-4	3	1	3	2	1
CLO-5	3	3	3	3	1

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	3	2	1	2	1
CLO-2	3	2	1	2	2
CLO-3	3	2	3	3	3
CLO-4	3	2	2	3	2
CLO-5	3	2	3	3	3

Advance application-3; Intermediate level-2 & Basic level-1

LESSON PLAN

Unit	Description	Hours	Mode
UNIT - I	Definition – Traditional and modern history of biotechnology – biotechnology tree.	3	Chalk and talk
	-Biotechnology in medicine and industries, biotechnology and the environment, biotechnology and agricultural	3	Chalk and talk Problem solving
UNIT - II	Genes: definition and structure - Enzymes: restriction endonucleases and ligases.	2	Chalk and talk
	Vectors: definition and types (plasmid and cosmids).	2	Chalk and talk
	Host organisms: prokaryotic – <i>E.coli</i> and eukaryotic organisms – yeast and mouse. Methods of gene transfer - transformation and electroporation	2	Chalk and talk PPT
UNIT - III	Transgenic plants: gene transfer methods – particle bombardments, Bt cotton and transgenic tomato, advantages and disadvantages of transgenic plants.	3	Chalk and talk
	Transgenic animal: methods of gene transfer – microinjection, advantages and disadvantages of transgenic animal - Dolly	3	Chalk and talk
UNIT-IV	Definition – Bioreactors: conventional fermenter and its features – Types of fermentation process	3	Chalk and talk PPT
	Downstream process: Separation, concentration, and purification	3	Chalk and talk

UNIT - V	Definition - National and International level biosafety regulations - Hazardous materials used in biotechnology (handling and disposal)	3	Chalk and talk
	Intellectual Property Rights (IPR) - Implication of IPRs and agricultural technology – Patents and copyrights	3	Chalk and talk

Learning Outcome Based Education & Assessment (LOBE)

Blue Print – Introduction to Biotechnology Course (CIA-I & II)

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

CLOs	K- Level	Section A		Section B		Section C	
		Short Answers		(Either/or Choice)		(Open Choice)	
		No. of Questions	K- Level	No. of Questions	K- Level	No. of Questions	K- Level
CLO x	Up to K2	1	K1	1	K2/K2	1	K1
CLO y	Up to K2	2	K1	1	K2/K2	2	K1
No. of Questions to be asked		3		2		3	
No. of Questions to be answered		3		2		2	
Marks for each question		2		7		10	
Total Marks for each section		6		14		20	

Distribution of Section-wise Marks with K Levels (CIA I & II)

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	6	-	30	-	36	56.25	100
K2	-	28	-	-	28	43.75	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	6	14	30	-	64	100.00	100%

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Introduction to Biotechnology Course
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K-Level	Section – A		Section – B		Section – C	
			Short Answers		(Either / or Choice)		(Open Choice)	
			No. of Questions	K-Level	No. of Questions	K-Level	No. of Questions	K-Level
1	CLO 1	Up to K2	1	K1	1	K2/K2	1	K1
2	CLO 2	Up to K2	1	K1	1	K2/K2	1	K1
3	CLO 3	Up to K2	1	K1	1	K2/K2	1	K1
4	CLO 4	Up to K2	1	K1	1	K2/K2	1	K1
5	CLO 5	Up to K2	1	K1	1	K2/K2	1	K1
No. of Questions to be asked			5		5		5	
No. of Questions to be answered			5		5		3	
Marks for each question			2		7		10	
Total Marks for each section			10		35		30	

Distribution of Section-Wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (No Choice)	Section D (No Choice)	Total Marks	% of Marks (without choice)	Consolidated
K1	10	-	50	-	60	46.15	100
K2	-	70	-	-	70	53.85	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	10	35	50	-	130	100.00	100

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	SBE-I	20U3LSM1	Biophysics and Bioenergetics	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1	To understand the concepts of energy in biological system.
2	To gain knowledge about biological oxidation.
3	To apprehend the biophysical property of proteins.

Unit	Description	Hours	K-level	CLO
I	Thermodynamics of Biological system First and second law of thermodynamics, activation energy. Biological systems as open, non-equilibrium systems, Concept of free energy, entropy, heat content of food, bomb calorimetry, Enthalpy, Standard free energy change, actual free energy depend on reactant and product concentration, standard free energy changes are additive	6	Up to K-2	1
II	Redox potential Oxidation and reduction, redox potential and its calculation by Nernst equation, examples of redox potential in biological system. Standard electrode potentials & its determination, its relationship with emf.	6	Up to K-3	2
III	Bioenergetics Concept of energy coupling in biological processes, Energy requirements in cell metabolism, structure and role of mitochondria, high energy phosphate bond, energy currency of cell, Biological oxidation, Electron-transport chain, Oxidative Phosphorylation including chemiosmotic hypothesis. Inhibitors of ETC, inhibitors of oxidative phosphorylation, uncouplers.	6	Up to K-4	3
IV	Protein structure and Kinetics Ramachandra plot, Structure of heme, Structure of Myoglobin and hemoglobin, Oxygen binding mechanism, Oxygen binding co-operativity, Hill equation, Hill coefficient, Allosteric protein, Allostery in hemoglobin, Bohr effect.	6	Up to K-3	4
V	Dynamics of biomolecules Diffusion, Laws of diffusion, Active transport, Facilitated diffusion, Osmosis, Osmotic pressure, Osmoregulation, Viscosity and its biological importance, Surface tension, Factors influencing surface tension.	6	Up to K-4	5

Books for Study

1. Jain JL. 2005. Fundamentals of Biochemistry. S.Chand & company Ltd.
2. Nelson DL and Cox MM. 2013. Lehninger's Principles of Biochemistry. 6th edition. W.H. Freeman and Company. New York.

Books for Reference

1. Voet DJ, Voet JG and Pratt CW. Principles of Biochemistry. 2008. 3rd edition. John Wiley & Sons, Inc. New York.
2. Stryer L. Biochemistry. 2000. Fourth edition. W.H. Freeman and Company. New York.

Web Resources

<http://www.gwumc.edu>

<http://nptel.ac.in>

<http://swayam.gov.in>

Rationale for Nature of the course

The skill based elective paper focuses on the ability to discern about the energy concepts in biological system. They would gain knowledge on various dynamics of macromolecules.

Activities having direct bearing on Skill development / Employability / Entrepreneurship

- Critical thinking and analysis on concepts related to energetics.
- Problem solving with thermodynamics in biological system.
- Model making to explain electron transport system in Mitochondria and chloroplast.
- Review about the 3D structure with kinetics and function.

Pedagogy

The teaching methods may include Chalk and talk, PowerPoint, demonstrations, assignments and group discussions and Problem solving

Course content designer:

Ms. R.Suguna

Dr. N.Krithiga

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K - Level
CLO-1	Discuss about the energy transfer as applicable to biological system.	Up to K-2
CLO-2	Interpret the concept of redox potential in living system.	Up to K-3
CLO-3	Explain the concept of energy coupling in biological processes.	Up to K-4
CLO-4	Apply the physical process of ligand binding to macromolecules.	Up to K-3
CLO-5	Distinguish the various dynamics of bio molecules.	Up to K-4

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	2	1	2
CLO-2	3	1	3	2	1
CLO-3	3	2	2	2	2
CLO-4	3	2	3	2	3
CLO-5	3	1	2	2	1

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	3	2	1	2	2
CLO-2	3	2	2	2	1
CLO-3	3	3	2	1	1
CLO-4	3	3	3	3	3
CLO-5	3	2	1	2	2

Advance application-3; Intermediate level-2 & Basic level-1

.

LESSON PLAN

Unit	Description	Hours	Mode
UNIT - I	First and second law of thermodynamics, activation energy. Biological systems as open, non-equilibrium systems	2	Chalk and talk Problem solving
	Concept of free energy, entropy, heat content of food, bomb calorimetry	2	Chalk and talk Problem solving
	Enthalpy, Standard free energy change, actual free energy depend on reactant and product concentration, standard free energy changes are additive.	2	Chalk and talk Problem solving
UNIT - II	Oxidation and reduction, redox potential and its calculation by Nernst equation	2	Chalk and talk Problem solving
	Examples of redox potential in biological system.	2	Chalk and talk
	standard electrode potentials & its determination , its relationship with emf	2	Chalk and talk
UNIT - III	Concept of energy coupling in biological processes, Energy requirements in cell metabolism	2	Chalk and talk
	structure and role of mitochondria, high energy phosphate bond, energy currency of cell, Biological oxidation	2	Chalk and talk
	Electron-transport chain, Oxidative Phosphorylation including chemiosmotic hypothesis. Inhibitors of ETC, inhibitors of oxidative phosphorylation, uncouplers	2	Chalk and talk PPT
UNIT-IV	Ramachandraplot, Structure of heme, Structure of Myoglobin and hemoglobin, Oxygen binding mechanism	3	Chalk and talk PPT
	Oxygen binding co-operativity, Hill equation, Hill coefficient, Allosteric protein, Allosterism in hemoglobin, Bohr effect.	3	Chalk and talk
UNIT - V	Diffusion, Laws of diffusion, Active transport, Facilitated diffusion, Osmosis, Osmotic pressure	2	Chalk and talk
	Osmoregulation, Viscosity and biological importance	2	Chalk and talk Problem solving
	Surface tension, Factors influencing surface tension.	2	Chalk and talk Problem solving

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Biophysics and Bioenergetics Course
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

BLUE PRINT FOR INTERNAL ASSESSMENT – I

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

BLUE PRINT FOR INTERNAL ASSESSMENT – II

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
3.	CLO 3	Up to K 4	2	K1 & K2	1	K1	2 (K3&K3)	1(K4)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Biophysics and Bioenergetics Course
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K-2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K-3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
3.	CLO 3	Up to K-4	2	K1 & K2	1	K1	2 (K3&K3)	1(K4)
4.	CLO 4	Up to K-3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
5.	CLO 5	Up to K-4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K2 Level)
		2 Questions from Unit-II (K2 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K3 Level)	1Question from Unit-IV (K3 Level)
		2 Questions from Unit-V (K4 Level)	1Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Core-5	20U3LMC5	Biochemistry	5	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	✓

Course Objectives

1	To provide students with an understanding of biomolecules, the basic building blocks of living organisms.
2	To focus on the structure, unique properties, biological roles and functions of biomolecules.
3	Emphasis on the association between structure and function of various biomolecules at a chemical level with a biological perspective.

Unit	Description	Hours	K-level	CLO
I	The foundations of biochemistry Chemical basis of life, Water: unique properties, weak interactions in aqueous systems, weak acids & bases - buffering action, pH, hydrogen ion concentration, Henderson and Hasselbach equation. Chemical bond- covalent, ionic, hydrogen, co-ordinate and VanderWaals force.	15	Up to K-2	1
II	Carbohydrates and Glycobiology Definition, classification and functions of carbohydrates. Monosaccharides - structure of aldoses and ketoses; Ring structure of sugars, conformations of sugars, mutarotation, anomers, epimers and enantiomers, oxidation and reduction of sugars, Disaccharides - reducing and non-reducing disaccharides - lactose, maltose, sucrose. Polysaccharides – homo- and heteropolysaccharides. Carbohydrates metabolism – glycolysis and kreb cycle.	15	Up to K-3	2
III	Amino acids and Protein Amino acids- Structure and classification, optical properties, Chemical properties - acid base properties, titration curve. Proteins - classification & general characteristics, primary, secondary, tertiary and quaternary structure of proteins. Enzymes- definition, activation energy, theories of enzymes action - Lock and key model, induced fit theory, classification, nomenclature, enzyme kinetics - MM plot, LB plot, Coenzyme and Cofactors. Factors affecting enzyme activity, Types of inhibitions –reversible and irreversible	15	Up to K-4	3
IV	Lipids and Vitamins Lipids – classification and functions of lipids, fatty acids – saturated and unsaturated, nomenclature, essential fatty acids, Storage lipids - triacyl glycerol and waxes; Structural lipids in membranes – glycerophospholipids, galactolipids and sulpholipids, sphingolipids and sterols. Metabolism of fatty acids- β oxidation of fatty acids. Structure and active forms of water soluble and fat - soluble vitamins; Deficiency diseases, hypervitaminosis	15	Up to K-3	4

V	Nucleic acids Nucleotides - structure and properties of bases, pentoses, nucleosides, Chargaff's rule; Nucleic acid structure – Watson-Crick model of DNA, forms of DNA – A, B & Z; Structure of mRNA, tRNA and rRNA; Properties of nucleic acids – denaturation, renaturation, hyperchromicity. Functions of nucleotides – sources of energy, secondary messengers.	15	Up to K-4	5

Books for study

1. Jain JL. 2005. Fundamentals of Biochemistry. S. Chand & Company Ltd.
2. Stryer L. 2000 Biochemistry, Fourth edition. W.H. Freeman and Company. New York.

Books for reference

1. Satyanarayana U and Chakrapani U. 2009. Biochemistry. Books and Allied Pvt Ltd. Kolkata.
2. Nelson DL and Cox MM. 2013. Lehninger's Principles of Biochemistry. 6th edition. W.H. Freeman and Company. New York.
3. Voet DJ, Voet JG and Pratt CW. Principles of Biochemistry. 2008. 3rd edition. John Wiley & Sons, Inc. New York.

Rationale for Nature of the course

This major core paper focuses on students' ability to understand the macromolecules of living organisms. They would discern about the way by which the macromolecules are metabolised and utilised for various cellular functions.

Activities having direct bearing on Skill development / Employability / Entrepreneurship

- Creating mind map
- Learning the metabolism using flowchart method
- Case study to analysis the disease associated with the disorders in metabolism

Web resources

www.nptel.ac.in

www.swayam.gov.in

Pedagogy

The teaching methods may include Chalk and talk, PowerPoint, demonstrations, assignments, group discussions and Problem solving

Course content designer

Dr.N.Krithiga

Ms. R. Suguna

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K – Level
CLO-1	Explain the chemical and molecular foundations of life and appreciate the role of water in biological systems.	Up to K-2
CLO-2	Illustrate the structure, properties and roles of carbohydrates.	Up to K-3
CLO-3	Analyse the structure, function and properties of amino acids, proteins and enzymes	Up to K-4
CLO-4	Relate lipids with their biological roles	Up to K-3
CLO-5	Distinguish the various components of nucleic acid and their significance.	Up to K-4

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	3	1	2	2
CLO-2	3	2	2	2	1
CLO-3	3	3	3	3	3
CLO-4	3	1	2	2	1
CLO-5	3	3	3	3	3

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	3	--	--	--	1
CLO-2	3	2	1	--	--
CLO-3	3	2	3	3	3
CLO-4	3	2	--	3	-
CLO-5	3	2	3	3	3

Advance application-3; Intermediate level-2 & Basic level-1

LESSON PLAN

Unit	Description	Hours	Mode
UNIT - I	Chemical basis of life, Water: unique properties, weak interactions in aqueous systems	5	Chalk and talk
	Weak acids & bases - buffering action, pH, hydrogen ion concentration, Henderson and Hasselbach equation.	5	Chalk and talk Problem solving
	Bonds in biology – Chemical bond- covalent, ionic, hydrogen, coordinate and vanderwaals bond.	5	Chalk and talk
UNIT - II	Definition, classification and functions of carbohydrates. Monosaccharides - structure of aldoses and ketoses	5	Chalk and talk
	Ring structure of sugars, conformations of sugars, mutarotation, anomers, epimers and enantiomers, oxidation and reduction of sugars	5	Chalk and talk
	Disaccharides - reducing and non-reducing disaccharides - lactose, maltose, sucrose. Polysaccharides – homo - and heteropolysaccharides	3	Chalk and talk PPT
	Carbohydrates metabolism – glycolysis and kreb cycle	2	Chalk and talk PPT
UNIT - III	Amino acids- Structure and classification, optical properties (Stereoisomerism), Chemical properties.	5	Chalk and talk
	Proteins - classification & general characteristics, primary, secondary, tertiary and quaternary structure of proteins.	5	Chalk and talk
	Enzymes- definition, activation energy, theories of enzymes action - Lock and key theory, induced fit theory, classification, nomenclature, enzyme kinetics - MM plot, LB plot Co enzyme and cofactors. Factors affecting enzyme activity, Types of inhibitions – reversible and irreversible.	5	Chalk and talk
UNIT-IV	Lipids -classification and functions of lipids, fatty acids – saturated and unsaturated, nomenclature, essential fatty acids, Storage lipids - triacyl glycerol and waxes	5	Chalk and talk PPT
	Structural lipids in membranes – glycerophospholipids, galactolipids and sulpholipids, sphingolipids and sterols. Metabolism of fatty acids- β oxidation of fatty acids.	5	Chalk and talk
	Structure and active forms of water soluble and fat - soluble vitamins; Deficiency diseases, hypervitaminosis	5	
UNIT - V	Nucleotides - structure and properties of bases, pentoses, nucleosides, Chargaff's rule	5	Chalk and talk
	Nucleic acid structure – Watson-Crick model of DNA, forms of DNA – A, B & Z; Structure of mRNA, tRNA and rRNA	5	Chalk and talk Problem solving
	Properties of nucleic acids – denaturation, renaturation, hyperchromity. Functions of nucleotides – sources of energy, secondary messengers.	5	Chalk and talk Problem solving

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Biochemistry Course
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)
BLUE PRINT FOR INTERNAL ASSESSMENT – I

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

BLUE PRINT FOR INTERNAL ASSESSMENT – II

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
2.	CLO 4	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

Learning Outcome Based Education & Assessment (LOBE)

Blue Print – Biochemistry Course

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K-2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K-3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
3	CLO 3	Up to K-4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4	CLO 4	Up to K-3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
5	CLO 5	Up to K-4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K2 Level)
		2 Questions from Unit-II (K3 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K2 Level)	1Question from Unit-IV (K3 Level)
		2 Questions from Unit-V (K4 Level)	1Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Major Practicals	20U3LMP3	Major Practicals-III	2	3	40	60	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1	To provide students with an understanding of the basic analysis in biochemistry.
2	To focus on the interpretation of the results with biological normal values.
3	To understand the applicability of the biochemical analysis

	Experiments
1	Preparation of buffers
2	Qualitative analysis of carbohydrates
3	Estimation of glucose
4	Estimation of fructose
5	Qualitative analysis of amino-acids
6	Estimation of cholesterol
7	Estimation of Vitamin C
8	Estimation of DNA
9	Estimation of RNA
10	Enzyme assay – Km value by MM plot and LB plot (Any one enzyme – amylase, Acid phosphatase)
	Spotters Bomb calorimeter, mitochondria, chloroplast, Hemoglobin, myoglobin, Na-K pump, Ramachandran plot.

Books for study

1. Jayaraman J. Laboratory Manual in Biochemistry. 1981. New Age International Publishers.
2. Sadasivam S and Manickam A. Biochemical methods. 2009. New Age International Publishers

Course content designers

R. Suguna

Dr.N.Krithiga

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K –Level
CLO-1	Associate the experimental results with normal biological range	Up to K-2
CLO-2	Analyse biological samples and interpret the results.	Up to K-4
CLO-3	Experiment with biochemical methods.	Up to K-3
CLO-4	Apply basic principles of chemistry to biological systems.	Up to K-3
CLO-5	Demonstrate biochemical analysis.	Up to K-2

Rationale for Nature of the course

The laboratory course based on the core paper Biochemistry and Biophysics aims to discern the basic understanding on the analytical techniques in Biochemistry. They would be trained to make use of instruments for various analyses. They gain knowledge on the interpretation of biological values.

Activities having direct bearing on Skill development /Employability /Entrepreneurship

- Individual experimental activity to the students.
- Hands on training various instruments.
- Analysis and interpretation of results.

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	3	2	2
CLO-2	3	2	3	2	2
CLO-3	3	2	2	3	2
CLO-4	3	2	3	1	1
CLO-5	3	2	3	2	2

Mapping of Course outcomes with Program specific Outcomes

CO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	3	3	3	3	2
CLO-2	3	3	2	2	2
CLO-3	3	3	2	3	2
CLO-4	3	3	2	2	2
CLO-5	3	3	2	3	3

Advance application-3; Intermediate level-2 & Basic level-1

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.A. / B.Sc.				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	NME-II	20U4LNM2	Applied Biotechnology	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1.	To understand the applications in areas of biotechnology.
2.	To provide students with a basic understanding the advancement in biotechnology
3.	To learn the applications of the biotechnology and its products.
4.	To inculcate the students on current scenario in biotechnology.

Unit	Description	Hours	K level	CLOs
I	Food technology Single cell proteins: <i>Spirulina</i> and <i>Chlorella</i> - sources, nutritive values and uses. Fermented foods – definition, advantages of fermented foods, production of cheese and yoghurt	3	Up to K-2	1
II	Fisheries technology Integrated fish farming types - paddy cum fish culture, fish cum poultry culture. Methods of breeding-Natural, artificial – Stripping method, induced breeding - Hypophysation, Stages of hypophysation –Genetic manipulation - Transgenic fish production. Shrimp culture	3	Up to K-2	2
III	Immunotechnology ELISA – principle and applications, Vaccine-Active and passive immunization, attenuated, heat-killed, subunit vaccines, Vaccination schedule, route of administration, advantages and disadvantages of vaccines	3	Up to K-2	3
IV	Assisted reproductive technology Animal propagation - In vitro fertilization, artificial insemination in cattle, embryo transfer technique and superovulation (MOET) in farm animals. Cryopreservation, Negative aspects of ART.	3	Up to K-2	4
V	Bioethics and Biosafety Benefits of Biotechnology, ELSI Biotechnology, ICSI, Risks and ethics of Biotechnology, Genetically engineered Organisms – risks and benefits, Biological warfare. Biosafety guidelines and regulations.	3	Up to K-2	5

Books for Study

1. Satyanarayana. U. 2009. Biotechnology. Books and Allied Pvt. Ltd.
2. Kumaresan. 2015. Biotechnology. Saras Publications.

Books for Reference

1. Balasubramaniam D, CFA Bryce, K Dharmalingam, J Green, KunthalaJayaraman. Concepts in Biotechnology, University Press Reference Book.
2. Dubey RC. 2012. A textbook of Biotechnology, S. Chand Publications.

Web resources

www.nptel.ac.in

www.swayam.gov.in.

Rationale for Nature of the course

A wide range of young graduates are required for modern biotechnology to explore hidden wonders in the field of Biotechnology particularly traditional technology. This course is offering as non-major elective for all streams of undergraduate students to provide basic knowledge on biomass production, integrated fish technology, insight into various immunotechnology like attenuated, heat killed vaccine and monoclonal antibodies, and help to understand the concepts of bioethics and biosafety.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Seminar
- Poster preparation
- Scientific discussion
- Critical thinking and analysis on theoretical concepts

Pedagogy

The teaching methods may include Chalk and talk, PowerPoint, demonstrations, assignments, group discussions and Problem solving

Course content designers

Dr. S. Baskaran

Dr. P. Vimal

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K – Level
CLO-1	Summarize the advancements in food technology.	Up to K-2
CLO-2	Outline the technology used for fish breeding & cultivation	Up to K-2
CLO-3	Understand the principle behind the diseases diagnosis & prevention	Up to K-2
CLO-4	Explain the methods of production of farm animal	Up to K-2
CLO-5	Distinguish the various bioremediation processes.	Up to K-2

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	2	2	1
CLO-2	3	1	2	2	1
CLO-3	3	2	2	2	1
CLO-4	3	1	2	2	1
CLO-5	3	2	2	2	2

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	3	--	--	--	1
CLO-2	3	2	1	--	--
CLO-3	3	2	3	3	3
CLO-4	3	2	--	3	-
CLO-5	3	2	3	3	3

Advance application-3; Intermediate level-2 & Basic level-1

LESSON PLAN

Unit	Description	Hours	Mode
UNIT - I	Single cell proteins: <i>Spirulina</i> and <i>Chlorella</i> - sources, nutritive values and uses.	3	Chalk and talk
	Fermented foods – definition, advantages of fermented foods, production of cheese and yoghurt.	3	Chalk and talk Problem solving
UNIT - II	Integrated fish farming types - paddy cum fish culture, fish cum poultry culture. Methods of breeding-Natural, artificial – Stripping method	3	Chalk and talk
	Induced breeding - Hypophysation, Stages of hypophysation - Genetic manipulation - Transgenic fish production	3	Chalk and talk
UNIT - III	ELISA – principle and applications, Vaccine-Active and passive immunization, attenuated, heat-killed, subunit vaccines	3	Chalk and talk
	Vaccination schedule, route of administration,	3	Chalk and talk
UNIT-IV	Animal propagation - In vitro fertilization, artificial insemination in cattle, embryo transfer technique	3	Chalk and talk PPT
	Superovulation (MOET) in farm animals. Cryopreservation, Negative aspects of ART.	3	Chalk and talk
UNIT - V	Benefits of Biotechnology, ELSI Biotechnology, Risks and ethics of Biotechnology	3	Chalk and talk
	Genetically engineered Organisms – risks and benefits, Biological warfare. Biosafety guidelines and regulations.	3	Chalk and talk

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Applied Biotechnology Course (CIA-I & II)
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

CLOs	K- Level	Section A		Section B		Section C	
		Short Answers		(Either/or Choice)		(Open Choice)	
		No. of Questions	K- Level	No. of Questions	K- Level	No. of Questions	K- Level
CLO x	Up to K2	1	K1	1	K2/K2	1	K1
CLO y	Up to K2	2	K1	1	K2/K2	2	K1
No. of Questions to be asked		3		2		3	
No. of Questions to be answered		3		2		2	
Marks for each question		2		7		10	
Total Marks for each section		6		14		20	

Distribution of Section-wise Marks with K Levels (CIA I & II)

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	6	-	30	-	36	56.25	100
K2	-	28	-	-	28	43.75	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	6	14	30	-	64	100.00	100%

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Applied Biotechnology Course
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K-Level	Section – A		Section – B		Section – C	
			Short Answers		(Either / or Choice)		(Open Choice)	
			No. of Questions	K-Level	No. of Questions	K-Level	No. of Questions	K-Level
1	CLO 1	Up to K2	1	K1	1	K2/K2	1	K1
2	CLO 2	Up to K2	1	K1	1	K2/K2	1	K1
3	CLO 3	Up to K2	1	K1	1	K2/K2	1	K1
4	CLO 4	Up to K2	1	K1	1	K2/K2	1	K1
5	CLO 5	Up to K2	1	K1	1	K2/K2	1	K1
No. of Questions to be asked			5		5		5	
No. of Questions to be answered			5		5		3	
Marks for each question			2		7		10	
Total Marks for each section			10		35		30	

Distribution of Section-Wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (No Choice)	Section D (No Choice)	Total Marks	% of Marks (without choice)	Consolidated
K1	10	-	50	-	60	46.15	100
K2	-	70	-	-	70	53.85	
K3	-	-	-	-	-	-	-
K4	-	-	-	-	-	-	-
Total Marks	10	35	50	-	130	100.00	100

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	SBE-II	20U4LSM2	Food Processing and Preservation	2	2	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1.	To make students aware of food spoilage, food related hazards/risks and diseases.
2.	To introduce the students to food processing, preservation and packaging methods.
3.	To instill knowledge on the national/international food safety organisations, food standards and governmental regulations on food safety.

Unit	Description	Hours	K level	CLOs
I	Food composition and Food quality Food industry - A historical perspective. Food composition and nutritive values: food as energy source, carbohydrate, protein and fats, nutraceuticals, Vitamins, Minerals. Food quality and consumer preference. Quality Factors in food: appearance, textural, flavour. Food quality assurance agencies- National and International Organisation – FDA, FSSAI.	6	Up to K-2	1
II	Food spoilage and preservation Food deterioration & Food spoilage: Shelf life of food, Factors governing food spoilage – Abiotic, biotic, enzymatic and chemical changes in the food. Food preservation strategies - Heat, Cold, Radiation, chemical techniques.	6	Up to K-3	2
III	Food processing Types of consumable foods – perishable, non-perishable, processed preserved, formulated and derived foods. Handling and management of raw materials of food: Harvesting, transportation from field, sorting and grading. Processing of cereals & grains, milk & milk products, vegetables and fruits, fat/oil related products, microbes in food industry - fermentation & benefits of fermented foods.	6	Up to K-4	3
IV	Food additives and packaging Food additive – functions, additives used in food processing. Food packaging: requirements for effective packaging, types of containers-primary, secondary & tertiary. Types of packaging materials, food packaging methods – nutritive effects and need for food packing.	6	Up to K-3	4

V	Food hazards/risks, food safety and Government regulations Risk assessment & management – Biological hazards –Control of microorganisms - HACCP – seven principles, nutrient related illness, physical hazards, chemical hazards, impact of trace chemicals and additives. Government regulations of food safety – Laws, acts and guidelines for food safety - GRAS, food additives, pesticide residues, testing for safety, Food labelling, nutritional labelling. International food standards and codex alimentarius.	6	Up to K-4	5

Books for study

1. Potter & Hotchkiss. 1998. Food Science. 5th edition. Springer.
2. Vaclavik & Christian. 2008. Essentials of Food Science. 3rd edition. Springer.

Books for reference

1. Adams & Moss. 2008. Food Microbiology. 3rd edition. RSC publishing.
2. Varzakas & Tzia. 2016. Handbook of food processing, food safety, quality, and manufacturing processes. CRC Press.

Weblinks

http://www.old.fssai.gov.in/Portals/0/Training_Manual/Volume%20I-%20Intoduction%20to%20Food%20%20and%20Food%20Processing.pdf
<http://www.ignouhelp.in/ignou-mfn-08-study-material/>
<https://foodprocessingindia.gov.in/>

Rationale for nature of the course

The enormous growth of food industry in the past 50-100 years had led to large scale food production worldwide and transport across the countries. This had seen rapid evolution of modern food processing and preservation technologies and national/international regulatory bodies for food safety. This course is designed to provide basic knowledge on food types, nutritive value of food, insight into various food processing & preservation technologies, awareness on food spoilage, food borne hazards, government food safety regulatory bodies and regulations.

Activities having direct bearing on Skill development / Employability / Entrepreneurship

- Seminar
- Poster preparation
- Scientific discussion
- Critical thinking and analysis on theoretical concepts

Pedagogy

The teaching methods may include Chalk and talk, PowerPoint, assignments, group discussions and quiz.

Course content designers

Dr. N. Arul Muthu Kumaran
Dr. N. Krithiga

Course Learning Outcomes

On completion of this course the students would be able to

#	CLOs	K - Level
CLO-1	Incur basic knowledge on food composition, nutrition and quality	Up to K-2
CLO-2	identify food spoilage agents and select ideal preservation strategies	Up to K-3
CLO-3	Explain the methods of handling and processing of different food materials and their applications.	Up to K-4
CLO-4	analyse the merits & demerits of food additives and explain the materials & methods of food packaging	Up to K-3
CLO-5	identify the food related hazards/risks and appreciate the importance of government organisations/regulations on food safety	Up to K-4

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	2	2	1
CLO-2	3	2	2	2	1
CLO-3	3	2	2	2	1
CLO-4	3	2	2	2	1
CLO-5	3	2	2	3	1

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	--	--	--	--	--
CLO-2	2	2	2	3	2
CLO-3	2	1	1	2	1
CLO-4	2	1	2	2	2
CLO-5	2	2	1	1	1

Advance application-3; Intermediate level-2 & Basic level-1

LESSON PLAN

Unit	Description	Hours	Mode
UNIT - I	Food industry - A historical perspective. Food composition and nutritive values: food as energy source, carbohydrate, protein and fats, nutraceuticals, Vitamins, Minerals. Food quality and consumer preference.	3	Chalk & Talk
	Quality Factors in food: appearance, textural, flavour. Food quality assurance agencies- National and International Organisation – FDA, FSSAI.	3	Chalk & Talk Discussion
UNIT - II	Food deterioration & Food spoilage: Shelf life of food, Factors governing food spoilage – Abiotic, biotic, enzymatic and chemical changes in the food.	3	Discussion & PPT
	Food preservation strategies - Heat, Cold, Radiation, chemicals techniques.	3	Chalk & Talk
UNIT - III	Types of consumable foods – perishable, non-perishable, processed preserved, formulated and derived foods. Handling and management of raw materials of food: Harvesting, transportation from field, sorting and grading.	3	Chalk & talk, PPT
	Processing of cereals & grains, milk & milk products, vegetables and fruits, fat/oil related products, microbes in food industry - fermentation & benefits of fermented foods.	3	Discussion & PPT
UNIT-IV	Food additive – functions, additives used in food processing. Food packaging: requirements for effective packaging, types of containers-primary, secondary & tertiary.	3	Chalk & Talk Discussion
	Types of packaging materials, food packaging methods – nutritive effects and need for food packing.	3	Chalk & talk, PPT
UNIT - V	Risk assessment & management – Biological hazards –Control of microorganisms - HACCP – seven principles, nutrient related illness, physical hazards, chemical hazards, impact of trace chemicals and additives.	3	Chalk and talk. PPT
	Government regulations of food safety – Laws, acts and guidelines for food safety - GRAS, food additives, pesticide residues, test for safety, Food labelling, nutritional labelling. International food standards and codex alimentarius.	3	Chalk and talk. PPT

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Food Processing and Preservation
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

BLUE PRINT FOR INTERNAL ASSESSMENT – I

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

BLUE PRINT FOR INTERNAL ASSESSMENT – II

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
2.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Food Processing and Preservation
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K2 Level)
		2 Questions from Unit-II (K3 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K2 Level)	1Question from Unit-IV (K3 Level)
		2 Questions from Unit-V (K4 Level)	1Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analysing, presentation and make interferences with evidences

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Major Core-6	20U4LMC6	Cell and Molecular Biology	5	5	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1.	To equip students with a basic knowledge of the structural and functional properties of cell organelles.
2.	To become aware of various macromolecular complexity and their functions
3.	To provide an overview of the flow of information from genes to proteins.
	To relate the properties of cancerous cells to mutational changes in gene function

Unit	Description	Hours	K level	CLOs
I	Ultrastructure of cell membrane and cell organelle Ultra structure of cell membrane, cytosol, endoplasmic reticulum - rough and smooth, golgi bodies, ribosomes, cytoskeletal structures - intermediate filaments, microtubules, microfilaments, mitochondria, chloroplast, lysosomes, peroxisomes, nucleus - nuclear membrane, nucleoplasm, nucleolus, differences between prokaryotic and eukaryotic cells.	15	Up to K-3	3
II	Chromosomes and Cell cycle Chromosome - discovery, morphology, chemical composition, structural organization, centromere, telomere, chromatin, nucleosome organization, eu- and heterochromatin, special chromosomes - polytene, lampbrush chromosomes. Cell division: mitosis and meiosis, interphase, comparison of mitosis and meiosis, cell cycle - phases and regulation. Cancer - characteristic of cancer cells, types - carcinoma, sarcoma, lymphoma.	15	Up to K-3	3
III	Replication and DNA repair Prokaryotic and eukaryotic DNA replication - mechanism of DNA replication - initiation, replication fork, enzyme machinery of replication, types of DNA replication - rolling circle and bidirectional replication, inhibitors of DNA synthesis. Mutation - molecular mechanism, biological repair mechanism - SOS, Excision, photo reactivation	15	Up to K-4	4
IV	Transcription Prokaryotic and eukaryotic transcription - RNA polymerases, general and specific transcription factors, transcription process, post transcriptional modifications - 5'cap formation, 3' polyadenylation, splicing, editing and gene silencing. Nuclear export of mRNA, inhibitors of transcription, gene regulation - lac and trp operon.	15	Up to K-2	2

V	Translation Genetic code - characteristics of genetic code, Wobble hypothesis. Prokaryotic and eukaryotic translation, mechanism - initiation, elongation and termination, post translational modification of proteins, inhibitors of protein synthesis, signal hypothesis.	15	Up to K-4	4

Books for Study

1. David Freifelder, 2015. Molecular Biology, 4th Edition. Narosa Publishing house New Delhi.
2. Verma and Agarwal, 2016. Cell and Molecular Biology. S.Chand publications, New Delhi.

Books for Reference

1. Tropp BE, 2012. Molecular Biology Genes to proteins. Jones and Bartlett learning.
2. Molecular Biology of the Gene, 6th Edition (2008), James D. Watson, Pearson Education.

Web Resources

<http://www.gwumc.edu>
<http://nptel.ac.in>
<http://swayam.gov.in>

Rationale for Nature of the course

The course focuses on the basic molecular aspects of gene expression. To seek core knowledge on the macromolecular complexity with its structure and function. To gain knowledge on the cell cycle and its regulation and to correlate with the diseased state.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Model making of cell and its organelles and also structure of molecules of life
- Critical reasoning and analysis on molecular basis of inheritance through problem solving.
- Review of topics related to inhibitors of gene expression as therapeutic molecule.

Pedagogy

The teaching methods may include Chalk and talk, PowerPoint, demonstrations, assignments and group discussions and Problem solving.

Course content designers

Ms.R. Suguna
Dr. P. Vimal

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K - Level
CLO-1	Illustrate the structure and function of plasma membrane and cell organelles	Up to K-3
CLO-2	Interpret the importance of cell cycle with cancer	Up to K-3
CLO-3	Compare and contrast the replication process in prokaryotes and eukaryotes	Up to K-4
CLO-4	Explain gene expression and the roles of the promoter, coding and termination sequences	Up to K-2
CLO-5	Analyze the role of enzymes, organelles and molecules involved in translation	Up to K-4

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	3	2	2
CLO-2	3	2	3	2	1
CLO-3	3	2	3	2	1
CLO-4	3	2	2	2	1
CLO-5	3	2	3	2	1

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	3	3	-	2	3
CLO-2	3	3	2	3	2
CLO-3	3	-	-	1	2
CLO-4	3	2	-	2	1
CLO-5	3	3	3	2	2

Advance application-3; Intermediate level-2 & Basic level-1

LESSON PLAN

Unit	Description	Hours	Mode
UNIT - I	Ultra structure of cell membrane, cytosol, endoplasmic reticulum - rough and smooth, golgi bodies, ribosomes	5	Chalk & Talk
	cytoskeletal structures - intermediate filaments, microtubules, microfilaments	5	Chalk & Talk
	mitochondria, chloroplast, lysosomes, peroxisomes, nucleus - nuclear membrane, nucleoplasm, nucleolus	5	Chalk & talk, PPT
UNIT - II	Chromosome - discovery, morphology, chemical composition, structural organization, centromere, telomere, chromatin	5	Discussion & PPT
	Nucleosome organization, eu- and heterochromatin, special chromosomes - polytene, lampbrush chromosomes.	5	Chalk & Talk
	Cell division: mitosis and meiosis, interphase, comparison of mitosis and meiosis, cell cycle – phases and regulation. Cancer - characteristic of cancer cells, types –carcinoma, sarcoma, lymphoma.	5	Chalk & Talk Discussion
UNIT - III	Prokaryotic and eukaryotic DNA replication - mechanism of DNA replication - initiation, replication fork, enzyme machinery of replication,	5	Chalk & talk, PPT
	Types of DNA replication - rolling circle and bidirectional replication, inhibitors of DNA synthesis.	5	Discussion & PPT
	Mutation – molecular mechanism, biological repair mechanism - SOS, Excision, photo reactivation	5	Chalk & Talk
UNIT-IV	Prokaryotic and eukaryotic transcription - RNA polymerases, general and specific transcription factors, transcription process, post transcriptional modifications - 5'cap formation, 3' polyadenylation, splicing, editing and gene silencing.	8	Chalk & Talk Discussion
	Nuclear export of mRNA, inhibitors of transcription, gene regulation – lac and trp operon.	7	Chalk & talk, PPT
UNIT - V	Genetic code - characteristics of genetic code, Wobble hypothesis. Prokaryotic and eukaryotic translation, mechanism - initiation, elongation and termination	9	Chalk and talk. PPT
	Post translational modification of proteins, inhibitors of protein synthesis, signal hypothesis.	6	Chalk and talk. PPT

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Cell and Molecular Biology Course
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

BLUE PRINT FOR INTERNAL ASSESSMENT – I

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K3)
2	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

BLUE PRINT FOR INTERNAL ASSESSMENT – II

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
2	CLO 4	Up to K 2	2	K1 & K2	1	K2	2 (K2&K2)	1(K2)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

Learning Outcome Based Education & Assessment (LOBE)

Blue Print – Cell and Molecular Biology Course

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K3)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4.	CLO 4	Up to K 2	2	K1 & K2	1	K2	2 (K2&K2)	1(K2)
5.	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K3 Level)
		2 Questions from Unit-II (K3 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K2 Level)	1Question from Unit-IV (K2 Level)
		2 Questions from Unit-V (K4 Level)	1Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Major Practical	20U4LMP4	Major Practicals -IV	2	3	40	60	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1.	To introduce students with an understanding of the basic of the basic techniques in cell biology.
2.	To acquire the ability to analyse the food samples.
3.	To understand the applicability of the analysis.

	Experiments
1	Measurement of cell diameter using micrometer.
2	Preparation of permanent slide of plant tissue.
3	Isolation of Mitochondria from liver tissue.
4	Isolation of Chloroplast from leaves.
5	Isolation & estimation of DNA.
6	Isolation & estimation of RNA.
7	Determination of moisture content in food samples.
8	Estimation of reducing sugar in food samples
9	Determination of titratable acidity in food samples.
10	Determination of total phenols in food samples.
	Spotters Telomeres, nucleosomes, Thymine dimers, Promoters, Muffle furnace, Kjeldahl apparatus, FSSAI

Books for study

1. Shalini Sehgal. 2010. A laboratory manual of food analysis. Wiley Inc.
2. Sadasivam S and Manickam A. Biochemical methods. 2009. New Age International Publishers

Course content designers

Ms. R. Suguna

Dr. P. Vimal

Rationale for Nature of the course

The laboratory course based on the Major core and skilled paper focuses on the ability to learn about the techniques in molecular biology. They gain knowledge in isolating cell organelles and identify

its key marker enzyme. They learn about the food analysis and its interpretation related to its preservation and nutritive value.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Individual experimental activity to the students.
- Hands on training various instruments.
- Analysis and interpretation of results.

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K – Level
CLO-1	Associate the experimental results with normal biological range	Up to K-2
CLO-2	Analyse biological samples and interpret the results.	Up to K-4
CLO-3	Experiment with food samples.	Up to K-3
CLO-4	Apply basic principles of chemistry to biological samples.	Up to K-3
CLO-5	Demonstrate biochemical analysis.	Up to K-2

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	3	2	2	2
CLO-2	3	3	3	3	3
CLO-3	3	2	3	3	1
CLO-4	3	1	2	1	2
CLO-5	3	3	3	2	2

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	3	3	3	3	2
CLO-2	3	3	2	2	2
CLO-3	3	3	2	3	2
CLO-4	3	3	2	2	2
CLO-5	3	3	2	3	3

Advance application-3; Intermediate level-2 & Basic level-1

Ancillary Biotechnology Papers for B.Sc., Microbiology

Semester	Subject Code	Paper	Title of the paper	H	C
III	20U3LAC1	Ancillary-I Theory	Concepts in Biotechnology	4	4
	20U3LAP1	Ancillary-I Practicals	Lab in Biotechnology - I	2	1
IV	20U4LAC2	Ancillary-II Theory	Biotechnology in Human Welfare	4	4
	20U4LAP2	Ancillary-II Practicals	Lab in Biotechnology-II	2	1

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Ancillary-I	20U3LAC1	Concepts in Biotechnology	4	4	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1.	To introduce fundamental concepts, tools and techniques of Biotechnology
2.	To make students aware of various types of fermenters
3.	To motivate the students to aspire for research in Biotechnology
4.	To make students aware of bioethics and patenting process of biological materials

Unit	Description	Hours	K level	CLOs
I	Introduction to Biotechnology Biotechnology-introduction and historical perspectives. Tools of genetic engineering: Nucleases, Ligases, Polymerases, alkaline phosphatase. Vectors –types of vectors: Plasmid - pBR322, pUC, lambda bacteriophage vectors & M13 vectors. Gene transfer methods – transformation, transduction, electroporation, particle bombardment, Calcium mediated gene transfer. Screening of clones – Insertional inactivation, Blue white colony selection, replica plating method.	12	Up to K-3	1
II	Industrial & Microbial Biotechnology Fermentation - definition, process. Bioreactor - types - continuous stirred tank, bubble column, airlift, fluidized and packed bed. Media for industrial fermentation - substrates used as carbon, nitrogen, growth factor sources. Isolation of microbes - enrichment methods, strains from unusual environment, preservation. Genetic improvement of strains-selection of mutants. Regulation of production – feedback, nutrients and induction.	12	Up to K-3	2
III	Plant & animal Biotechnology Plant tissue culture – Composition of plant tissue culture medium. Culture methods -callus culture, suspension culture, Protoplast culture, organ culture – anther & pollen, embryo. Agrobacterium mediated gene transfer – Ti plasmids. Animal Biotechnology – Primary and Secondary cell culture, culture medium, cloning methods – microinjection, embryonic stem cell transfer.	12	Up to K-4	3

IV	Environmental Biotechnology Sewage– composition, waste water treatment : Primary, Secondary – Aerobic and Anaerobic treatment, Tertiary Treatment – Solids removal, nitrogen removal, phosphorous removal, bioremediation types– <i>in situ</i> , <i>ex-situ</i> , Biopesticides – <i>Bacillus thuringiensis</i> , <i>Beauveria bassiana</i> , <i>Fusarium pallidoroseum</i> , Nuclear Polyhedrosis virus, Phytoremediation.	12	Up to K-4	4
V	Intellectual Property Rights & Ethics Intellectual Property Rights, Intellectual Property Protection, Forms of protection. Patents, Copyrights, Trademarks, Ethics- construction and usage of genetically engineered microbes, plants, animals - drug trials.	12	Up to K-2	5

Books for Study

1. Satyanarayana. U. 2009. Biotechnology. Books and Allied Pvt. Ltd.
2. Dubey RC. 2012. A textbook of Biotechnology, S. Chand Publications.

Books for Reference

1. Brown TA. 2012. Gene Cloning and DNA Analysis- An Introduction. Wiley Blackwell.
2. Primrose SB and Twyman R. Principles of Gene Manipulation and Genomics, Blackwell.
3. Dubey RC. 2016. Advanced Biotechnology, S. Chand Publications

Web References

<http://dbtindia.gov.in/>

<https://www.easybiologyclass.com/topic-biotechnology/>

Rationale for Nature of the course

This ancillary paper enriches the understanding of fundamental concepts, principles and techniques used in biotechnology to microbiology major students. Students can get awareness about bioethics and patenting process which are essential practices in modern biology

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Model/chart making for biotechnological process
- Literature survey on recent trends in biotechnology field
- Individual presentation to improve communicative skills

Pedagogy

The teaching methods may include Chalk and talk, PowerPoint, demonstrations, assignments and group discussions and Problem solving.

Course content designer

Dr. P. Vimal

Ms.R.Suguna

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K - Level
CLO-1	Relate tools and methods used in biotechnology	Up to K-3
CLO-2	Identify various types fermenters and fermentation process	Up to K-3
CLO-3	Dissect strategies and applications of animal and plant biotechnology	Up to K-4
CLO-4	Analyse significance of biotechnological principles in environmental protection	Up to K-4
CLO-5	Explain the patenting process and elaborate ethics related to biotechnology	Up to K-2

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	2	3	2
CLO-2	3	2	2	2	2
CLO-3	3	2	3	2	2
CLO-4	3	2	3	2	2
CLO-5	3	3	3	2	2

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	3	3	1	1	1
CLO-2	3	2	1	2	2
CLO-3	3	3	2	2	1
CLO-4	3	3	3	3	2
CLO-5	3	3	3	2	2

Advance application-3; Intermediate level-2 & Basic level-1

LESSON PLAN

Unit	Description	Staff Name	Hours	Mode
I	Biotechnology-introduction and historical perspectives. Tools of genetic engineering: Nucleases, Ligases, Polymerases, alkaline phosphatase.		4	Chalk and talk PPT
	Vectors –types of vectors: Plasmid - pBR322, pUC, lambda bacteriophage vectors & M13 vectors		4	Chalk and talk
	Gene transfer methods – transformation, transduction, electroporation, particle bombardment, and Calcium mediated gene transfer. Screening of clones – Insertional inactivation, Blue white colony selection, replica plating method.		4	Chalk and talk PPT
II	Fermentation – process. Bioreactor – types - continuous stirred tank, bubble column, airlift, fluidized and packed bed.		4	Chalk and talk
	Media for industrial fermentation - substrates used as carbon, nitrogen, growth factor sources.		4	Chalk and talk
	Isolation of microbes - enrichment methods, strains from unusual environment, preservation. Genetic improvement of strains-selection of mutants, Regulation of production – feedback, nutrients and induction.		4	Chalk and talk PPT
III	Plant tissue culture – Composition of plant tissue culture medium.		3	Chalk and talk
	Culture methods -callus culture, suspension culture, Protoplast culture, organ culture – anther & pollen, embryo.		5	Chalk and talk PPT
	Agrobacterium mediated gene transfer – Ti plasmids.		2	PPT
	Animal Biotechnology – Primary and Secondary cell culture, culture medium, cloning methods – microinjection, embryonic stem cell transfer.		2	Chalk and talk PPT
IV	Sewage– composition, Waste water Treatment : Primary, Secondary – Aerobic and Anaerobic treatment, Tertiary Treatment		5	Chalk and talk PPT
	bioremediation types– <i>in situ</i> , <i>ex-situ</i> , Phytoremediation		2	Chalk and talk
	Biopesticides – <i>Bacillus thuringiensis</i> , <i>Beauveria bassiana</i> , <i>Fusarium pallidoroseum</i> , Nuclear Polyhedrosis virus.		5	Chalk and talk PPT
V	Intellectual Property Rights, Intellectual Property Protection		4	Chalk and talk
	Forms of protection. Patents, Copyrights, Trademarks		4	Chalk and talk
	Ethics- construction and usage of genetically engineered microbes, plants, animals-drug trials.		4	Chalk and talk
			60	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Concepts in Biotechnology Course
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

BLUE PRINT FOR INTERNAL ASSESSMENT – I

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K3)
2	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

BLUE PRINT FOR INTERNAL ASSESSMENT – II

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 3	Up to K 4	2	K1 & K2	1	K1	2 (K3&K3)	1(K4)
2	CLO 4	Up to K 4	2	K1 & K2	1	K1	2 (K4&K4)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

Learning Outcome Based Education & Assessment (LOBE)

Blue Print – Concepts in Biotechnology Course

Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1.	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K3)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4.	CLO 4	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
5.	CLO 5	Up to K 2	2	K1 & K2	1	K2	2 (K2&K2)	1(K2)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (NoChoice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1Question from Unit-I (K3 Level)
		2 Questions from Unit-II (K3 Level)	1Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K4 Level)	1Question from Unit-IV (K3 Level)
		2 Questions from Unit-V (K2Level)	1Question from Unit-V (K2 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Ancillary Practicals-I	20U3LAP1	Lab in Biotechnology-I	1	2	40	60	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1.	To introduce basic techniques used in biotechnology
2.	To understand and design a cloning process
3.	To identify problem, Interpret results and modify the techniques used in biotechnology

	Experiments
1.	Extraction of genomic DNA from animal tissue
2.	Extraction of genomic DNA from Bacterial Cells
3.	Extraction of Plasmid DNA from Bacterial Cells
4.	Agarose gel electrophoresis
5.	DNA quantification by DPA method
6.	Restriction Digestion & Ligation
7.	Competent cell preparation & Transformation
8.	Selection of recombinants – Blue White Colony Selection
	Spotters Karyotyping, Syndromes, Diseases - Cystic fibrosis, sickle cell Anemia, Duchenne's muscular dystrophy, SNP, Cloning Vectors maps –pBR322, pUC 18, Microinjection, electroporation

Books for Study

1. John Vennison. 2009. Laboratory Manual of Genetic Engineering. PHI.
2. Sambrook, Joseph. 2001. Molecular Cloning: a Laboratory Manual. Cold Spring Harbor, N.Y. Cold Spring Harbor Laboratory Press.

Books for Reference

1. Abhijit Dutta. 2011. Experimental Biology: A laboratory Manual. Narosa.
2. Rajan & Selvi Christy. 2010. Experimental Procedures in Lifesciences. Anjanaa Book House

Rationale for Nature of the course

The ancillary laboratory course focuses on training the students in basic techniques in biotechnology and cloning strategies and to practice them to explicit the problem solving ability. Students can apply these skills & analytical ability for their higher studies.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Individual experimental activity to the students.
- Hands on- training in techniques in Biotechnology.
- Report writing – new advanced methodologies in biotechnology

Pedagogy

The teaching methods may include: Demonstrations, hands on experiments and Problem solving

Course content designer

R.Suguna

Dr. P. Vimal

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K - Level
CLO-1	Demonstrate techniques to construct recombinant DNA	Up to K-2
CLO-2	Correlate the results and develop critical thinking skills	Up to K-4
CLO-3	Apply biotechnological concepts to develop new techniques	Up to K-3
CLO-4	Solve the problem associated with disease diagnosis strategies	Up to K-3
CLO-5	Elaborate principle behind the analytical methods	Up to K-2

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	3	2	2
CLO-2	3	2	2	2	2
CLO-3	3	2	3	2	2
CLO-4	3	2	3	2	2
CLO-5	3	3	3	2	2

Mapping of Course outcomes with Program specific Outcomes

CO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	3	3	3	3	2
CLO-2	3	1	2	1	1
CLO-3	3	3	1	3	1
CLO-4	3	3	2	2	2
CLO-5	3	3	2	3	3

Advance application-3; Intermediate level-2 & Basic level-1

EPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Ancillary-II	20U4LAC2	Biotechnology in Human Welfare	4	4	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

1.	To learn production of biological products at industry level
2.	To understand role of DNA in diagnostic and treatment of diseases
3.	Describe development of transgenic plants and animals and its uses

Unit	Description	Hours	K level	CLOs
I	Industrial products in human welfare Production of organic solvents - ethanol, organic acids - citric acid, antibiotics - penicillins, amino acids - glutamic acid, Vitamin - B12. Polysaccharide – production of Xanthan, biomass – composition: cellulose, hemicellulose, lignin, biomass to ethanol production.	12	Up to K-3	1
II	Development of transgenic plants & animals Germplasm conservation - types - <i>in-situ</i> and <i>ex-situ</i> and cryopreservation. GM crops: Flavr - Savr tomato, golden Rice, Pest resistant, virus resistant, drought resistant. Animal propagation - <i>In vitro</i> fertilization technology, artificial insemination in cattle, embryo transfer technique and superovulation in farm animals - MOET.	12	Up to K-3	2
III	Environmental Biotechnology Biodegradation – definition, Factors affecting biodegradation, metabolic effects of microbes on xenobiotics, Biodegradation of hydrocarbons, pesticides, genetically engineered bacteria for bioremediation, Biofilters – micro-organisms used in biofilters, mechanisms, Microbial Leaching – copper, uranium, gold, silver and silica.	12	Up to K-4	3
IV	DNA as a diagnostic tool Nucleic acid hybridization - DNA probes, mechanism of action of DNA probes, PCR and signal amplification, DNA chip - Microarray - techniques and applications. DNA in diagnosis – RFLP and SNP, infectious diseases - Malaria, genetic diseases - sickle cell anemia. DNA sequencing – sanger method	12	Up to K-2	4

V	Medical Biotechnology Gene therapy - types, treating - ADA deficiency, haemophilia, Cystic Fibrosis. Gene delivery methods. Production of recombinant therapeutic agents-Insulin, hGH, Tissue Plasminogen Activator. Recombinant Subunit vaccines - Hep B, attenuated recombinant vaccine – Cholera vaccine, DNA Vaccines, COVID	12	Up to K-4	5

Books for Study

1. Satyanarayana. U. 2009. Biotechnology. Books and Allied Pvt. Ltd.
2. Glick BR, Delovitch TL, Patten CL. 2014. Medical Biotechnology. ASM Press, Washington

Books for Reference

1. Primrose SB and Twyman R. Principles of Gene Manipulation and Genomics, Blackwell.
2. Dubey RC. 2016. Advanced Biotechnology, S. Chand Publications.
3. Slater A. 2006. Plant Biotechnology – The Genetic Manipulation of Plants. Oxford press.

Rationale for Nature of the course

In the recent past, many beneficial products such as antibiotics, drugs, amino acids, vaccines and disease diagnostic tools are produced using biotechnology. This course paves a way to understand such process at industries level and students can able to communicate in both verbal & writing.

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Model/chart making for biotechnological process
- Literature survey on recent trends in biotechnology field
- Individual presentation to improve communicative skills

Pedagogy

The teaching methods may include Chalk and talk, PowerPoint, demonstrations, assignments and group discussions and Problem solving

Course content designers

Dr. P. Vimal

Dr.N. Arul MuthuKumaran

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K - Level
CLO-1	Identify biological compounds produced using bioreactors in industries	Up to K-3
CLO-2	Plan strategies for the development of transgenic plants and animals	Up to K-3
CLO-3	Analyse various organisms for degradation waste in the environment	Up to K-4
CLO-4	Describe DNA based technologies for diseases diagnostic and treatment	Up to K-2
CLO-5	Survey new therapy methods and vaccines against various diseases	Up to K-4

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	2	2	2
CLO-2	3	1	2	2	2
CLO-3	3	2	2	2	2
CLO-4	3	2	2	2	2
CLO-5	3	2	3	2	2

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CLO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	2	--	3	--	2
CLO-2	3	--	1	1	3
CLO-3	2	3	1	3	1
CLO-4	2	2	3	3	2
CLO-5	1	2	2	3	1

Advance application-3; Intermediate level-2 & Basic level-1

LESSON PLAN

Unit	Description	Hours	Mode
I	Production of organic solvents - ethanol, organic acids - citric acid, antibiotics - penicillin, amino acids - glutamic acid	6	Chalk and talk, PPT
	Vitamin - B12. Polysaccharide – production of Xanthan, biomass – composition: cellulose, hemicellulose, lignin, biomass to ethanol production.	6	Chalk and talk PPT
II	Germplasm conservation - types - <i>in-situ</i> and <i>ex-situ</i> and cryopreservation. GM crops – FlavrSavr, golden Rice	5	Chalk and talk, PPT
	Pest resistant, virus resistant, drought resistant	2	Chalk and talk
	Animal propagation - In vitro fertilization technology, artificial insemination in cattle, embryo transfer technique and superovulation in farm animals - MOET.	5	Chalk and talk PPT
	Biodegradation – Factors affecting biodegradation, metabolic effects of microbes on Xenobiotics	3	Chalk and talk, PPT
III	Biodegradation of hydrocarbons, pesticides, genetically engineered bacteria for bioremediation	3	Chalk and talk
	Biofilters – micro-organisms used in biofilters, mechanisms	3	Chalk and talk
	Microbial Leaching - copper, uranium, gold, silver, silica.	3	Chalk and talk PPT
IV	Nucleic acid hybridization - DNA probes, mechanism of action of DNA probes,	3	Chalk and talk PPT
	PCR and signal amplification, DNA chip - Microarray - techniques and applications.	3	Chalk and talk PPT
	DNA in diagnosis - infectious diseases - Malaria, AIDS, genetic diseases - Cystic fibrosis, sickle cell anaemia.	3	Chalk and talk
	DNA fingerprinting, RFLP, VNTR and SNP in diagnosis.	3	Chalk and talk, PPT
V	Gene therapy - types, treating - ADA deficiency, haemophilia, Cystic Fibrosis. Gene delivery methods.	4	Chalk and talk, PPT
	Gene delivery methods. Production of recombinant therapeutic agents - Insulin, hGH, Clotting Factor VIII, Tissue Plasminogen Activator, Interferon.	4	Chalk and talk PPT
	Recombinant Vaccines - Subunit vaccines - Hep B, HIV, DNA Vaccine, RNA vaccines	4	Chalk and talk
		60	

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Biotechnology in Human Welfare Course
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

BLUE PRINT FOR INTERNAL ASSESSMENT – I

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K3)
2	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

BLUE PRINT FOR INTERNAL ASSESSMENT – II

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 3	Up to K 4	2	K1 & K2	1	K1	2 (K3&K3)	1(K4)
2	CLO 4	Up to K 2	2	K1 & K2	1	K1	2 (K2&K2)	1(K2)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

Learning Outcome Based Education & Assessment (LOBE)
Blue Print – Biotechnology in Human Welfare Course
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K-Level		
1	CLO 1	Up to K 3	2	K1 & K2	1	K1	2 (K1&K1)	1(K3)
2	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
3	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4	CLO 4	Up to K 2	2	K1 & K2	1	K2	2 (K2&K2)	1(K2)
5	CLO 5	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A (NoChoice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total Marks	10	10	50	50	120	100.00	100%

Distribution of Unit-wise questions with K Levels

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1 Question from Unit-I (K3 Level)
		2 Questions from Unit-II (K3 Level)	1 Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1 Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K2 Level)	1 Question from Unit-IV (K2 Level)
		2 Questions from Unit-V (K4 Level)	1 Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Microbiology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Ancillary Practicals -II	20U4LAP2	Lab in Biotechnology-II	1	2	40	60	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented	✓		Entrepreneurship oriented	

Course Objectives

1.	To introduce basic techniques used in biotechnology
2.	To understand and design a cloning process
3.	To identify problem, Interpret results and modify the techniques used in biotechnology

	Experiments
1	Isolation of Yeast
2	Immobilization of yeast cells
3	Alcohol fermentation& Estimation of alcohol
4	Isolation of antibiotic producing microbes from soil
5	Plant tissue culture media preparation & shoot culture
6	Separation of serum and plasma
7	Immunoelectrophoresis
8	Isolation of lipolytic bacteria from butter
	Spotters Microarray, Cystic fibrosis, RFLP, microinjection, DNA fingerprinting, Liposome mediated gene transfer, superbugs

Books for Study

1. John Vennison. 2009. Laboratory Manual of Genetic Engineering. PHI.
2. Sambrook, Joseph. 2001. Molecular Cloning: a Laboratory Manual. Cold Spring Harbor, N.Y. Cold Spring Harbor Laboratory Press.

Books for Reference

1. Abhijit Dutta. 2011. Experimental Biology: A laboratory Manual. Narosa.
2. Rajan&Selvi Christy. 2010. Experimental Procedures in Lifesciences. Anjanaa Book House

Rationale for Nature of the course

This laboratory course aimed to provide practical experience on industrial biotechnology, bioremediation process and diseases diagnostic tools. Knowledge gained by the students through this course not only enriches their understanding, but also enhance their analytical ability

Activities having direct bearing on Skill development / Employability /Entrepreneurship

- Individual experimental activity to the students.
- Hands on- training in techniques in Biotechnology.
- Report writing – new advanced methodologies in biotechnology

Pedagogy

The teaching methods may include: Demonstrations, hands on experiments and Problem solving

Course content designers

R.Suguna

Dr. P. Vimal

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K –Level
CLO-1	Demonstrate the fermentation process	Up to K-2
CLO-2	Correlate the role of plant hormones in plant tissue culture	Up to K-4
CLO-3	Apply various techniques to isolate microbes	Up to K-3
CLO-4	Solve the problem associated with genetic disorders	Up to K-3
CLO-5	Elaborate principle behind the transgenesis	Up to K-2

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	3	2	3	2	2
CLO-2	3	2	2	2	2
CLO-3	3	2	3	2	2
CLO-4	3	2	3	2	2
CLO-5	3	3	3	2	2

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5
CLO-1	3	3	3	3	2
CLO-2	3	1	2	1	1
CLO-3	3	3	1	3	1
CLO-4	3	3	2	2	2
CLO-5	3	3	2	3	3

Advance application-3; Intermediate level-2 & Basic level-1

DEPARTMENT OF BIOTECHNOLOGY					Certificate course			
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours	CIA	Ext	Total
	Certificate course		Sericulture Technology		30	50	50	100

Course Objectives

1	To introduce fundamental concepts, tools and techniques of mulberry cultivation, silkworm rearing and silk reeling
2	To train the students in comprehensive silk production techniques
3	To make the students become an entrepreneur

Unit	Description	Hours
I	Introduction to Sericulture: History, scope and economic importance of sericulture - Sericulture industry in India and World - Silk boards: Central silk board, International Silk Commission – Seribiotech research – Silk worm seed Technology – Silk Technology	6
II	Cultivation of Mulberry: Taxonomy, morphology geographical distribution, and varieties of Mulberry plants, Optimum conditions for mulberry cultivation - Different methods of propagation - seedling, vegetative propagation (cutting, grafting and layering) – Irrigation, manuring - Harvesting and storage methods of leaves – Disease and management of mulberry plants (Bacterial, Fungal and Viral)	6
III	Silkworm and Rearing: Lifecycle of mulberry silkworm (<i>Bombyxmori</i>) –Silk Glands - Brief account on Eri, Tasar and Muga silkworms - Silkworm diseases: causes and prevention of Pebrine, Flacherie, Muscardine – Silkworm rearing: Disinfection, Brushing, Maintenance of optimum conditions for rearing, Feeding, Bed Cleaning, Spacing, Care during mounting, Mounting, Harvesting.	6
IV	Silk Reeling: Stifling, Storage of cocoons, sorting of cocoons, Deflossing, Cocoon riddling, Cocoon mixing, cocoon cooking, brushing – Reeling operations: reeling end formation, twisting, drying and reeling – Reeling appliances: country charkha, domestic basin, cottage basin and filatures – Re-reeling, Lacing – Silk Testing	6
V	By Products Technology and Entrepreneurship: By-products of Moriculture – By-products of rearing: use as compost, animal feed, suturing material, biogas plant, and pharmaceutical industry – By-products of grainage operation – By-products of reeling – Entrepreneurship opportunity: Silk Graft, silkworm egg production and supply, Chawki rearing, Silk dyeing and printing, Zari manufacturing.	6

Books for study

1. Johnson M and Kesary M. 2008. Sericulture. 4th edition
2. Ganga G and Sulochanachetty J. 2000. An Introduction to Sericulture. Oxford & IBH

Books for reference

1. Ravindranathan KR. 2003. Economic Zoology. Dominant Publishers and distributors
2. Venkatanarasaiah P. 2013. Sericulture. APH Publishing Corporation

DEPARTMENT OF BIOTECHNOLOGY					Certificate course			
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours	CIA	Ext	Total
	Certificate course		Spirulina cultivation		30	50	50	100

Course Objectives

1	To introduce fundamental concepts and methods of spirulina cultivation.
2	To train the students in comprehensive spirulina production and post-production.
3	To make the students become an entrepreneur

Unit	Description	Hours
I	Introduction to SCP production – historical use and rediscovery of <i>Spirulina</i> , importance, morphology, taxonomy and habitat of <i>Spirulina</i>	6
II	Biochemical composition - amino acids, unsaturated fatty acids and lipids, minerals vitamins, pigments, carotenoids and phycobiliproteins. Chelating of toxic minerals.	6
III	Cultivation and production of spirulina -Natural production –Nutritional media ,small scale commercial production – commercial and mass cultivation (tank construction, culture medium, strain selection, scaling up of the process) – importance of light and pH in <i>Spirulina</i> cultivation –Harvesting and processing drying and packing ,Production of spirulina in organic nutrients including waste effluents post-harvest technology and single cell protein formulation.	6
IV	Products, uses and benefits -Spirulina and its use by humans-Immune system enhancement,nutritional supplements, Food source, Food safety aspects related to human consumption of spirulina, Spirulina and agriculture-Use as fertilizer, Use as a protein supplement in poultry and livestock feeds, Use as a colourant in poultry, livestock and food products, Spirulina and aquaculture-Spirulina as a nutritional supplement, Spirulina as a colourant.	6
V	Challenges and future outlook -Maintenance of steady-state production in outdoor cultures, Controlling photo-inhibition , Decreasing dark respiration, Decreasing oxygen tension in the culture, Diurnal fluctuation in temperature, Sensitivity to high osmoticum. Gene manipulation, Plant growth regulators, Strain development and improvement, Potential use as a nutritional supplement in humanitarian emergencies.	6

Book for Reference

1. Avigad Vonshak. *Spirulina platensis* (Arthrospira) Physiology, cell-biology and biotechnology, Taylor & Francis Ltd.
2. Selvendran D. 2015. Large Scale Algal Biomass (Spirulina) Production in India. In: D. Das (Ed.) Algal Biorefinery: An Integrated Approach, Springer.
3. Habib M.A.B., Parvin M., Huntington T.C. and Hasan M.R. 2008. A review on culture, production and use of Spirulina as food for humans and feeds for domestic animals and fish. FAO Fishers and Aquaculture Circular No. 1034, FAO, Rome, Italy.

Evaluation pattern

Add-On Courses

Evaluation pattern for Add-on courses

Internal evaluation : 50 % marks

External evaluation : 50 %marks

Continuous Internal Assessment components	Marks
Assignment (3nos)/mini project)	20 %
Paper presentation/seminar	15 %
Quiz	15 %
Total	50%

External examination duration: 2 hours

Question paper pattern

Part-A Multiple choice type 10 x 1 = 10 marks

Part- B Descriptive type [4 out of 7] 4 x 10 = 40 marks

Self-learning Courses

Evaluation pattern for Self-study courses

Assessment components	Marks
Assignments (minimum 2)	25%
Project/innovative experimental design	25%
Paper presentation/ viva voce	25%
Internal test	25%
Total	100%

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Add on	21U3LAD1	Reproductive Biology	2	2	50	50	100

Course Objectives

1.	To learn the fundamental developmental processes
2.	To understand the fertilization and cleavage processes
3.	To acquire knowledge about Assisted Reproductive Technology

Unit	Description	Hours
I	Gametogenesis General introduction to reproductive biology, Spermatogenesis, Oogenesis, Egg membranes and organization of egg - yolk, pigments, egg cortex, Maturation of egg, Polarity and Symmetry.	6
II	Fertilization & activation Types of eggs - Polarity - Mechanism of fertilization-Monospermy and Polyspermy, Activation of egg and metabolism, Parthenogenesis.	6
III	Cleavage and Gastrulation Types of cleavage, Factors affecting cleavage, Blastulation, Gastrulation - Mechanism of morphogenetic movement, Metabolic and molecular changes during gastrulation; Cell motility and Differential cell affinity; Fate maps construction. Concept of organizer.	6
IV	Embryonic and postembryonic development Placenta – types and physiology, Metamorphosis and regeneration, Nucleo-cytoplasmic interactions, teratogenesis-causative agents.	6
V	Experimental embryology Concept of Assisted Reproductive Technology (ART) – Monitoring of ovulation phase, Super-ovulation and Cryopreservation, Sperm banking, Artificial insemination, IVF, Embryo transfer and Test tube babies.	6

Books for Study

1. Balinsky, BI. 2012. An introduction to Embryology. 5th Edition. Thomson Asia Pvt. Ltd., Singapore
2. Jain, PC. 1994. Elements of Developmental Biology. Vishal Publications, Jalandhar, New Delhi.
3. Verma, PS and Agarwal, VK. 2006. Chordate Embryology. S. Chand & Company Ltd., New Delhi.

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Add-on	21U4LAD2	Enzyme Technology	2	2	50	50	100

Course Objectives

1	To focus on the enzyme structure and its function.
2	To provide students with an understanding about the enzyme kinetics.
3	To understand the methods of immobilization and its applications.

Unit	Description	Hours
I	Enzymes an overview- Historical aspects, Structure and properties, classification and nomenclature, Sources of enzyme, Active site, active centre	6
II	Mechanism of action of enzymes- lock and key model induced fit theory, factors affecting enzyme action, Determination of protein structure-active site prediction.	6
III	Enzyme purification- strategies in enzyme purification ,choice of source, methods of homogenization, ammonium sulphate precipitation, methods of separation- centrifugation, gel filtration, dialysis and ultrafiltration , Ion-exchange chromatography, electrophoresis, Iso-electrofocussing. Affinity chromatography, separation based on polarity –salting- in and salting –out, Test for purity, test for catalytic activity.	6
IV	Enzyme kinetics- Michaelis –Menten plot, LB plot, Hanes Woolf plot, Briggs-Haldane plot, Eadie-Hofstee plot, Significance of K_m and K_{cat} , Mechanism of enzyme catalysis- acid base, covalent and metal ion catalysis. Effect of temperature, pH, substrate, inhibitors-reversible and irreversible inhibition on enzyme activity, Types of multisubstrate reaction. Allosteric enzyme - MWC model and KNF model, Isozymes.	6
V	Enzyme immobilization, engineering and applications - immobilised enzyme definition and properties, types of immobilization- entrapment, encapsulation, adsorption, crosslinking, applications of immobilised enzymes. Enzyme engineering – lysozyme, subtilisin, Asparaginase. Enzyme applications - enzymes in starch industries, alcoholic beverages, bread making, cheese making, detergent, clarification of fruit juices, desizing fabrics, meat tenderizing, dehairing of hides, recovering of silver. Enzymes as Biosensor.	6

Books for study

1. Price NC. Fundamentals of enzymology – the cell and molecular biology of catalytic proteins. 3rd edition. Oxford University press.
2. Prasad NK. 2011. Enzyme technology -Pacemaker of Biotechnology , PHI learning Pvt Ltd.
3. Palanivelu P. 2007. Enzymes, Ribozymes and DNAzymes 21st century publications.

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III & IV	Self-learning	21U4LSS1	Medical Biochemistry	2		50	50	100

Course Objectives

1	To understand the biochemical concept underlying the cause of disease.
2	To provide students with basic understanding about the clinical analysis related to disorders
3	To make the students aware of various inherited disorders of metabolism.

Unit 1 Introduction

Role of biochemistry in day today life. Blood and coagulation - disturbances of blood clotting mechanisms - systematic analysis of haemorrhagic disorders - coagulation and prothrombin time, determination - haemoglobin- their derivatives of haemoglobin- combination of haemoglobin with gases- anaemia - abnormal haemoglobins and haemoglobinopathies- Thalassemia's.

Unit 2 Clinical Enzymology

Laboratory investigations on serum and Urine for constituents (normal & abnormal) of diagnostic and prognostic importance. Plasma specific and non plasma specific enzymes of diagnostic prognostic importance and their interpretation of amylase, aminotransferase, phosphatase, creatinine kinase, cholinesterase, lactate dehydrogenase, phosphohexoisomerase, lipoprotein lipase.

Unit 3 Disorders of carbohydrates metabolism

Glucose level in normal blood, renal threshold, hyper and hypoglycaemia and glycosuria - qualitative tests for sugars in urine - intravenous and other types of glucose tolerance tests - fructose levels in blood lab diagnosis of early and latent diabetes mellitus - diabetic coma, secondary degenerative changes associated with diabetes mellitus - Glycogen storage disorders.

Unit 4 Disorders of nitrogen&Lipid metabolism

Assimilation and excretion of nitrogen with reference to ammonia, urea, uric acid, creatine, creatinine - excretion of nitrogenous waste products - abnormalities of nitrogen metabolism including uremia, porphyrias, porphyrinurias, and aminoaciduria - factors affecting nitrogen balance. Lipid metabolism disorders Plasma lipoproteins, cholesterol triglycerides and phospholipids in health and diseases, ketosis, fatty liver. Inherited disorders- Refsum's disease,zellweger's syndrome, Jamaican vomiting sickness.Hyperlipoproteinaemias and Hypolipoproteinaemias- Antherosclerosis.

Unit 5 Inherited disorders of metabolism

Changes occurring in phenyl ketonuria, alkaptonuria, tyrosinosis, albinism, Hartnup's disease, galactosemia.Tay-Sach's disease, Niemann Pick's disease and Hunter's syndrome,lesch-nyhan syndrome syndrome - detection of these anomalies.

Books for reference

1. David Martin et al. 2018. Harper's Review of Biochemistry Lange Medical Publications
2. Chatterjea MN and Shinde R. 2012. Textbook of Medical Biochemistry. Jaypee Brothers Medical Publishers (P) Ltd.

DEPARTMENT OF BIOTECHNOLOGY				CLASS: II B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Self-learning	21U4LSS2	Evolutionary Biology	IV		50	50	100

Course Objectives

1	To understand the process of origin of life and diversification of species.
2	To appreciate the effects of natural selection, variation and adaptation in evolution of different life forms.
3	To provide insights into co-evolution, molecular evolution and human evolution.

Unit-I: Origin of Life and Evidences for Evolution

Origin of life – theories – creation- cosmozoic theory - spontaneous generation- Oparin and JBS Haldane, Chemical evolution – Urey Miller hypothesis, Biogenesis – Fransisco Reddy’s experiment, origin of prokaryotic & eukaryotic cell, Evidences of evolution – Comparative anatomy, vestigial organs, living fossils, Embryological – ontogeny repeats phylogeny.

Unit – II: Natural selection, variation and adaptation

Pre Darwinism– Lamarckism, Charles Darwin and William Huxley -Natural selection theory, mode of selection - Directional selection –Stabilising selection, Balancing selection, Disruptive selection, Adaptations – variations and origin, adaptive trends, Mimicry and Coloration, Sexual selection – Convergent, Divergent and Parallel evolution, Neodarwinism - Hardy Weinberg law, forces of evolution – mutation, migration, random genetic drift, founder’s effect, bottleneck effect

Unit – III: Speciation and co-evolution

Reproductive isolation mechanisms - Prezygotic isolation - Habitat, temporal/seasonal, ethological, mechanical, gametic, Postzygotic isolation – hybrid inviability, hybrid sterility, hybrid breakdown, origin of species – species concept, modes of speciation – allopatric, sympatric and paprapatric, speciation in plants – polyploidy, hybridisation, Kin selection& altruism – Hamilton’s rule, Co-evolution – co-operation & conflict, Prey-predator/parasite-host, mutualism, symbiosis, commensalism.

Unit – IV Macroevolution and extinction

Macroevolution– Heterochrony, allometric changes, pedomorphosis, peramorphosis, Molecular evolution – gene birth – duplication, exon shuffling, Gene families, pseudogenes, death of a gene, protein coding genes, gene expression, evolution of chromosome number & structure – fission, fusion, inversion, transposable elements – horizontal gene transfer-rate of evolution, punctuated equilibrium, causes and consequences of extinction.

Unit-V History of life and Human evolution

Geological eras, Fossils and fossilization, dating of fossils, Human origin - Ancestors of primates – Apes, fossil ancestors of man - Dryopithecus, Australopithecus, *Homo habilis*, *H. erectus*, *H. Neanderthalensis* (Neanderthal man), The Cro-magnon, *Homo sapiens* (Modern man), Socio-cultural evolution – Language, Human influences on evolution - Domestication.

Books for reference

1. Sanjib Chattopadhyay. 2008. Life: Evolution, Adaptation and Ethology, 2nd edition, Books and Allied Priv Ltd, India
2. Futuyma and Kirckpatrick. 2017. Evolution. 4th edition, Sinauer Associates, Inc., Publishers, USA.
3. Mark Ridley. 2004. Evolution. 3rd edition, Blackwell Publishing, UK.
4. Hall, Hallgrimsson, Strickberger. 2014. Evolution, 5th edition, Jones & Bartlett Learning, USA.
5. Ernst Mayr. 2002. What Evolution is? Phoneix, UK.

DEPARTMENT OF BIOTECHNOLOGY				CLASS: I B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Practicals	20U1LMP1	Major Practicals-I	3	3	40	60	100

Course Objectives

1.	To introduce students to various analytical experiments
2.	To understand and analyse the Mendelian Inheritance pattern.
3.	To identify problem, Interpret results of bio-analytical techniques.

Lab Experiments

1. Simple Mendelian characters in human.
2. Monohybrid and dihybrid cross using beads – model.
3. Identification of Blood groups by kit method.
4. Observation of mitotic cell stages using onion roots.
5. Identification of Barr Body
6. Isolation of plasmid DNA from bacterial cells
7. Restriction analysis of plasmid DNA
8. Culturing of baker's yeast

Spotters

PolyteneChromosomes, lampbrush Chromosomes, Vector map of pBR322 and pUC18, Pedigree Charts.

Books for Study

1. Rajan&Selvi Christy. 2010. Experimental Procedures in Lifesciences. Anjanaa Book House.
2. Kanika Sharma. 2011. Manual of Microbiology: Tools & Techniques. Ane books Pvt. Ltd
3. Sinha et al., 2011. Advanced Practical Zoology. Books & Allied (P) Ltd.

Books for Reference

1. AbhijitDutta. 2011. Experimental Biology: A laboratory Manual. Narosa.
2. John Vennison. 2009. Laboratory Manual of Genetic Engineering. PHI.

Pedagogy

The teaching methods may include: Demonstrations, hands on experiments and Problem solving

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K - Level
CLO-1	Show hands-on techniques that will supplement and enrich the lecture part	Up to K-2
CLO-2	Correlate the results and develop critical thinking skills	Up to K-4
CLO-3	Examine genetic inheritance pattern in both animals & Plants	Up to K-3
CLO-4	Infer the physiological process in plants and animals	Up to K-3
CLO-5	Categorize various genetic disorders	Up to K-2

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	2	--	--	3
CLO-2	2	1	--	--	3
CLO-3	3	3	1	2	3
CLO-4	1	2	2	2	1
CLO-5	3	2	2	2	3

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7
CLO-1	3	3	3	3	2	--	--
CLO-2	3	1	2	1	1	2	--
CLO-3	3	3	1	3	1	1	1
CLO-4	3	3	2	2	2	2	1
CLO-5	3	3	2	3	3	3	3

Advance application-3; Intermediate level-2 & Basic level-1

DEPARTMENT OF BIOTECHNOLOGY				CLASS: I B.Sc. Biotechnology				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Major Practicals	20U2LMP2	Major Practical-II	3	3	40	60	100

Course Objectives

1.	To introduce students to various analytical experiments.
2.	To understand and analyse the Mendelian Inheritance pattern.
3.	To identify problem, Interpret results of bio-analytical techniques.

Lab Experiments

1. Estimation of Oxygen consumed by fishes by Winkler's method.
2. Identification of nitrogenous waste from excreta.
3. Plasmolysis experiments using onion cells.
4. Verification of Beer's Law.
5. Amino-acid separation using paper and thin layer chromatography.
6. Agarose Gel Electrophoresis – demonstration.
7. SDS-PAGE – demonstration
8. Determination of pH of various samples

Spotters

Compound microscope, types of rotors, UV spectrophotometer, GM counter, neurons, pituitary gland, stomata

Books for Study

1. Rajan&Selvi Christy. 2010. Experimental Procedures in Lifesciences. Anjanaa Book House.
2. Kanika Sharma. 2011. Manual of Microbiology: Tools & Techniques. Ane books Pvt. Ltd
3. Sinha et al., 2011. Advanced Practical Zoology. Books & Allied (P) Ltd.

Books for Reference

1. Abhijit Dutta. 2011. Experimental Biology: A laboratory Manual. Narosa.
2. John Vennison. 2009. Laboratory Manual of Genetic Engineering. PHI.

Pedagogy

The teaching methods may include: Demonstrations, hands on experiments and Problem solving

Course Learning Outcomes

On completion of this course the students will be able to

#	CLOs	K - Level
CLO-1	Interpret the result with physiological process	Up to K-2
CLO-2	Categorize various electrophoretic techniques	Up to K-4
CLO-3	Determine biophysical parameters in a biological samples	Up to K-3
CLO-4	Experiment with various chromatographic methods	Up to K-3
CLO-5	Estimate the abiotic components	Up to K-2

Mapping of Course outcomes with Program Outcomes

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	2	--	--	3
CLO-2	2	1	--	--	3
CLO-3	3	3	1	2	3
CLO-4	1	2	2	2	1
CLO-5	3	2	2	2	3

Advance application-3; Intermediate level-2 & Basic level-1

Mapping of Course outcomes with Program specific Outcomes

CO/PSO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7
CLO-1	3	3	3	3	2	--	--
CLO-2	3	1	2	1	1	2	--
CLO-3	3	3	1	3	1	1	1
CLO-4	3	3	2	2	2	2	1
CLO-5	3	3	2	3	3	3	3

Advance application-3; Intermediate level-2 & Basic level-1

I UG Ratifications

Course Code	Course Title	Nature of the course	Rationale	Activities having direct bearing on Skill development / Employability /Entrepreneurship
20U1LMC1	Genetics	Knowledge & Skill	Core paper on Genetics focuses on the knowledge gain in mendelian and non-mendelian inheritance. The students would learn about the chromosomal aberrations and the disorders associated with it. Also they would acquire skills on sex-linked and cytoplasmic inheritance.	Model making related to inheritance pattern. Pedigree analysis for genetic disorders Solving problem related to genetics
20U1LMC2	Basics of Biotechnology	Knowledge & Skill	The core paper Basics of Biotechnology is pivotal in gaining knowledge on the basic concepts in biotechnology. They would be proficient in various tools and techniques of biotechnology. They aware on the ethics and biosafety aspects in biological research.	Flow chart preparation Seminar presentation Case study analysis
20U1LMP1	Major Practicals-I	Knowledge & Skill Skill Oriented	The core lab Practicals focus on genetics and basic biotechnology experiments. It aims to develop experimental skill and analytical thinking among students. The students would able to enrich their theoretical concepts through these experiments	Individual experimental activity to the students. Hands on training various instruments. Analysis and interpretation of results.
20U2LMC3	General Physiology	Knowledge & Skill	The core paper aims to make students to understand the basic physiological processes of plants and animals. They would gain proficiency in the various adaptive mechanisms in higher organisms. They would know about the significance of various physiological processes	Virtual model making Mind map and flow chart preparation Assignment writing
20U2LMC4	Bioinstrumentation	Knowledge & Skill Skill Oriented	Core paper on Bioinstrumentation aims to teach the students about the various analytical instruments used in life sciences. They get expertise in principle, instrumentation, working and application of those instruments. They would be well versed in assessing the advancement in bio analytical techniques	Experiment based activities Virtual model making Assignment writing
20U2LMP2	Major Practicals-II	Knowledge & Skill Skill Oriented	This core lab based on the experiments related to physiology & bioinstrumentation. Students would be aware about the do's and dont's in handling instruments	Individual experimental activity to the Hands on training various instruments. Analysis and interpretation of results.

PART – V Activities

(NCC, NSS, YRC, PHYSICAL EDUCATION)

Revised Curriculum

(Choice Based Credit system with Outcome Based Education)

Academic Year 2020-2021 onwards



THE MADURA COLLEGE (AUTONOMOUS), MADURAI – 625 011
REVISED PART – V N.C.C. SYLLABUS 2020-21 ONWARDS
FIRST YEAR

NATIONAL CADET CORPS				CLASS: UG students				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Part V	20U2NCC1	Introduction to NCC	-	-	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Objectives: *The objective of this course is to make the student*

- (i) *To know about NCC & its organization in India.*
- (ii) *To know about the armed forces*
- (iii) *To involve in social service activities.*

UNIT I. N.C.C. Organization

History of NCC – NCC act 1948 – NCC organization-starting from college up to Directorate. NCC song – Motto, Cardinal principles of discipline and Aims of NCC.

UNIT II. Geography & Current affairs in India

Geography: Geography of India, boundary lines with neighboring countries.

Current affairs: Entire cabinet of Indian government – Governor, Chief Minister and capital city of all Indian states – President and Prime Minister of our neighboring countries.

UNIT III. Armed services

Various military organizations in Army, Navy & Airforce.

- a. Various commands and their headquarters.
- b. Rank of equivalents in Army, Navy & Airforce.
- c. Employment opportunities in the armed forces – OTS, NDA, UPSC, IMA, etc.

UNIT IV. Leadership, civil defense & hygiene

Leadership: Basic traits and development. Civil defense: Organization – importance during civil and war times. Hygiene: Brief account of hygiene, sanitation and significance.

UNIT V. Role of NCC in social service activities

Social services: Adult education – Road safety: Traffic rules and regulations. AIDS awareness: causes – mode of transmission – diagnosis – prevention of AIDS.

Pollution: Types and control.

Malaria : Origin and control.

Tree plantation and its importance.

Books for study:

1. NCC Guide – Army Wing, Priya Publications, Major R. Ramasamy, Karur, 2010.
2. Cadets hand book-Common subjects for SD/SW, OTA training materials, Kamptee.

Books for reference:

1. Precis, Published by Officer Training School, Kamptee, 2009.
2. Cadet's diary, Published by cadets' center, Chennai, 2000.
3. NCC: Handbook of NCC cadets, R. Gupta, Ramesh Publishing House, 2015.
4. A hand book of NCC-Army wing, Lt. S. N. Saravanamoorthy, Jayalakshmi publications, Madurai, 2015.

Web resources:

1. <https://indiancc.nic.in/>
2. https://play.google.com/store/apps/details?id=com.chl.ncc&hl=en_IN&gl=US
3. <https://joinindianarmy.nic.in/default.aspx>
4. <https://www.joinindiannavy.gov.in/>
5. <https://indianairforce.nic.in/>

Rationale for nature of the course

This course will enable the students to enrich the understanding of NCC and its organization. Through the course, students are motivated to involve in social service activities.

Activities having direct bearing on Skill development/ Employability/Entrepreneurship

Cadets will be involved in social service activities like tree plantation, awareness rallies, street shows, field works related to NCC and able to act upon various emergency situations. Through battalion, students can participate in trekking, mountaineering and other adventure training national level.

After successful completion of this course, the students will be able to

	CLO Statement	Knowledge level
CLO-1	Understand the structure, organization of NCC and armed forces.	Up to K2
CLO-2	Develop leadership qualities and general knowledge from current affairs.	Up to K2
CLO-3	Involve in social service activities and act in the emergency situation.	Up to K2
CLO-4*	Develop qualities like character, comradeship and discipline through regular training and field work.	Up to K2
CLO-5*	Improve secular outlook, spirit of adventure, ethics and ideals of selfless service.	Up to K2

* CLO-4 *Will be considered for field work*

* CLO-5 *Will be considered for attending camps and attendance (regular parades)*

PO and CLO mapping:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	1	1	2	2
CLO-2	2	1	1	1	2
CLO-3	2	1	1	2	1
CLO-4	2	1	1	1	2
CLO-5	2	1	1	1	2

EVALUATION PATTERN

INTERNAL ASSESSMENT	:	40 marks
EXTERNAL EXAMINATION	:	60 marks
TOTAL	:	100 marks

- **INTERNAL ASSESSMENT**

TOTAL : 40 MARKS

Following components are fixed for internal assessment:

Field work/Camp/Rallies/Special camp, etc.	:	20 marks	(CLO-4)
Attendance	:	10 marks	(CLO-5)
Assignment	:	10 marks	(CLO-1to3)

- **EXTERNAL ASSESSMENT**

EXTERNAL EXAMINATION : 60 MARKS
QUESTION PAPER PATTERN

Duration: 2 Hrs

Max Marks: 60

Part – A.	Answer ALL questions.	(Either or type)	5 x 4 = 20
Part – B.	Answer any FIVE questions from eight questions. (Open Choice)		5 x 8 = 40

Summative Examination – Blue Print

Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section-A (Either / or choice)		Section-B (Open choice)	
			No. of questions	K-Level	No. of questions	K-Level
1	CLO-1	Up to K2	2	K1 & K1	3	K2
2	CLO-2	Up to K2	4	K1 & K1	3	K2
3	CLO-3	Up to K2	4	K1 & K1	2	K2
No. of Questions to be asked			10		8	
No. of Questions to be answered			5		5	
Marks for each question			4		8	
Total Marks for each section			20		40	

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers.

Distribution of Section-wise marks with K-levels

K Levels	Section A (Either / or)	Section B (Open Choice)	Total Marks	% of Marks without choice
K1	40		40	38.5
K2		64	64	61.5
Total marks			104	100

Name of the course Designer

- Lt Dr. S. V. Karthikeyan

NATIONAL CADET CORPS				CLASS: UG students				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Part V	18U4NCC2	Field training in NCC	1	-	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Objectives: *The objective of this course is to make the student*

- (i) To know about geography and current affairs of world.*
- (ii) To know the types of drill with and without arms*
- (iii) To understand the types of weapons, ground and concepts of map reading.*

UNIT I. Geography & Current affairs of world

Geography of the world – Continents. Important nations: Capitals and leaders. Important world organizations: NATO, various UN organizations, peace keeping activities – important agreements – current affairs – important achievements in social activities – Adventure activities in mountaineering, trekking, voyage, etc.

UNIT II. Drill

Important drill movements – measurements, distance degree, etc. of each drill movement.

Drill without arms: Attention, stand at ease, marching, saluting, halt formation of squad.

Drill with arms: With rifle, Attention, shoulder arm, present arm and saluting with arms.

UNIT III. Map reading

Introduction – aim, definition and importance – Technical terms and uses of service protractor – parts and uses of prismatic compass. Conventional signs – Grid systems – reference of four and six figures – Types of north – finding north and won positions – bearing – map to ground and ground to map.

UNIT IV. Field craft & Battle craft

Definition – Judging the distance: various methods of judging the distance – Types of grounds – why things are seen? (7 sisters & 1 mother).

Camouflage & concealment: definition & principles.

Patrol: Definition, types, strength, tasks and stages of patrol – patrol moves, briefing and debriefing in patrol.

Ambush: Definition, Types, aims, parties, functions and essentials of ambush. *Section and Platoon formations:* Definition, types and uses.

UNIT V. Weapon training

Weapon training: Parts, stripping, assembling, effecting range and weight of the following weapons:

Rifle, Self-loading rifle (SLR) and Light machine gun (LMG).

Books for study:

1. NCC Guide – Army Wing, Priya Publications, Major R. Ramasamy, Karur, 2010.
2. Cadets hand book-Common subjects for SD/SW, OTA training materials, Kamptee.
3. Cadets hand book-Special subjects for SD/SW, OTA training materials, Kamptee

Reference Books:

1. Precis, Published by Officer Training School, Kamptee, 2009.
2. Cadet's diary, Published by cadets' center, Chennai, 2000.
3. NCC: Handbook of NCC cadets, R. Gupta, Ramesh Publishing House, 2015.
4. A hand book of NCC-Army wing, Lt. S. N. Saravanamoorthy, Jayalakshmi publications, Madurai, 2015.

Web resources:

1. <https://indiancc.nic.in/>
2. https://play.google.com/store/apps/details?id=com.chl.ncc&hl=en_IN&gl=US
3. <https://joinindianarmy.nic.in/default.aspx>
4. <https://www.joinindiannavy.gov.in/>
5. <https://indianairforce.nic.in/>

Rationale for nature of the course

This course will enable the students to enrich the understanding of geography and current affairs of world. Through the course, students are motivated to join in armed forces.

Activities having direct bearing on Skill development/ Employability/Entrepreneurship

Cadets will be able to handle weapons, read map and develop qualities like character, comradeship, discipline, leadership, secular outlook, spirit of adventure, ethics and ideals of selfless services. Through battalion, students can participate in rock climbing, para sailing, cycling, trekking, mountaineering and other adventures training at both state level and national level.

After successful completion of this course, the students will be able to

CLOs	CLO Statement	Knowledge level
CLO-1	Understand the geography, important world organizations and will do various drills with & without arms.	Up to K2
CLO-2	Read maps and related sign systems.	Up to K2
CLO-3	Comprehend the types of weapons, field crafts and battle crafts.	Up to K2
CLO-4*	Develop qualities like character, comradeship and discipline through regular training and field work.	Up to K2
CLO-5*	Improve secular outlook, spirit of adventure, ethics and ideals of selfless service.	Up to K2

* CLO-4 *Will be considered for field work*

* CLO-5 *Will be considered for attending camps and attendance (regular parades)*

PO and CLO mapping:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	2	1	2	2
CLO-2	2	1	1	2	1
CLO-3	2	1	1	2	2
CLO-4	2	1	1	1	2
CLO-5	2	1	1	1	2

EVALUATION PATTERN:

INTERNAL ASSESSMENT	:	40 marks
EXTERNAL EXAMINATION	:	60 marks
TOTAL	:	100 marks

- **INTERNAL ASSESSMENT**

TOTAL : 40 MARKS

Following components are fixed for internal assessment:

Field work/Camp/Rallies/Special camp, etc.	:	20 marks	(CLO-4)
Attendance	:	10 marks	(CLO-5)
Assignment	:	10 marks	(CLO-1to3)

- **EXTERNAL ASSESSMENT**

EXTERNAL EXAMINATION : 60 MARKS

QUESTION PAPER PATTERN

Duration: 2 Hrs

Max Marks: 60

Part – A.	Answer ALL questions.	(Either or type)	5 x 4 = 20
Part – B.	Answer any FIVE questions from eight questions. (Open Choice)		5 x 8 = 40

Summative Examination – Blue Print

Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section-A (Either / or choice)		Section-B (Open choice)	
			No. of questions	K-Level	No. of questions	K-Level
1	CLO-1	Up to K2	2	K1 & K1	3	K2
2	CLO-2	Up to K2	4	K1 & K1	3	K2
3	CLO-3	Up to K2	4	K1 & K1	2	K2
No. of Questions to be asked			10		8	
No. of Questions to be answered			5		5	
Marks for each question			4		8	
Total Marks for each section			20		40	

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers.

Distribution of Section-wise marks with K-levels

K Levels	Section A (Either / or)	Section B (Open Choice)	Total Marks	% of Marks without choice
K1	40		40	38.5
K2		64	64	61.5
Total marks			104	100

Name of the course Designer

- Lt Dr. S. V. Karthikeyan



THE MADURA COLLEGE (AUTONOMOUS), MADURAI – 625 011
REVISED PART – V – NSS SYLLABUS 2020-21 ONWARDS
FIRST YEAR

NATIONAL SERVICE SCHEME				CLASS: UG students				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Part V	20U2NPN	Introduction to National Service Scheme	-	-	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Objectives: *The objectives of this course is to make the student*

- (i) *To understand the community in which they work and their relation.*
- (ii) *To identify the needs and problems of the community and involve them in problem solving*
- (iii) *To develop capacity to meet emergencies and natural disasters*
- (iv) *To develop competences required for group living and sharing responsibilities.*
- (v) *To acquire leadership qualities and democratic attitude.*

Unit – I –BASICS OF NATIONAL SERVICE SCHEME

NSS-Motto-Aim – Role of Programme officer- Role of NSS Group leader and volunteers in the implementation.

Unit –II – ADMINISTRATIVE STRUCTURE OF NSS

Structure of NSS at world level, Regional level, University level, College level – body –functions- Planning and execution.

Unit – III – PROGRAMMES AND ACTIVITIES

Activities of NSS – Traffic regulation- Working with Police commissioner's Office- with Corporation of Madurai – Working with Health Department –Blind assistance- collection during disaster – Non-formal education – Environmental Education, and Training (EEAT)' Blood donation.

Unit – IV- COMMUNITY DEVELOPMENT

Camp-fund allocation –procedure for special camp activities to be carried out in adopted – general awareness programs during camp.

Unit – V DEVELOPMENT AND PARTICIPATION WITH SOCIAL ISSUES

Economic survey- first aid – disaster management (flood) –communicable and non-diseases –HIV, DENGUE- people participation.

Books for study:

1. NATIONAL SERVICE SCHEME MANUAL (REVISED) by Government of India Ministry of Youth Affairs & Sports New Delhi
2. Hand book of National Service Scheme Empanelled Training Institution, Avinashilingam University for Women, Coimbatore

Reference Books:

1. National Service Scheme Manual (Revised) Ministry of Human Resource Development of India.
2. A. Kumar (2006), “Health and Nutritional Status of Indian Women”, Anmol Publications Pvt, Ltd., New Delhi

Web resources:

1. <https://nss.gov.in/nss-detail-page>
2. www.icmr.nic.in
3. <https://www.avit.ac.in/nss/index.php>
4. <https://nss.gov.in/>

Rationale for nature of the course

This course will enable the students to enrich the understanding of NSS and its organization. Through the course, students are motivated to involve in social service activities.

Activities having direct bearing on Skill development/ Employability/Entrepreneurship

Cadets will be involved in social service activities like

1. National Integration Camp
2. Shramdaan
3. Blood donation
4. Immunization
5. Plantation
6. Disaster Management
7. Adventure programs.

After successful completion of this course, the students will be able to

CLOs	CLO Statement	Knowledge level
CLO-1	To understand the aims and principles of NSS , the duties and responsibilities of an NSS volunteer to the society.	Up to K2
CLO-2	To know the administrative structure of NSS, its plans and its execution.	Up to K2
CLO-3	To acquire leadership qualities and democratic attitudes through the participation in various social activities	Up to K2
CLO-4*	To aid in character building and develop qualities like comradeship and discipline through regular training and field work.	Up to K2
CLO-5*	To develop the spirit of humanity and ideals of selfless service.	Up to K2

*CLO-4 Will be considered for field work

* CLO-5 Will be considered for attending camps and attendance (regular NSS activities)

PO and CLO mapping:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	1	2	3	3
CLO-2	2	1	2	3	3
CLO-3	2	1	2	3	3
CLO-4	2	1	2	3	3
CLO-5	2	1	2	3	3

EVALUATION PATTERN:

INTERNAL : 40 marks
 EXTERNAL : 60 marks
 TOTAL : 100 marks

• INTERNAL ASSESMENT

TOTAL : 40 MARKS

Following components are fixed for internal assessment:

Fieldwork/Camp/Special camp, etc. : 20 marks (CLO-4)
 Assignment : 10 marks (CLO-1 to 3)
 Attendance : 10 marks (CLO-5)

EXTERNAL EXAMINATION : 60 MARKS

QUESTION PAPER PATTERN

Duration: 3 Hrs

Max Marks: 60

Part – A. Answer ALL questions. (Either or type) 5 x 4 =20
 Part – B. Answer any FIVE questions from eight questions. (Open Choice) 5 x 8=40

Summative Examination – Blue Print
Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section-A (Either / or choice)		Section-B (Open choice)	
			No. of questions	K-Level	No. of questions	K-Level
1	CLO-1	Up to K2	2	K1	3	K2
2	CLO-2	Up to K2	4	K1	3	K2
3	CLO-3	Up to K2	4	K1	2	K2
No. of Questions to be asked			10		8	
No. of Questions to be answered			5		5	
Marks for each question			4		8	
Total Marks for each section			20		40	

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers.

Distribution of Section-wise marks with K-levels

K Levels	Section A (Either / or)	Section B (Open Choice)	Total Marks	% of Marks without choice
K1	40		40	38.5
K2		64	64	61.5
Total marks			104	100

Name of the course Designer

- Dr. Y. Natarajan, Assistant Professor, Department of commerce.

NATIONAL SERVICE SCHEME				CLASS: UG students				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Part V	18U4NPN	Community Services	1	-	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Objectives: *The objectives of this course is to make the student*

- (i) *To understand the community in which they work and their relation.*
- (ii) *To identify the needs and problems of the community and involve them in problem solving*
- (iii) *To develop capacity to meet emergencies and natural disasters*
- (iv) *To develop competences required for group living and sharing responsibilities.*
- (v) *To acquire leadership qualities and democratic attitude.*

Unit – I –SOCIAL AWARENESS

Philosophy, ideology- Relationship of Social Work with Social Service, Social welfare, Social Security & Social Reforms – Drugs abuse.

Unit –II – ENVIRONMENTAL AWARENESS

Conservation, enrichment and Sustainability –Climate change, Global Efforts for conservation- Waste management – Natural resource management Rain water Energy Conservation, Waste land development, Soil conservation and Afforestation

Unit – III – GENDER EQUALITY

Concept of family and society – Growing up in the family-dynamics- in values – Concept & Importance – Concept of Gender Justice & its need

Unit – IV- HEALTH AWARENESS

Sanitation- Definition, needs and scope of health education – Food and Nutrition, Balance Diet- Safe drinking water, water borne disease- National Health Programme and Nursing and First Aid

Unit – V SOCIAL AND POLITICAL AWARENESS

Features of Constitutions of India – Fundamental Rights and duties – Human Rights- awareness and the legal rights of the consumer –Rights to Information Act. 2005- Education Act- Right to Employment Act.

Books for study:

1. Eugene (2010), “Environment Economics”, Vrinda Publishers, New Delhi.
2. A. Kumar (2006), “Health and Nutritional Status of Indian Women” Anmol Publications Pvt., Ltd., New Delhi.

Reference Books:

1. C. N Shankar Rao (2012), Principles of Sociology”, S. Chand & Co., Pvt., Ltd., Ram Nagar, NewDelhi.
2. Dr. P. Saravanan& P. Andichamy (2011), Value Education, Merit India Publications, Madurai

Web resources:

1. <https://indiaNSS.nic.in/>
2. www.rtionline.gov.in
3. www.nhrc.nic.in

Rationale for nature of the course

This course will enable the students to enrich the chance to improve skills important for a workplace, such as communication and organizational skills, teamwork, planning, problem-solving and task management.

Activities having direct bearing on Skill development/ Employability/Entrepreneurship

Cadets will be able to handle weapons, read map and develop qualities like Character, Volunteer at your local library, chaperone a field trip, Volunteer with a local nonprofit, Volunteer at an animal shelter, Volunteer at a community center, Volunteer as a lifeguard, Volunteer to be a crossing guard, Volunteer to do social media for a local org

After successful completion of this course, the students will be able to

CLOs	CLO Statement	Knowledge level
CLO-1	To provide an opportunity to become responsible members of the society by taking part in community service.	Up to K2
CLO-2	To enable students acquire life skills and knowledge, through the involvement in environmental awareness activities	Up to K2
CLO-3	To understand gender difference and learn to give equal respect to members of the opposite gender, develop service spirit and participate collectively in community programmes.	Up to K2
CLO-4*	To develop qualities like compassion, kindness and caring sense through regular training and field work in health awareness programmes.	Up to K2
CLO-5*	To become responsible citizens with a sound knowledge of the Indian Constitution and Fundamental Rights and be prepared for selfless service to the community.	Up to K2

*CLO-4 Will be considered for field work

* CLO-5 Will be considered for attending camps and attendance (regular NSS activities)

PO and CLO mapping:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	2	1	3	2
CLO-2	2	2	1	3	2
CLO-3	2	2	1	3	2
CLO-4	2	2	1	3	2
CLO-5	2	2	1	3	2

EVALUATION PATTERN:

INTERNAL : **40 marks**
EXTERNAL : **60 marks**
TOTAL : **100 marks**

- **INTERNAL ASSESMENT**

TOTAL : **40 MARKS**

Following components are fixed for internal assessment:

Fieldwork : 20 marks (CLO-4)
Assignment : 10 marks (CLO- 1 to 3)
Attendance : 10 marks (CLO-5)

EXTERNAL EXAMINATION : 60 MARKS

QUESTION PAPER PATTERN

Duration: 3 Hrs

Max Marks: 60

Part – A. Answer ALL questions. (Either or type) 5 x 4 =20

Part – B. Answer any FIVE questions from eight questions. (Open Choice) 5 x 8=40

Summative Examination – Blue Print
Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section-A (Either / or choice)		Section-B (Open choice)	
			No. of questions	K-Level	No. of questions	K-Level
1	CLO-1	Up to K2	2	K1	3	K2
2	CLO-2	Up to K2	4	K1	3	K2
3	CLO-3	Up to K2	4	K1	2	K2
No. of Questions to be asked			10		8	
No. of Questions to be answered			5		5	
Marks for each question			4		8	
Total Marks for each section			20		40	

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers.

Distribution of Section-wise marks with K-levels

K Levels	Section A (Either / or)	Section B (Open Choice)	Total Marks	% of Marks without choice
K1	40		40	38.5
K2		64	64	61.5
Total marks			104	100

Name of the course Designer

- Dr. Y. Natarajan, Assistant Professor, Department of commerce.



THE MADURA COLLEGE (AUTONOMOUS), MADURAI – 625 011
REVISED PART – V - YRC SYLLABUS 2020-21 ONWARDS
FIRST YEAR

YOUTH RED CROSS				CLASS: UG students				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Part V		Introduction to Youth Red Cross	-	-	40	60	100

Nature of Course			
Knowledge and skill		Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Objectives: *The objectives of this course is*

- (i) *To furnish the youth representation part in the Red Cross for their humanitarian commitment.*
- (ii) *To equip the Young volunteers for providing significant contribution to the most vulnerable people through the Red Cross youth Programme*
- (iii) *To learn and recognize Logistic Information system.*

Unit – I

Introduction- History of Red Cross and Red Crescent Movement- Origin of Indian Red Cross Society- Principles of YRC- Academic Activities.

Unit -II

Mission: Indian Red Cross Society – Fundamental Principles of the International Red Cross and Red Crescent Movement- Junior/Youth Red Cross – History- Valuing the role of young people.

Unit – III

Organizational structure of IRCS Junior / Youth- Member and Volunteer of IRCS- Formation procedure at Indian Red Cross Society, National Headquarters- Formation procedure at State Branches- Formation procedure at District Branches- Junior/Youth Red Cross groups.

Unit – IV

Organize junior and youth Red Cross- Recognition of services of counselors and Programme officers- Recognition to Junior/Youth Red Cross members & volunteers- Correspondence between State Headquarters & District Branches.

Unit – V

Camps/Zonal meetings- Finances- Membership, fees, etc.- Special fund: Junior/Youth Red Cross funds- Transportation Suggested activities for junior and youth groups.

Books for study:

1. Guidelines for Junior and Youth Red Cross, Indian Red Cross Society

Reference Books:

1. Indian First Aid Manual 2016 (7th Edition) Authorized Manual – English Version
2. Junior Red Cross Activities: Teachers Manual. October, 1918 Paperback – Import, 2 September 2011
3. Basics about red cross - Published by : Indian Red Cross Society, National Headquarters

Web resources:

1. <https://www.indianredcross.org/youth/>
2. <https://henrybakercollege.edu.in/StudentsSupport/G/Youth%20Red%20Cross>
3. <https://indianredcross.org/publications/basics-of-red-cross.pdf>
4. <https://www.icrc.org/en/doc/assets/files/publications/icrc-002-0962.pdf>
5. <https://redcrossernakulam.org/upload/forms/Youth%20Red%20Cross.pdf>

Rationale for nature of the course

This course will enable the students to understand the YRC and its organization, through this course students are motivated to involve in social service activities.

Activities having direct bearing on Skill development/ Employability/Entrepreneurship

Students will be involved in social service activities like

- Orientation Programme to newly admitted students about YRC AIDS Awareness Programme- Celebrating Life
- Eye Camp
- HIV/AIDS Awareness Programme
- Blood Donation Camp
- First Aid & Fire Safety Training
- Drive Safety Awareness Campaign
- Blood Donation Awareness Rally
- Road Safety Rally and other activities

After successful completion of this course, the students will be able to

CLOs	CLO Statement	Knowledge level
CLO-1	Equip to conduct social and health awareness programmes.	Up to K2
CLO-2	Making awareness regarding red cross service and social activities	Up to K2
CLO-3	Encourage and to youth members and other students to contribute in red cross activities.	Up to K2
CLO-4*	Develop qualities like compassion, kindness and caring sense through regular training and field work.	Up to K2
CLO-5*	Improve kind heartedness, spirit of humanity and ideals of selfless red cross service	Up to K2

**CLO-4 Will be considered for field work*

** CLO-5 Will be considered for attending camps and attendance (regular Red Cross activities)*

PO and CLO mapping:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	1	1	2	3
CLO-2	2	1	1	2	3
CLO-3	2	1	1	2	3
CLO-4	2	1	1	2	3
CLO-5	2	1	1	2	3

EVALUATION PATTERN:

INTERNAL	:	40 marks
EXTERNAL	:	60 marks
TOTAL	:	100 marks

INTERNAL ASSESMET

TOTAL	:	40 MARKS

Following components are fixed for internal assessment:

Fieldwork/Rallies/Special camp, etc.:	:	20 marks (CLO-4)
Attendance	:	10 marks (CLO-5)
Assignment	:	10 marks (CLO-1 to 3)

EXTERNAL ASSESMET

EXTERNAL EXAMINATION	:	60 MARKS

QUESTION PAPER PATTERN

Duration: 2 Hrs

Max Marks: 60

Part – A. Answer ALL questions.

(Either or type)

5 x 4 = 20

Part – B. Answer any FIVE questions from eight questions. (Open Choice)

5 x 8 = 40

Summative Examination – Blue Print

Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section-A (Either / or choice)		Section-B (Open choice)	
			No. of questions	K-Level	No. of questions	K-Level
1	CLO-1	Up to K2	2	K1	3	K2
2	CLO-2	Up to K2	4	K1	3	K2
3	CLO-3	Up to K2	4	K1	2	K2
No. of Questions to be asked			10		8	
No. of Questions to be answered			5		5	
Marks for each question			4		8	
Total Marks for each section			20		40	

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers.

Distribution of Section-wise marks with K-levels

K Levels	Section A (Either / or)	Section B (Open Choice)	Total Marks	% of Marks without choice
K1	40		40	38.5
K2		64	64	61.5
Total marks			104	100

Name of the course Designer

- Dr. S. Selvakumar, Assistant Professor, Department of commerce
- Dr.D.Gandhimathi, Assistant Professor, Department of Tamil
- Dr.P.N.Rajarajan, Assistant Professor, Department of Microbiology
- Dr.R.Dharani, Assistant Professor, Department of commerce

YOUTH RED CROSS				CLASS: UG students				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Part V		Field Work in Youth Red Cross	1	-	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Objectives: *The objectives of this course is*

- (i) *To furnish the youth representation part in the Red Cross for their humanitarian commitment.*
- (ii) *To equip the Young volunteers for providing significant contribution to the most vulnerable people through the Red Cross youth Programme*
- (iii) *To learn and recognize Logistic Information system.*

UNIT - I

Introduction- History of Red Cross And Red Crescent Movement- Origin of Indian Red Cross Society - international conventions (Geneva Conventions)- International Committee of the Red Cross - International Federation of the Red Cross and Red Crescent Societies.

Unit - II

Blood donation - The Science of Blood -The Blood Donation Criteria– blood donation camps -The Blood Donation Process-Success Factors for Blood Mobile.

Unit - III

Community services - First Aid - Red Cross Service Learning - Fund Raising / Food Aid - Disaster Management - Types of conflicts & National Disasters – Role of Red Cross Society in relief activities-how to handle the emergency situations - Psycho-Social Support Training.

Unit - IV

Leadership Development: First war of Indian Independence – Gandhiji and Non Violence – Nethaji and INA Leadership – types and traits – Man management Duty and discipline, factors affecting duty and discipline Indian Citizenship – duties and responsibilities.

Unit - V

Civil Defence and Self Defence: Civil defence – organization – aim and services – aid to civil authorities in emergency Fire fighting – types of fire, spreading of fire, fire extinguishing and equipments Self defence – unarmed combat – attacking and throws – vital parts of human body.

Books for study:

1. Guidelines for Junior and Youth Red Cross, Indian Red Cross Society
2. Nagendran, N.A. A guide to Youth Red Cross Society. Thiagarajar College, Madurai

Reference Books:

1. Indian First Aid Manual 2016 (7th Edition) Authorized Manual – English Version
2. Junior Red Cross Activities: Teachers Manual. October, 1918 Paperback – Import, 2 September 2011
3. Basics about red cross - Published by : Indian Red Cross Society, National Headquarter

Web resources:

1. <https://www.indianredcross.org/youth/>
2. <https://henrybakercollege.edu.in/StudentsSupport/G/Youth%20Red%20Cross>
3. <https://indianredcross.org/publications/basics-of-red-cross.pdf>
4. <https://www.icrc.org/en/doc/assets/files/publications/icrc-002-0962.pdf>
5. <https://redcrossernakulam.org/upload/forms/Youth%20Red%20Cross.pdf>

Rationale for nature of the course

This course will enable the students to enrich the understanding of YRC national as well as international level and its organization. Through the course, students are motivated to involve in red cross services.

Activities having direct bearing on Skill development/ Employability/Entrepreneurship

Students will be involved in social service activities like

- Orientation Programme to newly admitted students about YRC AIDS Awareness Programme-Celebrating Life
- Eye Camp
- HIV/AIDS Awareness Programme
- Blood Donation Camp
- First Aid & Fire Safety Training
- Drive Safety Awareness Campaign
- Blood Donation Awareness Rally
- Road Safety Rally and other activities

After successful completion of this course, the students will be able to

CLOs	CLO Statement	Knowledge level
CLO-1	To know the importance of YRC in national and international level	Up to K2
CLO-2	To making awareness of needs and importance of blood donation and its mobility	Up to K2
CLO-3	Create the knowledge to act in the emergency situations at the time of natural disaster	Up to K2
CLO-4*	Develop qualities like compassion, kindness and caring sense through regular training and field work.	Up to K2
CLO-5*	Improve kind heartedness, spirit of humanity and ideals of selfless red cross service	Up to K2

**CLO-4 Will be considered for field work*

** CLO-5 Will be considered for attending camps and attendance (regular Red Cross activities)*

PO and CLO mapping:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	1	1	2	3
CLO-2	2	1	1	2	3
CLO-3	2	1	1	2	3
CLO-4	2	1	1	2	3
CLO-5	2	1	1	2	3

EVALUATION PATTERN:

INTERNAL	:	40 marks
EXTERNAL	:	60 marks
TOTAL	:	100 marks

INTERNAL ASSESMENT

TOTAL	:	40 MARKS

Following components are fixed for internal assessment:

Fieldwork/Rallies/Special camp, etc.	:	20 marks (CLO-4)
Attendance	:	10 marks (CLO-5)
Assignment	:	10 marks (CLO-1to3)

EXTERNAL EXAMINATION : 60 MARKS

QUESTION PAPER PATTERN

Duration: 2 Hrs

Max Marks: 60

Part – A. Answer ALL questions. (Either or type) $5 \times 4 = 20$

Part – B. Answer any FIVE questions from eight questions. (Open Choice) $5 \times 8 = 40$

Summative Examination – Blue Print

Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section-A (Either / or choice)		Section-B (Open choice)	
			No. of questions	K-Level	No. of questions	K-Level
1	CLO-1	Up to K2	2	K1	3	K2
2	CLO-2	Up to K2	4	K1	3	K2
3	CLO-3	Up to K2	4	K1	2	K2
No. of Questions to be asked			10		8	
No. of Questions to be answered			5		5	
Marks for each question			4		8	
Total Marks for each section			20		40	

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers.

Distribution of Section-wise marks with K-levels

K Levels	Section A (Either / or)	Section B (Open Choice)	Total Marks	% of Marks without choice
K1	40		40	38.5
K2		64	64	61.5
Total marks			104	100

Name of the course Designer

- Dr. S. Selvakumar, Assistant Professor, Department of commerce
- Dr. D. Gandhimathi, Assistant Professor, Department of Tamil
- Dr. P.N. Rajarajan, Assistant Professor, Department of Microbiology
- Dr. R. Dharani, Assistant Professor, Department of commerce



THE MADURA COLLEGE (AUTONOMOUS), MADURAI – 625 011
REVISED PART – V PHYSICAL EDUCATION SYLLABUS 2020-21 ONWARDS
FIRST YEAR

PHYSICAL EDUCATION				CLASS: UG students				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
II	Part V	20U2PED1	History of Physical education	-	-	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Objectives: *The objective of this course is to make the student*

- (i) *To know about physical education national and international level.*
- (ii) *To know about ancient Olympics and modern Olympics.*
- (iii) *To understand Games rules and ground measurements (volleyball, football, ball badminton).*

UNIT I. PHYSICAL EDUCATION

Meaning _ national level _ international level _ importance _ benefits _ need of physical education.

UNIT II. ANCIENT OLYMPICS & MODERN OLYMPIC

About Olympics _ history of Olympics _ importance of Olympics _ ancient Olympics _ modern Olympics _ history of ancient Olympics _ history of modern Olympics.

UNIT III. GAMES RULES AND GROUND measurements

- a. volley ball rules and ground measurements
- b. football rules and ground measurements
- c. ball badminton rules and ground measurements.

UNIT IV . FIRST AID

Basic things In First Aid _ Importance of First Aid _ Benefits Of First Aid .

UNIT V . YOGA

History Of Yoga _ Important Of Yoga _ Benefits Of Yoga _ Needs of Yoga .

Books for study:

- 1. Essentials of physical education, A. Singh, J. Bains, Kalyani publications, 2016.
- 2. The complete book of the Olympics, D. Wallechinsky, Aurum press, 2004.
- 3. The complete book of yoga, Swami Vivekananda, Finger print publishing, 2019.

Books for reference:

1. Rules of games and sports, K. Sharma, Khel Sathiya Kendra publications, 2018.
2. Sports and games: Rules and Regulations, P. V. Pathak, Khel Sathiya Kendra publications, 2019.
3. Olympics, C. Oxlade, D. Baliheimer, Dorling Kindersley publications, 2000.
4. Light on yoga, B. K. S. Iyengar, Thorsons publications, 2006.
5. Manual of First aid, L. C. Gupta, A. Gupta, JPB publications, 2012.

Web resources:

1. <https://study.com/academy/lesson/what-is-physical-education-definition-overview.html>
2. <https://olympics.com/en/>
3. <https://olympics.com/ioc/ancient-olympic-games>
4. <https://www.verywellhealth.com/basic-first-aid-procedures-1298578>
5. <https://www.yogajournal.com/lifestyle/health/womens-health/count-yoga-38-ways-yoga-keeps-fit/>

Rationale for nature of the course

This course will enable the students to enrich the understanding of Physical education. Through the course, students are motivated to participate in various games in all levels.

Activities having direct bearing on Skill development/ Employability/Entrepreneurship

Students will be involved in sports competition under district level, state level and national level and daily sports activities.

After successful completion of this course, the students will be able to

	CLO Statement	Knowledge level
CLO-1	Know physical education in national and international level.	Up to K2
CLO-2	Understand ancient Olympics, modern Olympics, first aid and yoga	Up to K2
CLO-3	Comprehend games rules and ground measurements	Up to K2
CLO-4*	Develop their physique in good shape through regular work outs and exercises.	Up to K2
CLO-5*	Realize the need of physical education.	Up to K2

* CLO-4 *Will be considered for field work*

* CLO-5 *Will be considered for attending games in various levels and attendance*

PO and CLO mapping:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	1	1	2	2
CLO-2	2	1	1	1	2
CLO-3	2	1	1	2	1
CLO-4	2	1	1	1	2
CLO-5	2	1	1	1	2

EVALUATION PATTERN

INTERNAL ASSESSMENT	:	40 marks
EXTERNAL EXAMINATION	:	60 marks
TOTAL	:	100 marks

- **INTERNAL ASSESSMENT**

TOTAL : 40 MARKS

Following components are fixed for internal assessment:

Field work, playing games and participating competition, etc.	: 20 marks	(CLO-4)
Attendance	: 10 marks	(CLO-5)
Assignment	: 10 marks	(CLO-1 to 3)

- **EXTERNAL ASSESSMENT**

EXTERNAL EXAMINATION : 60 MARKS

QUESTION PAPER PATTERN

Duration: 2 Hrs

Max Marks: 60

Part – A. Answer ALL questions. (Either or type) 5 x 4 = 20

Part – B. Answer any FIVE questions from eight questions. (Open Choice) 5 x 8 = 40

Summative Examination Blue Print
Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section-A (Either / or choice)		Section-B (Open choice)	
			No. of questions	K-Level	No. of questions	K-Level
1	CLO-1	Up to K2	2	K1 & K1	3	K2
2	CLO-2	Up to K2	4	K1 & K1	3	K2
3	CLO-3	Up to K2	4	K1 & K1	2	K2
No. of Questions to be asked			10		8	
No. of Questions to be answered			5		5	
Marks for each question			4		8	
Total Marks for each section			20		40	

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers.

Distribution of Section-wise marks with K-levels

K Levels	Section A (Either / or)	Section B (Open Choice)	Total Marks	% of Marks without choice
K1	40		40	38.5
K2		64	64	61.5
Total marks			104	100

Name of the Course Designer

Dr. K. Kathirvel pandian

PHYSICAL EDUCATION				CLASS: UG students				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
IV	Part V	20U4PED2	Physical Education and Games	1	-	40	60	100

Nature of Course				
Knowledge and skill			Employability oriented	✓
Skill oriented	✓		Entrepreneurship oriented	

Objectives: *The objective of this course is to make the student*

- (i) To know about yoga and meditation.*
- (ii) To realize the importance of exercise in daily life.*
- (iii) To understand the components and benefits of wellness.*
- (iv) To Know about games*

UNIT I.MEDITATION

History of meditation _meaning of meditation _benefits of meditation _importance of meditation _needs of meditation.

UNIT II. EXERCISE IN PHYSICAL EDUCATION

Importance of exercise _time & duration _ human life style.

UNIT III. WELLNESS IN PHYSICAL EDUCATION

Meaning of wellness _components _benefits of wellness _needs for wellness.

UNIT I V. NEW GAMES

- a . Rules And Regulations Of Boxing , and Ground Measurements.
- b. Rules And regulations Of Fencing and Ground Measurements.
- c. Rules and regulation Of JUDO and Ground Measurements.

UNIT V. GAMES

(BASKETBALL , CRICKET , HOCKEY)

- a. Rules and Regulations of basketball and Ground Measurements.
- b. Rules and Regulations of Cricket and Ground Measurements.
- c. Rules and Regulations of Hockey and Ground Measurements.

Books for study:

1. Meditation and its methods, Swami Vivekananda, Grapevine India publications, 2018.
2. The principles of exercise therapy, M. D. Gardiner, CBS Publications, 4th edition, 2005.
3. Sports and games: Rules and Regulations, P. V. Pathak, Khel Sathiya Kendra publications, 2019.

Books for Reference:

1. Most popular sports and games, J. K. Thakur, V. Singh, Sports Publications, 2019.
2. Rules of games and sports, K. Sharma, Khel Sathiya Kendra publications, 2018.
3. A Health and wellness handbook, A. Singh, Notion press, 2021.
4. Meditation, Osho, Griffin publications, 2004.

Web resources:

1. <https://www.healthline.com/nutrition/12-benefits-of-meditation>
2. https://www.physio-pedia.com/Physiology_In_Sport
3. <http://www.sportzvision.com/sports-rules.html>
4. <https://www.dimensions.com/collection/sports-rules-regulations>

Rationale for nature of the course

This course will enable the students to enrich the understanding of Physical education. Through the course, students are motivated to participate in various games in all levels.

Activities having direct bearing on Skill development/ Employability/Entrepreneurship Cadets will be involved in sports competition like state level, district levels and national levels. And daily sports activities.

After successful completion of this course, the students will be able to

CLOs	CLO Statement	Knowledge level
CLO-1	Understand the meaning, benefits and essentials of yoga and meditation.	Up to K2
CLO-2	Maintain good physical and mental health by doing exercises, yoga and by taking nutritive foods.	Up to K2
CLO-3	Know the rules and regulations of games like boxing, fencing, judo, basketball, cricket, hockey.	Up to K2
CLO-4*	Develop their physique in good shape through regular work outs and exercises.	Up to K2
CLO-5*	Realize the need of physical education.	Up to K2

* CLO-4 *Will be considered for field work*

* CLO-5 *Will be considered for attending games in various levels and attendance*

PO and CLO mapping:

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	2	1	1	2	2
CLO-2	2	1	1	1	2
CLO-3	2	1	1	2	1
CLO-4	2	1	1	1	2
CLO-5	2	1	1	1	2

EVALUATION PATTERN:

INTERNAL ASSESSMENT	:	40 marks
EXTERNAL EXAMINATION	:	60 marks
TOTAL	:	100 marks

- **INTERNAL ASSESSMENT**

TOTAL	:	40 MARKS

Following components are fixed for internal assessment:

Field work, playing games and participating competition, etc.	:	20 marks (CLO-4)
Attendance	:	10 marks (CLO-5)
Assignment	:	10 marks (CLO-1 to 3)

- **EXTERNAL ASSESSMENT**

EXTERNAL EXAMINATION	:	60 MARKS

QUESTION PAPER PATTERN

Duration: 2 Hrs	Max Marks: 60

Part – A.	Answer ALL questions.	(Either or type)	5 x 4 = 20
Part – B.	Answer any FIVE questions from eight questions. (Open Choice)		5 x 8 = 40

Summative Examination Blue Print
Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K-Level	Section-A (Either / or choice)		Section-B (Open choice)	
			No. of questions	K-Level	No. of questions	K-Level
1	CLO-1	Up to K2	2	K1 & K1	3	K2
2	CLO-2	Up to K2	4	K1 & K1	3	K2
3	CLO-3	Up to K2	4	K1 & K1	2	K2
No. of Questions to be asked			10		8	
No. of Questions to be answered			5		5	
Marks for each question			4		8	
Total Marks for each section			20		40	

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers.

Distribution of Section-wise marks with K-levels

K Levels	Section A (Either / or)	Section B (Open Choice)	Total Marks	% of Marks without choice
K1	40		40	38.5
K2		64	64	61.5
Total marks			104	100

Name of the course Designer

Dr. K. Kathirvel pandian