

<b>DEPARTMENT OF BIOTECHNOLOGY</b>					<b>Certificate course</b>			
<b>Sem</b>	<b>Course Type</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Credits</b>	<b>Contact Hours</b>	<b>CIA</b>	<b>Ext</b>	<b>Total</b>
	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

<b>Unit</b>	<b>Description</b>	<b>Hours</b>
<b>I</b>	<b>Introduction to SCP production</b> – historical use and rediscovery of <i>Spirulina</i> , importance, morphology, taxonomy and habitat of <i>Spirulina</i>	6
<b>II</b>	<b>Biochemical composition</b> - amino acids, unsaturated fatty acids and lipids, minerals vitamins, pigments, carotenoids and phycobiliproteins. Chelating of toxic minerals.	6
<b>III</b>	<b>Cultivation and production of spirulina</b> -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
<b>IV</b>	<b>Products, uses and benefits</b> -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
<b>V</b>	<b>Challenges and future outlook</b> -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

<b>Continuous Internal Assessment components</b>	<b>Marks</b>
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

<b>Assessment components</b>	<b>Marks</b>
Assignments (minimum 2)	25%
Project/innovative experimental design	25%
Paper presentation/ viva voce	25%
Internal test	25%
Total	100%