

UNIVERSITY OF MADRAS  
M.Sc. DEGREE PROGRAMME IN BOTANY  
SYLLABUS WITH EFFECT FROM 2023-2024

<b>Title of the Course</b>	<b>ALGAL TECHNOLOGY</b>						
<b>Paper Number</b>	<b>ELECTIVE-II</b>						
<b>Category</b>	ELECTIVE	<b>Year</b>	I	<b>Credits</b>	3	<b>Course Code</b>	423E1E
		<b>Semester</b>	I				
<b>Instructional Hours per week</b>	<b>Lecture</b>		<b>Tutorial</b>		<b>Lab Practice</b>	<b>Total</b>	
	3		2		-	5	
<b>Pre-requisite</b>	Students should be familiar with the basic and applied knowledge on algal technology.						
<b>Learning Objectives:</b>							
<b>C1</b>	1.To provide a basic overview of algae cultivation techniques and resource potentials.						
<b>C2</b>	2.To educate people about the widespread commercial uses of algae.						
<b>C3</b>	3.To educate people about the therapeutic uses of algae.						
<b>C4</b>	4.To enrich the current knowledge of how algae are used in basic research and technological applications.						
<b>C5</b>	5.To spread awareness of the value of algae biotechnology and its applications in diverse industries.						
<b>UNIT</b>	<b>CONTENTS</b>						
<b>I</b>	<b>SCOPE OF ALGAL TECHNOLOGY</b> Scope of algal technology – Commercial potential and utility of algae. Algae as sources for food, feed, pigments, pharmaceuticals and nutraceuticals, fine chemicals and biofertilizers.						
<b>II</b>	<b>ALGAL PRODUCTS</b> Industrial application of algae - fuel, algal lipids - transesterification to ester fuel - substitutes for petroleum derived fuel. Algal products - Mass cultivation of micro algae as source of protein and as feed. Liquid seaweed fertilizers - method of preparation, applications and its advantages over inorganic fertilizers.						
<b>III</b>	<b>ALGAL PRODUCTION AND UTILIZATION</b> Algal production systems; Strain selection; Algal growth curve; Culture media; cultivation methods – small scale and Large-scale cultivation of algae. Harvesting and packing. Therapeutic uses - antioxidant, anti-ulcerogenic, antifungal, antibiotics, antitumor and antiviral compounds.						

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<b>IV</b>	<b>IMMOBILIZATION AND R-DNA TECHNOLOGY IN ALGAE</b>	
	Algal immobilization and its applications - Methods of immobilization - alginate beads-extraction of compounds. Culturing for metabolite production and natural compounds. Recombinant DNA technology in algae - Transformation systems in algae. Isolation of protoplasts, regeneration of fusion of macro algae.	
<b>V</b>	<b>ROLE OF ALGAE IN ENVIRONMENT MANAGEMENT</b>	
	Role of algae in environmental health - Sewage treatment, industrial effluent treatment, Phycoremediation- heavy metal removal, algae as indicators in assessing water quality and pollution.	
<b>Course outcomes:</b> <b>CO</b>	<b>On completion of this course, the students will be able to:</b>	<b>Programme outcomes</b>
CO1	Understand the applied facet of botany and acquire a complete knowledge about the cultivation methods in algae.	K1 & K3
CO2	Realization of the commercial potential of algal products.	K5
CO3	Analyze emerging areas of algal biotechnology for identifying therapeutic importance of algal products and their uses.	K2 & K4
CO4	Gain more information about algae genetics.	K4
CO5	Translate various algal technologies for the benefit of the ecosystem.	K3
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	
<b>Recommended Text:</b>		
<ol style="list-style-type: none"> <li>1. Trivedi, P.C. 2001. Algal Biotechnology. Point publisher, Jaipur. India.</li> <li>2. Bold, H.C and Wynne, M.J. 1978. Introduction to the Algae: Structure and Function. Prantice Hall of India New Delhi.</li> <li>3. Sahoo, D. 2000. Farming the ocean: seaweed cultivation and utilization. Aravali International, New Delhi.</li> <li>4. Bast, F. 2014. An Illustrated Review on Cultivation and Life History of Agronomically Important Sea plants. In Seaweed: Mineral Composition, Nutritional and Antioxidant Benefits and Agricultural Uses, Eds. Vitor Hugo Pomin, 39-70. Nova Publishers, New York. ISBN: 978-1-63117-571-8.</li> <li>5. Rapouso, M.F.J., Morais, R.M.S.C., Morais, A.M.M.B. 2013. Bioactivity and applications of sulphated polysaccharides from marine microalgae. Marine Drugs, 11, 233-252.</li> <li>6. Bajpai, Rakesh, K., Prokop, Ales, Zappi, Mark, E. 2014. Algal Biorefineries Volume 1:</li> </ol>		

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**Reference Books:**

1. Kumar H.D and H.N. Singh.1982. A text Book on Algae. Affiliated East- West Press Pvt. Ltd.
2. Suganya, T and Renganathan, S. 2015. Biodiesel production using algal technology. Academic Press. ISBN: 0128009713.
3. Bajpai, Rakesh K., Prokop, Ales, Zappi, Mark E. 2014. Algal Biorefineries Volume 1: Cultivation of Cells and Products. Springer. ISBN: 9400774931.
4. Hojnacka, K., Wiczorek, P.P., Schroeder, G., Michalak, I. (Eds.). 2018. Algae Biomass: Characteristics and Applications. Developments in Applied Phycology.
5. Aziz, Farhad and Rasheed, Rezan. 2019. A Course Book of Algae. Publisher: University of Sulaimani. ISBN: 978-9922-20-391-1.
6. Dinabandhu, S and Kaushik. B.D. 2012. Algal Biotechnology and Environment. I.K. International, New Delhi.
7. Trivedi, P.C. 2001. Algal Biotechnology. Point publisher, Jaipur. India.
8. Becker. E.W. 1994. Micro algae Biotechnology and Microbiology. Cambridge University press.
9. Borowitzka, M.A. and borowizka, L.J. 1996. Microalgal Biotechnology. Cambridge University Press, Cambridge,
10. Bast, F. 2014. Seaweeds: Ancestors of land plants with rich diversity. Resonance, 19(2) 1032-1043 ISSN: 0971-8044.
11. Faizal, Band Yusuf, C. 2016. Algal biotechnology: Products and processes. Springer.
12. Gouveia, L. 2011. Microalgae as a feedstock for biofuels. Springer Briefs in Microbiology, London.

**Web resources:**

1. <https://www.springer.com/gp/book/9783319123332>
2. [https://www.researchgate.net/publication/318449035\\_Algae\\_Biotechnology](https://www.researchgate.net/publication/318449035_Algae_Biotechnology)
3. [https://www.energy.gov/sites/prod/files/2015/04/f21/algae\\_marrone\\_132100.pdf](https://www.energy.gov/sites/prod/files/2015/04/f21/algae_marrone_132100.pdf)
4. <https://www.amazon.in/Prospects-Challenges-Algal-Biotechnology-Tripathi-ebook/dp/B0779BF366>
5. <https://www.degruyter.com/view/product/177050>
6. <https://www.amazon.in/Algal-Biotechnology-Mihir-Kumar-Das/dp/B0072I61LA>
7. <https://www.elsevier.com/books/algal-biotechnology/ahmad/978-0-323-90476-6>
8. <https://www.appleacademicpress.com/phycobotechnology-biodiversity-and-biotechnology-of-algae-and-algal-products-for-food-feed-and-fuel/9781771888967>

**Mapping with Programme Outcome**

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3	3	3	1	3	1
CO2	3	3	3	2	3	3	3	2	3	2
CO3	3	2	3	2	2	3	1	1	1	1
CO4	3	3	3	3	3	3	3	2	3	2
CO5	3	2	3	3	3	3	3	1	3	1

**S-Strong (3) M-Medium (2) L-Low(1)**