

ALLIED PAPERS OFFERED FOR OTHER DEPARTMENT STUDENTS

Course Code	Allied-IA	T/P	C	H/W
22BMBA1	FUNDAMENTALS OF MARINE BIOLOGY	T	3	3
Objectives	<ul style="list-style-type: none"> ➤ To study the physical and chemical properties of seawater. ➤ To understand the community ecology of marine environment. 			
Unit - I	Introduction to marine biology - definition, recent developments in marine sciences – Ocean expeditions- sea bottom topography and zonation.			
Unit – II	Physical properties of water and seawater – temperature, density, viscosity, surface tension, hydrostatic pressure. Waves: types of waves and its dynamics. Tides: types and tide generating force. Winds. Currents and its types.			
Unit – III	Chemical properties of seawater: Basics of chlorinity and salinity, Dissolved gases and their types. Elements-major and minor elements in seawater. Dissolved and Particulate organic matter-Biogeochemical cycles and their significance.			
Unit – IV	Biological properties of seawater: Primary and Secondary Productivity in coastal and marine environment. Phytoplankton and Zooplankton and their significance.			
Unit – V	Community ecology – sea surface and bottom-coral reef- seagrass, mangrove and inter tidal regions.			
References and Textbooks				
Naskar, K., & Mandal, R. (1999). <i>Ecology and Biodiversity of Indian Mangroves</i> (Vols. 1-2). Daya Publishing House.				
Nybakken, J. W., & Mark, D. Bertness. (2004). <i>Marine Biology an Ecological Approach</i> (6 th ed.). Benjamin-Cummings Pub Co.				
Peter McRoy, C., & Helterich, G. (1977). <i>Seagrass Ecosystem: A Scientific Perspective</i> . New York: Marcel Dekker Inc.				
Peter, C., & Michel, E. H. (2013). <i>Marine Biology</i> (9 th ed.). McGraw-Hill Education.				
Spoel. S. Vander, & Heyman, R. P. (1983). <i>Comparative atlas of Zooplankton biological patterns in the oceans</i> . Springer-Verlag Berlin.				
Sumich, J. L. (1999). <i>Introduction to the biology of Marine Life</i> (7 th ed.). The Mc Graw Hill Companies Inc.				
Sverdrup, H. U., Honson, M. W., & Fleming, R. H. (1959). <i>The oceans their physics, chemistry and general biology</i> . New Jersey: Prentice-Hall Inc.				
Outcomes				
<ul style="list-style-type: none"> ➤ The students gain knowledge in history of Marine biology and Oceanography features. ➤ The students able to know about the productivity of oceans with community ecology. 				

SEMESTER				
Course Code	Allied Practical-IA	T/P	C	H/W
22BMBAP1	PRACTICAL	P	2	2
FUNDAMENTALS OF MARINE BIOLOGY				
<ol style="list-style-type: none"> 1. Estimation of salinity, dissolved oxygen and pH. 2. Identification of Phytoplankton and zooplankton. 3. Identification of seaweeds and seagrasses 4. Identification of fishes, molluscs and crustaceans. 				

SEMESTER				
Course Code 22BMBA2	Allied-IB	T/P	C	H/W
	MARINE RESOURCES	T	3	3
Objectives	<ul style="list-style-type: none"> ➤ To understand the marine non-living resources including minerals. ➤ To learn about marine fishery resources, drug sources.. 			
Unit - I	Marine Non-living resources: Distribution of different kinds of resources in Indian ocean. Preservation and conservation-Renewable and non - renewable resources and their origin.			
Unit – II	Minerals in sea-types-Polymetallic nodules-exploration of seafloor minerals deposits.			
Unit – III	Fisheries resources - deep-sea fisheries. Resource potential and depletion- Fish resources of Indian EEZ- fishing vessel management. Capture fisheries in India. Shell fish fishery and algal resources.			
Unit – IV	Marine drugs: Definition-classification-bioactive compounds from seaweeds, actinomycetes, sponges, tunicates, molluscs and fishes.			
Unit – V	Marine biotoxins and venoms: definition- classification based on their chemical structure- Source and impact. Venom-definition-source organism and their pharmacological effects.			
References and Textbooks				
Teleki, P., Dobson, M., & Moore, R. (1987). <i>Marine Minerals</i> . Reidel Publishing Company.				
Thompson, M., Sarojini, R., & Nagabushanam, R. (1991). <i>Bioactive Compounds from Marine Organisms</i> . Oxford & IBH Publishing Co. Pvt. Ltd.				
Yadav, B. N. (1997). <i>Fish & Fisheries</i> . Daya Publishing House. Gautam, A. (1998). <i>Conservation & Management of Aquatic Resources</i> . Daya Publishing House.				
Madhu, M., Jakhar, P., & Adhikary, P. (2013). <i>Natural Resource Conservation</i> . Satish Serial Publishing House.				
Singh, R. (2013). <i>Fishery Resources</i> . Pearl Books Publishing.				
Outcomes				
<ul style="list-style-type: none"> ➤ The students able to understand the marine minerals and non-living resources. ➤ The students acquire knowledge about marine living resources and drugs from the ocean. 				

SEMESTER				
Course Code	Allied Practical-IB	T/P	C	H/W
22BMBAP2	PRACTICAL	P	2	2
MARINE RESOURCES				
<ol style="list-style-type: none"> 1. Identification of seaweeds. 2. Identification of Venomous marine molluscs, sponges and Tunicates. 3. Identification of fishing gear and crafts. 				

SEMESTER					
Course Code 22BMBA3	Allied-IIA		T/P	C	H/W
	MARINE POLLUTION		T	3	3
Objectives	<ul style="list-style-type: none"> ➤ To understand about different kinds of marine pollutants and their origin. ➤ To know thermal, pesticide and heavy metal pollution. 				
Unit I	Marine Pollution - Definition, pollutant and its classification. Organic wastes –. Origin and transport of organic pollutants to the oceans. Physical, chemical and biological effect of pollutants on marine organisms.				
Unit II	Sewage Pollution - Definition, sources, nature and their treatment processes- wastes from river run off, agricultural, paper, fertilizer, pulp and soap manufacturing industries. Micro and macro plastic pollution: source and effects.				
Unit III	Thermal Pollution - Status of thermal pollution in major oceansd and seas. Oil Pollution – types and properties of oil and fate of spilled oil on the marine environment - consequences and treatments.				
Unit IV	Pesticide pollution -sources, fate in the sea, factors affecting the bioaccumulation of pesticides, Impact of pesticides on the Environment-				
Unit V	Heavy metal Pollution - Sources, classification and effects of marine and coastal waters . Distribution- toxicity and disease -Minamata and Itai itai. Red tide and its ecological significance. Indicator organism - Macro algae, crustaceans and molluscs- GESAMP.				
References and Textbooks Aaradhana, S. (2018). <i>Marine, Nuclear and Thermal Pollution</i> . Jnanada Prakashan (P&D). Andres, H. A., & Jorge, E. (2017). <i>Marine Pollution and Climate Change</i> . Taylor & Francis Group. Clark, R. B. (1989). <i>Marine pollution</i> . Oxford, New York: Clarendon Press. Coffield, R. L. (2019). <i>Saving Our Oceans</i> . Moonlight Mesa Associates. Judith S. Weis (2015). <i>Marine Pollution</i> . Oxward University Press. Park, P. K., Kester, D. R., Deudall, J. W. & Ketchum, B. H. (1983). <i>Wastes in the Ocean</i> . (Vols. 1-3). New York: Wiley Interscience Publishers. Ricardo, B. (2018). <i>Marine Pollution: Sources, Fate and Effects of Pollutants in Coastal Ecosystem</i> . Elsevier. Singh, P. (1995). <i>Environmental Pollution and Management</i> . Chugh Publications.					
Outcomes <ul style="list-style-type: none"> ➤ Students acquire knowledge about marine pollution and their types and effects. ➤ The students will be able to understand about major types of pollutions such as Thermal, Pesticide and heavy metal pollution. 					

SEMESTER				
Course Code	Allied Practical-II A	T/P	C	H/W
22BMBAP3	PRACTICAL	P	2	2
MARINE POLLUTION				
<ol style="list-style-type: none"> 1. Estimation of BOD, 2. Enumeration of Tar balls in the coastal environment. 3. Identification of Pollution indicator organisms. 4. Estimation of macro plastic materials on the shore. 				

SEMESTER				
Course Code 22BMBA4	Allied- IIB	T/P	C	H/W
	AQUARIUM FISH KEEPING	T	3	3
Objectives	<ul style="list-style-type: none"> ➤ To elaborate about the importance of aquarium fishes and plants. ➤ To understand the aquarium design, construction and management. 			
Unit - I	Introduction to aquarium – types of aquaria – importance of aquarium – exotic and indigenous fishes-Identification of ornamental fishes, crustaceans, molluscs and ornamental aquatic plants and their propagation methods. Status of aquarium fish culture and trade in India and world.			
Unit – II	Design and construction aquarium– construction of marine and fresh water aquarium-construction materials, Equipment: pumps, filters, aerator and lights.			
Unit – III	Care and maintenance of aquarium - criteria for selection of ornamental fishes - water quality management – Feeds and probiotics.			
Unit – IV	Diseases management – bacterial, fungal and viral diseases –prevention and control.			
Unit – V	Hatchery production – farm and hatchery design and construction - Brooder management. Breeding-Ornamental Fishes, invertebrates and plants -Genetics and Biotechnological application in aquarium fish production-packaging and transport.			
References and Textbooks				
Anderson, C. (2009). <i>Reef fishes of the Maldives</i> . Republic of Maldives: Manta Marine Pvt Ltd.				
Boyd, C., & Tucker, C. (1998). <i>Pond Aquaculture: Water Quality Management</i> . Springer International Publishing.				
Coche, A. G., & Muir, J. F. (1992). <i>Pond Construction</i> . Daya Publishing House.				
Coleman, N. (2000). <i>Marine life of the Maldives</i> (Atoll Editions). Sea Challengers.				
Dash, M. C., & Patnaik, P. N. (1994). <i>Brackish Water Prawn Culture</i> . Palani Paramount Publications.				
Gupta, S., Mohapatra, B., & Routray, P. (2008). <i>Textbook of Breeding and Hatchery Management of Carps</i> . Narendra Publishing House.				
Thomas, P. C., Rath, S., & Mohapatra, K. D. (2013). <i>Breeding and Seed Production of Finfish and Shellfish</i> . Daya Publishing House.				
Outcomes				
<ul style="list-style-type: none"> ➤ The students gain knowledge in aquarium construction and management. ➤ The students will learn about breeding and hatchery production of aquarium fishers. 				

SEMESTER				
Course Code	Allied Practical –II B	T/P	C	H/W
22BMBAP4	PRACTICAL	P	2	2
AQUARIUM FISH KEEPING				
<ol style="list-style-type: none"> 1. Identification of ornamental plants. 2. Identification of ornamental molluscs, crustaceans and fin fishes. 3. Estimation of dissolved oxygen, pH and salinity. 				