SEMESTER – IV			
Core X : Marine Biology			
Code: 17PBCC41	**Hrs /Week : 6**	**Hrs / Sem: 90**	**Credits : 5**

Objectives

- To make the students realize the potentiality of marine environment
- To understand the marine ecosystem threats and conservation

Unit I Marine Environment – Zonation and Biota

Sea as a biological environment. Classification of marine environment.– Plankton – classification (size, life, habitat) and adaptations. Inter-tidal, rocky, sandy and muddy shores –features of the flora, fauna and adaptations. Role of marine micro-organisms (bacteria and fungi) in nutrient cycles (nitrate, phosphate and sulphate)

Unit II Characteristics of Sea Water

Physical properties: waves, tides, currents- types, causes, and their impact on marine organisms. Illumination, temperature, pressure,. Chemical properties: nutrients, (major, minor, and trace elements), salinity, pH, density, dissolved gases (oxygen, carbon-di-oxide).

Unit III Marine Ecosystems

Estuaries, saltmarshes, mangroves. Coral reef - ecology and types, species interaction, adaptations and importance. Threats and conservation of coastal ecosystems (coral reef and mangroves)

Unit I V Marine Pollution

Sources, effects and control measures of heavy metals, radioactive, oil, and thermal pollutions. Algal blooms-sources and effects. Microbial indicators of pollution. Role of microbes in pollution abatement.

Unit V Wealth of the sea

Living resources: Fishery products- fish meal and fish oil. Natural pearls: formation, ornamental and medicinal importance. Non-living resources: mineral wealth (manganese nodules, beach placers, glauconite and garnet). Bioactive compounds from marine organisms (bacteria, fungi, macro algae and sponges).Phycocolloids: agar-agar and algin.

Books for Reference

1. Tait, R.V. and Dipper F.A (1998) Elements of marine ecology.- 4 the d. British Library Cataloguing in Publication Data.

2. Gross, G., 1993.Oceanography: A view of the Earth. Sixth edition. Prentice Hall Inc., New Jersey.
3. McCormick, J.M. and J.V.Thiruvathaakal, 1976. Elements of Oceanography.W.B. Saunders Company, Philadelphia.
4. Nybakken, J.W. 1997.Marine Biology – An Ecological Approach. Addison Weslay Longman, Inc. California, 477pp.
5. Olivia J.Fernando 1999.Sea water-Properties and dynamics, Dhanesh Publications, Ponnagam,Thanjavur
6. Russel 1970. Marine Ecology, Academic Press- London and New York
7. Nelson and Smith 1973, Oil pollution and Marine Ecology-Plenum press
8. Benjamin- Cummings, Menlo Park, California.Vijaya Ramesh, K. (2004). Environmental Microbiology.MJP Publishers Chennai.
9. Moshrafuddin Ahamed and Basumatary. S.K.(2006). Applied Microbiology. MJP Publishers Chennai
10. Daws, C.J.1981. Marine Botany John Wiley and Sons, New York.

PRACTICALS

Hrs / Week : 2

1. Determination of acidity
2. Determination of salinity
3. Determination of alkalinity
4. Determination of total hardness
5. Determination of nitrite
6. Determination of phosphate
7. Biochemical test for micro-organisms-IMViC
8. Collection and identification of marine plankton (any three phyto and zooplanktons)
9. Identification and remarks of the following

   i. Plankton net

   ii.Inter-tidal organisms

   a. Rocky shore :Sea anemone, *Chiton*

   b. Muddyshore:*Uca, Cerithidia*

   c. Sandy shore: *Arenicola, Murex*

   iii. Food fishes*: Cybium,Sardinella*

   iv Sea weeds: *Gracilaria,Sargassum*,
10. Submission: Record Note Book

SEMESTER – III			
Core VIII: Biotechnology			
Code : 17PZOC32	**Hrs / week : 6**	**Hrs / sem : 90**	**Credits : 5**

Objectives

- To study the potential benefits of biotechnology
- To familiarize with basic concepts of nanotechnology
- To understand the application of biotechnology in industries

Unit I Cloning and Screening

Definition – scope – vectors - properties of good vector-cloning and expression vectors - *E.coli* vector- screening of recombinants - pBR 322 - bateriophage – Lambdaphage - M13 – cosmid – plasmid- shuttle and yeast. - Integration of DNA insert with the vector-Introduction of vector into suitable host.

Unit II Animal Cell and Organ Culture

Cell culture - culture media - initiation of cell culture - evolution of continuous cell lines – large scale culture of cell lines- stem cell culture – organ culture - somatic cell fusion- hybridoma technology – *in-vitro* fertilization- embryo transfer - transgenic animals- fish, sheep and mice.

Unit III Microbial Biotechnology and Human Welfare

Microbial biotechnology- Isolation and improvement of microbial strains – micro organism used in alcohol production –alcoholic beverages-wine, beer, whisky-uses of alcohols. Cloned genes and production of chemicals-human peptide hormones - insulin–vaccine for hepatitis B – rabies – polio - small pox – malaria - foot and mouth disease viruses - disease prevention - gene therapy - DNA finger printing.

Unit IV Enzyme and Industrial Biotechnology

Methods of enzyme production – immobilization of enzymes - enzyme engineering - application of enzymes. Single cell protein- mushroom culture – techniques-advantages and nutritive value. Bio gas production – anaerobic digestion-solubilization-acidogenesis-methanogenesis- mechanism of methane production

Unit V Nanotechnology

Nanomaterials, synthesis of nanoparticles: RF plasma, chemical methods, thermolysis, nanobiosensor, nanofluids, nanocrystals in biological detection - synthesis of nanodrugs - nanomedicine.

Books for Reference

1. Dubey.R.C. 2006. A Text Book of Biotechnology, 4th edition S.Chand & Company Ltd, New Delhi.
2. Singh.B.D.2005. Biotechnology. Revised edition. KalyaniPublishers, New Delhi.
3. Kumaresan V. 2009 Biotechnology. Saras Publication
4. Rema.L.P. 2007.Applied Biotechnology. MJP Publishers, Chennai.
5. Satyanarayana U. 2006. Biotechnology, Books and Allied (P) Ltd. Kolkatta
6. Robert Preidt, LauraCostlow and Peter. 2007. Introductory Nanotecnology. Dominant Publishers and Distributors, Delhi
7. Suhas Bhattacharya, 2013. Introduction to Nanotechnology. Wisdom Press. Delhi

PRACTICALS

Hrs/week : 2

1. Isolation of DNA from goat liver.
2. Isolation of RNA from yeast
3. PCR amplification.
4. Western blotting analysis.
5. Biogas production
6. Wine preparation
7. Mushroom culture
8. Charts and models pertaining to theory for spotters
9. Report of visit to Biotechnology lab

SEMESTER IV			
Core XII: Applied Microbiology			
Code: 17PZOC43	**Hrs/ Week :6**	**Hrs/sem : 90**	**Credits : 5**

Objectives

- To know the basic principles of food, industrial and environmental Microbiology.
- To concentrate on the economic aspects and to make use of or combat the activities of microorganisms.
- To understand the interaction of microorganisms with their environments and the practical consequences of these interactions.

Unit I **Microbial Classification**

Definition – scope, history of Microbiology - **Bergey's classification**-recent status of classification- Five kingdom concept. Distinctive features of the major groups of microorganism- bacteria, fungi and virus

Unit II **Food Microbiology**

Microbiology of food -growth of microorganisms in food - food spoilage - food poisoning - food infections – food preservation – microbiology of fermented foods - detection of food - borne pathogens.

Unit III **Industrial Microbiology**

Choosing microorganism for industrial microbiology – bioreactors - types of bioreactors - major products of industrial microbiology – antibiotics – organic acids - biopolymers – biosurfactants - bioconversion process and biofuels. Beverages – wine, beer.

Unit IV **Medical Microbiology**

Microbial diseases - Protozoan diseases; Plasmodium, Entamoeba. Fungal diseases: mycotoxicosis, aspergillosis. Bacterial diseases: meningitis and streptococcal pneumonia. Food and waterborne diseases: cholera, typhoid. STD and contact diseases: gonorrhea and syphilis. Viral diseases: influenza, hepatitis B

Unit V Environmental Microbiology

Biodegradation using microbial communities - leaching of metals,hydrocarbon degradation in water and soil. Waste as a resource - microbes in composting, sewage treatment, biofertilizers, symbiotic -asymbiotic nitrogen fixation.

Books for Reference

1. Dubey R. C.and D.K Maheswari, 2006. A Text Book of Microbiology. S. Chand & Co, New Delhi.
2. Rogar&Stainer, John l.ingrahan, Mark l. Wheelis& Page R. Painter, 1992. General Microbiology. Mac Millan India Ltd.
3. Kannan,N. 1996. Laboratory Manual in General Microbiology. Palani Paramount Publications.
4. James Cappuccino and Natalie Sherman,1999. Microbiology - A Laboratory Manual. Addison-Wesly - Hyman Inc. Tokyo.
5. Pelzer, Chan and Krieg, Microbiology 1998. 2nd edn. Tata Mc Graw Hill Publishing Company.
6. Presscott, Harley and Klein. 2005 Microbiology, WCB Mc Graw Hill Co. New York.
7. Purohit S. S.,1991. Microbiology – Fundamentals and Application. M/S SarawathiPurohit for Student edition, India

PRACTICALS

Hrs / Week : 2

1. Sterilization technique
2. Sample handling for microbial studies.
3. Preparation of culture media for microorganisms.
4. Counting of viable cells (CFU / ml) by serial dilution & spread plate or pour plate.
5. Dye reduction test in milk.
6. Gram staining
7. Capsular staining.
8. Test for antibiotic sensitivity.
9. Isolation of nitrogen fixing symbiotic bacteria from root nodule.
10. Observation of algae, fungi and blue green algae
11. Industrial visit/ Institutional visit and submission of report