SEMESTER I			
Core – II Microbial Diversity And Classification			
Code : 19PMIC12	**Hrs/ Week: 5**	**Hrs/ Sem: 75**	**Credits: 4**

Vision:

To understand about the evolution of organisms on earth and variability among living organisms.

Mission:

To study about the microbial population and its habitat and about microbial communities which are excellent models for understanding biological interactions and evolutionary history.

Course Outcome:

C O No	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	understand the ubiquitous nature of microbes.	1	Un
CO -2	explain the basic concept of microbial diversity and classification.	3	Re
CO -3	discuss the knowledge about the various diversification in microorganism	4	Cr
CO -4	explain the knowledge of reproduction in microbes	5	Un
CO- 5	describe genetic characters of microbes.	5	Un
CO -6	understand the general classification of microbes	4	Un
CO -7	explain the characters of protozoa	4	Un
CO -8	understand the characters of arthropod vectors	3	Un

SEMESTER I			
Core – II Microbial Diversity and Classification			
Code : 19PMIC12	**Hrs/ Week: 5**	**Hrs/ Sem: 75**	**Credits: 4**

Unit I: Biodiversity and Classification

Classification of microorganisms – Introduction – Haeckel's three kingdom concept – Whittaker' five kingdom concept – Three domain concept of Carl Woese basis of microbial classification, Salient features of bacteria according to Bergey's manual of determinative bacteriology. Identification of Microorganisms –phenotypic classification, phylogenetic classification, genotypic classification, taxonomic ranks – Techniques for determining microbial taxonomy & phylogeny: Classical & molecular characteristics - Genetic relationship - DNA homology -16S r RNA sequencing .

Unit II: Bacteria

General characters, Classification, nomenclature and properties. Structure and characteristics: Gram positive cocci– *Staphylococci, Streptococci*. Gram negative cocci– *Gonococci*. Gram positive non spore forming bacilli: aerobic – *Corynebacteria* and anaerobic- *Actinomyces*. Gram positive spore forming bacilli: aerobic- *Bacillus anthracis* and anaerobic *Clostridia.*

Unit III: Fungi and Algae

General characters, Morphology, taxonomy and classification, structure and cell differentiation of *Aspergillus sp, Candida sp, Agaricus sp*. Mycorrhiza – Ectomycorrhizae, Endomycorrhizae, Vesicular Arbuscular Mycorrhizae. Algae: Distribution, general characters, thallus and its structure, classification, nutrition and reproduction – Characters of selected groups – Blue green algae,Euglenophyta, Chrysophyta, Phaeophyta and Rhodophyta – Economic importance of algal biotechnology.

Unit IV: Virus

Classification, nomenclature and properties. Structure and characteristics of Plant virus (CaMV ,TMV) Animal virus (Adeno virus, HIV, Rhabdo virus) Insect virus (NPV,CPV) Brief outline on virion and Prions.

Unit V: Protozoa

Distinguishing characters, classification, host-parasite relationship, pathogenic mechanism, transmission, life cycle, lab diagnosis, treatment for the following: *Entamoeba sp, Leishmania sp, Giardia sp and Trichomonas sp*. Helminthes: Classification, lifecycle, pathogenesis, transmission, lab diagnosis treatment for Cestodes (*Taenia solium*) – Nematodes (*Ascaris lumbricoides*) – Arthropod vectors: Tick and mosquitoes.

Books for Reference:

1. Prescott L.M., Harley J.P., and Klein D.A 2008. *Microbiology* 7th Edition McGraw Hill, New York.
2. Madigan M.T., Martinko. J.M. Parker .J., and brock T.D. 1997. *Biology of Microorganisms*.8th Edition. Prentice Hall International Inc, London.
3. Alexopoulos, C.J.,and Mims,C.W.1979.*IntroductoryMycology*,Wiley,New York.
4. Stainer R.Y., In graham J.L., wheelis M.L., and Painter P.R. 1986. *General Microbiology*, Macmillan Education Lt., London.
5. Starr, M.P., Stolp, H., Truper, H.C.Balows, A., and Schlegel, H.C. 1991. *The Prokaryotes.A Hand Book of Habitats, Isolation and Identification of Bacteria.* Springer Verleg.
6. Tortora, Funke, and Case Addison (2001). *Microbiology - An Introduction* – 7th Edition Wesley Longman Inc
7. JohnL.Ingraham and Catherine A. Ingrahani 2000, *Introduction to Microbiology*. Books/Cole Thompson Learning, UK.
8. Talaro. K.P. and A.Talaro.1999. *Foundations in Microbiology*.WCP McGraw-Hill, New York.
9. Jagadish Chandar (1996). *A Text Book of Medical Mycology*. Inter Print. New Delhi.
10. Powar C.B and Daginawala H.F 2005. *General Microbiology, Volume I & II, 8th Edition,* Himalaya Publishing House, Mumbai.
11. Dubey. R.C., and Maheswari, S. 2000. *A Text Book of Microbiology* – Chand & Co, New Delhi.
12. Pelczar Jr. M.J., Chan E.C.S., and Kreig N.R. 1993.*Microbiology* – McGraw Hill, Inc., New York.
13. Salle, A.J. 1996. *Fundamental Principles of Bacteriology*. 7th edition. Tata McGraw-Hill Publishing Company Ltd., New Delhi.
14. Holt, J.S. Kreig, N.R., Sneath, P.H.A. and Williams, S.T. 1994. *Bergey's Manual of Determinative Bacteriology.* 9th edition – Williams & Wilkins, Balimore.

SEMESTER-II			
Core-VI Medical Microbiology			
Code: 19PMIC22	**Hrs/Week: 5**	**Hrs/Sem: 75**	**Credits:4**

Vision:

A centre of excellence for training and research in medical microbiology.

Mission:

To train quality healthcare professionals carry out creative innovative and inventive research and provide reliable diagnostic services in the field of medical microbiology.

Course Outcome:

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	recall the clinical microbiology concept to patient care	1	Re
CO -2	analyse the level information in the subject of medical microbiology	6	An
CO -3	illustrate the different classes of microbes	3	Un
CO -4	describe the applied microbiology aspects of clinical technique.	1	Un
CO- 5	describe the role of chemotherapic technique	4	Un
CO -6	explain the drug resistance capacity of microbes	4	Un
CO -7	outline the concepts of chemotherapy and its mode of action	4	Un
CO -8	explain the knowledge of mycology and parasitology	5	Un

SEMESTER-II			
Core-VI Medical Microbiology			
Code: 19PMIC22	**Hrs/Week: 5**	**Hrs/Sem: 75**	**Credits:4**

Unit-I : Infection and transmission

Microbial diseases - sources, route of transmission. Pathogenesis - adhesion, invasion, host cell damage, release of pathogens. Microbial virulence and virulence factors - Signs and symptoms of microbial diseases. Treatment, Prevention and control of microbial infections. Immunity of microbial diseases. Diagnosis of microbial diseases - Collection, transport, preliminary processing of clinical pathogens.

Unit- II: Bacterial diseases

Characteristics, classification, pathogenesis, pathology, diagnosis, treatment, prevention and control of diseases caused by *Staphylococci, Bacillus, Clostridium, Corynebacterium, Salmonella, Klebsiella, Vibrio, Pseudomonas, Mycobacteria.*

Unit- III: Viral diseases

Etiology, Clinical symptoms, laboratory diagnosis and treatment-Pox virus(small pox,)-Herpes virus-(HSVI&II), Orthomyxovirus (Infleunza virus, Swine Flu) - Paramyxovirus (Measles and Mumps), Enterovirus (Poliovirus), Arbovirus-(Chikungunga virus, Dengue, rubella), Hepatitis virus(HAV, HBV, HCV, HDV), HIV,SARS.

Unit-IV: Mycology and Parasitology

Human mycotic infections caused by Dermatophytes*, Histoplasma, Cryptococcus, Candida,* opportunistic mycoses. Medical importance of *Entamoeba, Giardia, Taenia, Ascaris*, Laboratory techniques in parasitology.

Unit-V: Antimicrobial agents

Classification of antimicrobial agents, Mechanism of drug action –antibacterial (Bacteriostatic and bactericidal) antifungal and antiprotozoans. Methods of testing drug sensitivity (*in vitro* and *in vivo*), antibiotic assay in body fluids. Mechanism of drug resistance and dissemination of multi drug resistance. Probiotics as therapeutic agents.

Books for Reference:

1. Chaechter M. Medoff G. and Eisenstein BC. 1993. *Mechanism of Microbial Diseases* 2nd edition. Williams and Wilkins, Baltimore.
2. David Greenwood, Richard CD, Slack, John Forrest Peutherer. 1992. *Medical Microbiology*. 14th edition. ELBS with Churchill Livingstone.
3. Hugo WB and Russell AD. 1989. *Pharmaceutical Microbiology* 4th edition. Blackwell Scientific Publication, Oxford.

4. Joan Stokes E, Ridgway GL and Wren MWD. 1993. *Clinical Microbiology*, 7th edition. Edward Arnold. A division of Hodder and Stoughton.
5. Ronald M. Atlas. 1989. *Microbiology. Fundamentals and Applications*. 2nd edition, Maxwell Macmillan international editions.
6. Topley and Wilsons's. 1990. *Principles of Bacteriology, Virology and Immunity,* 8th edition, Vol. III Bacterial Diseases, Edward Arnold, London.
7. Connie R Mahon. 2010. *Textbook of Diagnostic Microbiology*. 3rd edition. Pearson.
8. Fritz H. Kayser. 2005. *Medical microbiology*. Thieme Verlag.
9. Credric, A. Mims. 2004. *Medical microbiology*. 3rd edition. Moshy Inc.
10. Frank, Steven A. 2002. *Immunology and Evolution of Infectious Disease*. Princeton University Press.
11. Warren Levinson Ernest Jawetz 2002, *Medical Microbiology and Immunology:* Examination and Board Review, 7 th Edition. McGraw-Hill/Appleton and Laye
12. Prescott L.M. Harley J.P., and klein D.A . 2008. *Microbiology* (7th Edition) McGraw Hill, New York.
13. PelczarJr .M. J. Chan E.C.S. and Kreig N.R. 1993. *Microbiology*- McGraw Hill, Inc., New York.
14. DubeyR.C. and Maheswari,S. 2003. *A Text Book of Microbiology*. S. Chand &Co., New Delhi.
15. Madigan M., T., Martinko. J.M., and Parker J., Brock TD. 1997. *Biology of Microorganisms*.(8th Edition). Prentice Hall International Inc, New York.
16. Nester, E.W. Roberts, C.V. and Nester, M.T. 1995. *Microbiology, A Human perspective*. IWOA, U.S.A.
17. Stainer R.Y., Ingra ham J.L., Wheelis M.L., and Painter P.R. 1986. *General Microbiology*, Macmillan Education Ltd., London.
18. Tortora, Funke, Case Addison 2001, *Microbiology – An Introduction* – 7th Edition, Wesley Longman Inc.
19. John L. In graham and Catherine A Ingrahani. 2000. *Introduction to Microbiology*. Books / Cole Thomas Learning, New York.

Web References:

1. http://dmoz.org/Science/Biology/Microbiology/
2. http://microbiology.mtsinai.on.ca/manual/default.asp
3. http://cal.vet.upenn.edu/parasite/links.html
4. http.www.suite101.com/links.cfm/microbiology
5. http://www.biosci.ohio-state.edu/-zoology/parasite/home.html

SEMESTER – II			
Core VIII -Marine Microbiology			
Code :19PMIC24	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credits:4**

Vision:

To provide the learners with the best learning experience in Marine Microbiology by providing standard education and enabling the students to become entrepreneurs and socially responsible.

Mission:

To develop young students with active and creative minds in the field of microbiology. To motivate learners to contribute to sustainable development of nation through environmental protection and social responsibility

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	describe the basic knowledge on marine ecosystem.	1	Re
CO -2	acquire the knowledge about diversity of marine ecosystem	1,2	Kn
CO-3	can analyses the aware of bio fouling and prevention.	2,3,4	Ev
CO-4	interpret the knowledge on marine microorganisms.	1,2	Ap
CO-5	determines the microbial indicator organisms.	1	Kn
CO-6	explain the concept of marine pollution	2,3,4	Co
CO-7	grasp the knowledge about bioactive compounds.	2,3,4	An
CO-8	know the wealth of the sea	2	Kn

SEMESTER – II			
Core VIII -Marine Microbiology			
Code :19PMIC24	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credits: 4**

Unit I : Marine Environment – Zonation and Biota

Classification of marine environment. – Plankton– classification (size, life, habitat) and adaptations. Physical properties: waves, tides, currents- types, causes, and their impact on marine organisms. light, temperature, pressure. Chemical properties: nutrients, (major, minor, and trace elements), salinity, pH, density, dissolved gases (oxygen, carbon-di-oxide).

Unit II: Marine Diversity

Ecology of coastal, shallow and deep sea microorganism - importance and their significance. Diversity of microorganism - Nutrient cycles- Role of microorganisms in carbon, nitrogen, phosphorous and sulphur cycles in the sea under different environments including mangroves.

Unit III: Marine Ecosystems

Estuaries, salt marshes, mangroves. Coral reef -– ecology and types, species interaction, adaptations and importance. Threats and conservation of coastal ecosystems (coral reef and mangroves). Actinomycetes in the mangroves and coral environment.

Unit IV: Marine Pollution

Sources, effects and control measures of heavy metal, radioactive, oil, and thermal pollutions. Microbial indicators of pollution. Role of microbes in pollution abatement, Bio fouling. Microbial biodegradation - hydrocarbon. Bioremediation of heavy metal.

Unit V :Wealth of the sea

Living resources: Fishery products- fish meal and fish oil. Phycocolloids; agar-agar and algin. Microbial diseases diagnosis and control. Marine microorganisms as a source of biomedical resources - dinoflagellates as a source of bioactive molecules - chemistry and pharmacology of marine toxins - saxitoxin -tetradotoxin.

Books for Reference:

1. Gross, G., 1993.*Oceanography: A view of the Earth*. 6th edition. Prentice Hall Inc., NewJersey.
2. McCormick, J.M. and Thiruvathaakal J.V., 1976. *Elements of Oceanography.*W.B. Saunders Company, Philadelphia.
3. Nybakken, J.W. 1997. *Marine Biology – An Ecological Approach*. Addison Weslay Longman, Inc. California, 477pp.
4. Olivia J.Fernando 1999. *Sea water-Properties and dynamics*, Dhanesh Publications, Ponnagam, Thanjavur

5. Russel 1970. *Marine Ecology*, Academic Press- London and New York

6. Nelson and Smith 1973, *Oil pollution and Marine Ecology*-Plenum press

7. Daws, C.J.1981. *Marine Botany* John Wiley and Sons, New York.

8. Austin. B, and D.A Austin 1999. *Bacterial Fish pathogens- Diseases of Farmed and Wild Fish.* Springer Publisher.

9. Munn and Munn 1996. *Marine Microbiology: Ecology and Applications*. BIOS Scientific publisher.

10. Rheinheimer, G., 1980 *Aquatic Microbiology-an Ecological Approach*. Blackwell Scientific Publications

11. Vijaya Ramesh, K. 2004. *Environmental Microbiology*. MJP Publishers Chennai.

12. Tait, R.V and Dipper F.A 1998. *Elements of marine ecology* - 4th edition. British Library Cataloguing in Publication Data.

13. Atlas, R.M., and Bartha.M. 2003. *Microbial ecology- Fundamentals and Applications.* Benjamin- Cummings, Menlo Park, California.

14. Grant, W.D. and Long, P.L.1981. *Environmental Microbiology*. Blackie Glasgow and London.

SEMESTER I			
Core Practical - II- Laboratory in Biochemistry and Microbial Physiology			
Code : 19PMICR2	**Hrs/Week : 6**	**Hrs/Sem: 90**	**Credits : 3**

Vision:

To make the students imbibe the technical knowledge in the field of Biochemistry and Microbial physiology.

Mission:

To provide the students knowledge with various laboratory oriented techniques with advanced level informations.

Course Outcome:

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	know how to verify beer's law	2	K n
CO - 2	know how to estimate lowry's method	2	K n
CO - 3	recall about how to separate amino acid by paper chromatography	1	R n
CO- 4	know how to separate amino acid by thin layer chromatography.	3	K n
CO- 5	relate the procedures and principle of carbohydrate fermentation, imvic, triple sugar ion test.	1	Re
CO- 6	recall how to perform catalase and urease test.	2,3	Re
CO- 7	conclude the procedure for lactophenol cotton blue staining and turbidity method.	4,6	An
CO- 8	explain the fungal slide culture preparation and to examine dry weight of bacteria.	1,3	Ev

SEMESTER I			
Core Practical - II- Laboratory in Biochemistry and Microbial Physiology			
Code : 19PMICR2	**Hrs/Week : 6**	**Hrs/Sem : 90**	**Credits : 3**

1. Principles of colorimetry -Verification of Beer's law.
2. Estimation of proteins by Lowry's method.
3. Estimation of carbohydrates by Anthrone's method.
4. Separation of amino acid by paper chromatography.
5. Separation of amino acid by thin layer chromatography.
6. Extra cellular enzymatic activities of microorganisms (Utilization of gelatin, casein, starch, lipid)
7. Carbohydrate fermentation (Glucose, Lactose, Sucrose)
8. Triple sugar iron test
9. IMViC test series
10. H_2S test
11. Urease test
12. Catalase test
13. Growth curve (Turbidity method)
14. Examination of dry weight of bacteria

Books for Reference:

1. Cappuccino & Sherman, 2011. *Microbiology A laboratory manual,.* 9th Edition.Pearson Publication
2. Gunasekaran. P. 1996. *Laboratory Manual in Microbiology*. New Age International Ltd., Publishers, New Delhi.
3. Jayaraman, J. 1985. *Laboratory Manual in Biochemistry*. Wiley Eastern Ltd., New Delhi. Aneja.K.R., 2007. *Experiments in Microbiology, Plant pathology and Biotechnology.* Fourth Revised Edition. New Age International Publishers.
4. Kannan.N. 1995.*Laboratory Manual in General Microbiology*. Palani Paramount Publication, Palani.
5. Rajan.S.,Selvi Christy. R 2012.*Experimental procedure in Life sciences*. Anjanaa Book House.
6. Sundararaj, T. 2005. *Microbiology – Laboratory Manual.* (First Edition) Publn.