SEMESTER III			
ALLIED PRACTICAL-III **LABORATORY IN ADVANCED PLANT BIOLOGY & BIOTECHNOLOGY**			
CODE:15UMIAR3	**Hrs/Week:2**	**Hrs/Sem:30**	**Credits:2**

OBJECTIVES

To enhance the students knowledge on the various advancements in the techniques of plant biology & biotechnology.

1. Preparation of different nutritive media of plant tissue culture – Preparation & sterilization of explants-Demonstration
2. Organoleptic studies of plants included in theory part– starch.
3. Estimation of proteins & lipids-*Aloe*, Ginger
4. Antimicrobial study of various medicinal plants
   a) Neem b)Tulsi c) Fenugreek d) Turmeric e) Ginger
5. Phytochemical analysis on different flowers and leaves (Steroids, Phenol, Glycosides, Quinone, Flavonoids, Tannin, Furanoid, Alkaloids, Triterpenoids).
6. Pigment separation by paper Chromatography.
7. Thinlayer chromatography of alkaloids from the medicinal plants in the theory part.
8. Models and charts
9. A visit to sugarcane industry

REFERENCE BOOKS

1. Basic biotechnology. Rev.Fr.Dr.Ignacimuthu.S.J. Tata McGraw Hill Publication,Co. NewDelhi
2. Book of pharmacognosy – K.R.Arumugam and N.Murugesh sathya Publishers 1993.
3. Text book of Pharmacognosy – T.E.Wallis. Fifth Edition CBS publishers and distributors. NewDelhi.
4. Herbs cultivation and medicinal uses – H.Panda NIIR Publication Newdelhi.

SEMESTER – IV			
ALLIED PRACTICAL IV LABORATORY IN GENETIC ENGINEERING			
Code : 15UMIAR4	**Hrs / Week: 2**	**Hrs / Sem: 30**	**Credits: 2**

OBJECTIVES:

To impart advanced level of laboratory techniques in the field of Genetic Engineering.

1. Isolation of genomic DNA from bacteria and detection by AGE.

2. Bacterial Transformation.

3. Restriction Digestion of DNA.

4.DNA Ligation.

5. Isolation of bacteriophages (Demonstration).

6. Southern blotting (Demonstration).

7.Western Blotting(Demonstration).

8..Amplification of DNA-PCR (Demonstration).

9.RFLP(Demonstration).

10.RAPD(Demonstration).

REFERENCE BOOKS:

1. Janarthanan.S. and Vincent .S.(2007) Practical Biotechnology.Universities press (India) private limited.Hyderabad.
2. Gunasekaran.P. (1996). Laboratory Manual in Microbiology. New Age International Ltd., Publishers, New Delhi.
3. Molecular Cloning – A Laboratory Manual, Vol. 1,2,3 by J. Sambrook, E. F. Fritsch and T. Maniatis
4. Dubey, R.C.and Maheswari,D.K. (2002).Practical Microbiology, 1st Edition Chand and Company Ltd., India.

SEMESTER III			
CORE PRACTICAL III **Laboratory in Molecular biology and Microbial Genetics**			
Code : 15UMICR3	**HRS/WEEK-2**	**HRS/SEM - 30**	**CREDITS – 1**

OBJECTIVES

To impart basic level laboratory training in the subject of Microbial genetics .

1. Isolation of spontaneous mutants.
2. Isolation of induced mutant by UV
3. Isolation of antibiotic resistant mutants by gradient plate technique
4. UV induced auxotrophic mutants production and isolation of mutants by replica plating technique
5. Plasmid DNA isolation from *E.coli* (Demonstration)
6. Agarose Gel Electrophoresis (Demonstration)
7. Genetic recombination in Bacteria by conjugation (Demonstration)
8. Polymerase chain reaction (Demonstration)

REFERENCE BOOKS

1. Cappuccino.J.G., and Sherman. N. (1996). Microbiology – A Laboratory Manual. Benjamin Cummins. New York.
2. Kannan. N. (1996). Laboratory Manual in General Microbiology. Palani Paramount Publication, Palani.
3. Guansekaran.P. (1996). Laboratory Manual in Microbiology. New Age International Ltd., Publishers, New Delhi.
4. Sundararaj,T. (2005), Microbiology – Laboratory Manual. (1st Edition). Publn. Sundararaj. T, Chennai.
5. Jayaraman, J. (1985). Laboratory Manual in Biochemistry. Wiley Eastern Ltd., New Delhi.
6. Palanivelu. P. Analytical Biochemistry and Separation Techniques.

SEMESTER IV			
CORE PRACTICAL IV **Techniques in Immunology**			
Code : 15UMICR4	**HRS/WEEK-2**	**HRS/SEM - 30**	**CREDIT – 1**

OBJECTIVES

To impart basic level laboratory training in the subject of Immunology .

1. WIDAL test – qualitative assay
2. WIDAL test – quantitative assay
3. Latex agglutination test (ASO)
4. RPR test for syphilis
5. Agglutination reaction with reference to blood grouping
6. Agglutination reaction with reference to RH typing.
7. Demonstration of C-reactive Protein
8. Demonstration of Antigen – Antibody reaction – Ouchterlony technique-ODD
9. Demonstration of Antigen – Antibody reaction - Single radial immunodiffusion
10. Demonstration of western blot

Reference Books:

1. Microbiology laboratory manual T. Sundaraj, Aswathy Sundararaj, Chennai, 2002.
2. Practical microbiology R.C. Dubey & Maheswari, S. Chand & Co.Ltd., New Delhi, 2002.
3. Cappuccino & Sherman, Microbiology a laboratory manual, 2002. Experiments in Microbiology Plant pathology & Biotechnology, K.R. Aneja, Fourth edition, New age international (p) Limited, Publishers.
4. Kannan. N. (1996). Laboratory Manual in General Microbiology. Palani Paramount Publication, Palani.
5. Kanai L. Mukherjee, Medical Laboratory Technology – A procedure manual for routine diagnosis tests – Tata McGraw – Hill Publishing Co., Ltd., New Delhi. Vol.I-III.
6. Palanivelu. P. Analytical Biochemistry and Separation Techniques.

SEMESTER- V			
CORE PRACTICAL V **LABORATORY IN AGRICULTURAL AND INDUSTRIAL MICROBIOLOGY**			
Code : 15UMICR5	**HRS/WEEK: 4**	**HRS/SEM: 60**	**CREDITS: 2**

OBJECTIVES OF THE COURSE:

1. To impart knowledge on isolation of microbes from soil.
2. To enhance advanced level laboratory training in the Industrial Microbiology.

1. Quantitative assay of microbes in soil.
2. Isolation of phosphate solublising bacteria.
3. Isolation of *Rhizobium* from root nodules of leguminous plants.
4. Isolation of *Azotobacter sp* from soil.
5. Identification of *Cyanobacteria* from soil. (*Anabaena* and *Nostoc*).
6. Staining of VAM.
7. Preparation of biofertilizers (Demonstration).
8. Isolation of yeast from grapes.
9. Production of Ethanol from cane sugar using yeast cells (Demonstration).
10. Wine production using yeast – (Demonstration).
11. Antibiotic production by bacteria or actinomycetes- (Demonstration).

REFERENCE BOOKS:

1. Gunasekaran. P. (1996). Laboratory Manual in Microbiology. New Age International Ltd., Publishers, New Delhi.
2. Dubey, R.C.and Maheswari,D.K. (2002).Practical Microbiology, 1st Edition Chand and Company Ltd., India.
3. Aneja K.R.(1993). Experiments in Microbiology,Plant Pathology and Tissue Culture. Wishwa Prakashan.NewDelhi.India.
4. Benson. (2002). Microbiological Applications – Laboratory Manual in General Microbiology. International Edition, McGraw Hill Higher Education.

SEMESTER – III			
SKILL BASED ELECTIVE PRACTICALS IN MEDICAL LABORATORY TECHNOLOGY			
Code – 15UMIS31	**HRS/WEEK-2**	**HRS/SEM - 30**	**CREDITS – 2**

OBJECTIVES

To impart basic level information for doing test in medical field

1. Estimation of glucose
2. Estimation of cholesterol
3. Estimation of iron
4. Estimation of hemoglobin
5. Estimation of chlorides
6. Estimation of triglyceride
7. Identification of carbohydrates (Qualitative tests)
8. Identification of proteins (Qualitative tests)
9. Staining of blood smear
10. Blood grouping
11. Examination of urine- physical, chemical, &microscopic
12. Urine analysis: Glucose, protein, urea, creatinine and billirubin.
13. Culture tests- urine, nasal, throat swab, stool&pus
14. Antimicrobial susceptibility testing
15. Pregnancy test-Demo
16. ESR
17. CRP- Demo
18. Testing of malarial parasite
19. Testing of stool samples for parasites (ova& cysts)
20. Isolation &identification of Mycobacteria- Demo
21. Cultivation of viruses: Bacteriophage isolation

22. Isolation & identification & identification of fungi

23. Cultivation & identification of protozoa

24.Identification of Escherichia coli

25. Isolation of bacteria from blood.

Reference Books:

1. Cappucino.J.g., and Sherman. N.(1996). Microbiology - a laboratory manual . Benjamin Cummins. New york.

2. Kanan.N.(1996). A laboratory manual in general Microbiology. Palani paramount publication, Palani.

3. Gunasekaran. P. (1996). laboratory manual in Microbiology. a new age International Ltd., publishers, new Delhi.

4. Sundaraj. T. (2005). Microbiology - A laboratory manual. 1st Edition Publication. Sundaraj. Chennai.

5. Jayaraman. J. (1985) Laboratory manual in Biochemistry. Wiley Eastern Ltd., New Delhi.

6. Plummer. D.T. (1998) An introduction to Practical Biochemistry. Tata Mc Graw Hill, New delhi.

7. Palanivelu. p. Analytical Biochemistry and Seperation techniques.

8. Benson (2002). Microbiological applications - A Laboratory manual in general microbiology. International Edition, Mc Graw hill Higher Eductaion.

9. Renganathan. S., Gkul Shankar S., Ranjit.M.S, Pankajalakshmi.v., sivramakrishnan.M., Selvakumar.B.N., and mohhamed aejaz. (2001). Fungal Diseases and Diagnosis. (vol I)

10. Kanai Mukerjee L., medical Laboratory technology - a procedure manual for routine diagnosis tests- Tata mc Graw Hill Publishing Co. Ltd., New Delhi. Vol III.

SEMESTER V			
SKILL BASED ELECTIVE PRACTICALS IN SEA FOOD PROCESSING			
CODE:15UMISP51	**HRS/WEEK:2**	**HRS/SEM:30**	**CREDITS:2**

OBJECTIVE:

1.To get a basic idea on the fish processing techniques and quality control

2. To empower students with present day technologies involved in fish processing and to provide a firm understanding on the various quality requirements in seafood industry.

1. Determination of moisture content in fish and other seafood products.
2. Quality evaluation of fish & prawn.
3. Enumeration of bacteria in fish,prawns & Crabs-Vibrio cholera, Staphylococcus aureus, Streptococci
4. Enumeration of coli form-*E.coli*
5. Identification of various seafood diseases
6. Antibiotic residual analysis by microbiological assay
7. Prophylaxis for the prevention of outbreak of fish disease
8. Processing & Preservation – freezing Drying,salting
7. Fish product formulation - canning
9. Assessment of sanitation-swab method
10. Preparation of by products-fish,prawn

REFERENCES:

1. K.Gopakumar, Fish Processing Technology, ICAR, New Delhi
2. T.K. Govindan, Fish Processing Technology Oxfor & IBH Publication Co.
3. K.K. Balachandran Fish Canning – Principles & Practices.
4. Borgstrom,G. Fish as Food.
5. K.K. Balachandran, Postharvest Technology in Fish and Fishery Products.
6. Moorjani,M.V. Fish Processing in India.
7. Connell,J.J. Advances in Fishery science and Technology.
8. CIFT. Manual of Quality Control in Fish and Fishery Products.
9. Gopakumar,K. Fish Packaging Technology
10. A.M.Martin, Fisheries – Processing Chapman & Hall, Madras
11. Ed.G.M.Hall – Fish Processing Technology Chopra & Hall. Madras.

SEMESTER – IV			
Allied – IV – Mushroom Technology			
Code : 18UMIA41	**Hrs/Week : 4**	**Hrs/Sem : 60**	**Credit : 3**

Vision:

To facilitate the students with wide knowledge about the mushroom technology.

Mission:

To inculcate the deep knowledge on mushroom technology.

Course Outcome:

CO No	**Upon completion of this course, students will be able to**	**PSO addressed**	**CL**
CO-1	explain about the detailed information of edible and non – edible mushroom.	4	Un
CO-2	compare the cultivation of various types of mushrooms.	5	Un
CO-3	construct the mushroom house.	6	Cr
CO-4	compare different types of mushroom cultivation techniques and pure culture preparation.	7	An
CO-5	explain about economics of mushroom cultivation and their precaution.	6	Un
CO-6	interpret about the different modes of storage of mushroom.	5	Un
CO-7	illustrate about the various nutrition content present in mushroom.	4	Un
CO-8	make use of various types of foods prepared from mushroom.	6	Ap

SEMESTER – IV			
Allied – IV – Mushroom Technology			
Code : 18UMIA41	**Hrs/Week : 4**	**Hrs/Sem: 60**	**Credit : 3**

Unit – I

Nutritional and medicinal value of mushrooms - Historical account, Cultivation of button mushroom (*Agaricus bisporus*), milky mushroom (*Calocybe indica*), oyster mushroom (*Pleurotus sajor-caju*) and paddy straw mushroom (*Volvariella volvcea*)

Unit - II:

Structure and construction of Mushroom House- Layout of traditional and green house method and spawn lab. Preparation of Pure Culture. Cultivation technology - Substrates, bed preparation, spawning, Mushroom production.

Unit - III

Economics of mushroom cultivation – precautions in mushroom cultivation –area selection, spawn preparation, spawn run, harvesting, pest management.

Unit –IV

Storage and nutrition : Short time storage, Long term storage, Drying , Storage in salt solutions. Nutrition – Proteins , Amino acids , Mineral elements nutritions – Carbohydrate , Vitamins , Crude fibre content.

Unit – V

Value added products - Mushroom - Soup, Pickles, Powders, Jams ,Cutlet, Omelette , Samosa , Curry, mushroom biscuits, mushroom ketchup, mushroom chips, mushroom candy.

Text Books:

1) Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R, 1991. *Oyster Mushrooms, Department of Plant Pathology*, Tamil Nadu Agricultural University, Coimbatore.
2) Swaminathan, M. 1990. *Food and Nutrition*. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
3) Nita Bahl, 1988. *Hand book of Mushrooms,* II Edition, Vol. I & Vol. II.

Books for Reference:

1. Biswas S., Datta M. and Ngachan S.V. 2012. *Mushrooms: A Manual for Cultivation,* PHI.
2. Zadrazil F. and Grabbe K. 1983. *Edible Mushroom, Biotechnology* Vol. 3, Weinheim: Verlag Chemie, Berlin
3 Changs T. and Hayanes W.A. (Ed.) 1978. *Biology and Cultivation of Edible Mushrooms.* Academic Press. New York.
4 Tewari, Pankaj Kapoor, S.C., 1988. *Mushroom cultivation,* Mittal Publications, Delhi.

SEMESTER – IV			
Allied Practical – IV –Laboratory In Mushroom Technology			
Code : 18UMIAR2	**Hrs/Week : 2**	**Hrs/Sem : 30**	**Credit : 1**

Vision:

To provoke excellence for training and practising in the field of mushroom cultivation technology.

Mission:

To promote and encourage the entrepreneurship quality of every students for developing and providing them with a sustainable and profitable environment.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	give outline about the field of mushroom technology	1	Un
CO -2	explain the cultural characteristics of mushroom	1	Un
CO-3	develop the basic requirements for the high production of mushroom	4	Cr
CO-4	interpret the laboratrical concept of mushroom technology	2	Un
CO-5	to develop the mushroom cultivation skill	2	Cr
CO-6	analyze the nutritional significance of mushroom in our day to day life	2,3,4	An
CO-7	explain the purpose of mushroom of cultivation	1	Un
CO-8	organize students to develop mushroom cultivation farms to encourage their entrepreneurship.	2,3,4	Ap

SEMESTER – IV			
Allied Practical – IV –Laboratory In Mushroom Technology			
Code : 18UMIAR2	**Hrs/Week- 2**	**Hrs/Sem – 30**	**Credit – 1**

1.Isolation and purification – Tissue Culture Technique

2. Mother spawn preparation

3.Preparation of first and second generation spawn

4.Mushroom spore print and microscopic observation of spore

5. Cultivation of mushroom; Tropical and temperate types using compost/ Paddy straw /Agricultural wastes / sugar cane wastes etc., spawn running and harvesting.

6. Qualitative analysis of protein in the mushrooms

7. Qualitative analysis of sugar in the mushrooms

8. Qualitative analysis of lipid in the mushrooms

9. Visit to mushroom industry

10. Preparation of value added products mushroom soup , pickles

Books for Reference:

1. Biswas S., Datta M. and Ngachan S.V. 2012. *Mushrooms: A Manual for Cultivation*, PHI.
2. Zadrazil F. and Grabbe K. 1983. *Edible Mushroom, Biotechnology* Vol. 3, Weinheim: Verlag Chemie, Berlin
3. Changs T. and Hayanes W.A. (Ed.) 1978. *Biology and Cultivation of Edible Mushrooms.* Academic Press. New York.
4. Tewari, Pankaj Kapoor, S.C., 1988. *Mushroom cultivation*, Mittal Publications, New Delhi.
5. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R , 1991. *Oyster Mushrooms*, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
6. Swaminathan, M. 1990 *Food and Nutrition*. Bappco, The Bangalore Printing and Publishing Co. Ltd., No. 88, Mysore Road, Bangalore - 560018.
7. Nita Bahl , 1984-1988. *Hand book of Mushrooms*, II Edition, Vol. I & Vol. II.

SEMESTER – V			
Core – VIII - Immunology			
Code : 18UMIC52	**Hrs/Week-5**	**Hrs/Sem– 75**	**Credit – 4**

Vision:

To provoke excellence about various aspects of immune response and cells involved in immunity.

Mission:

To impart basic level information in the subject of Immunology and to study about the various immune responses of the human system towards the pathogens.

Course Outcome:

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	explain the structural features of the components of the immune system and functions.	4	Un
CO-2	compare humoral and cellular immunity and their relative significance.	4	Un
CO-3	interpret the characteristics of antigen and antibody reactions.	4	Ev
CO-4	influence of the roles of the immune system in both maintaining health and contributing disease.	4	Ev
CO-5	influence the immunological response and how it is triggered and regulated.	4	Ev
CO-6	analyze about the pathogenesis of disease, effect, treatment and maintenance to prevent disease.	4	An
CO-7	compare types of lymphoid organs	5	Un
CO-8	compare various types of hypersensitivity	5	Un

SEMESTER – V			
Core – VIII - Immunology			
Code : 18UMIC52	**Hrs/Week-5**	**Hrs/Sem– 75**	**Credits – 4**

Unit – I

History of immunology (Joseph Lister, Louis Pasteur and Elie Metchnikoff) – Innate and acquired - Structure, functions of the cells in immune system Detailed aspects of T and B cells.

Unit – II

Organs of Immune systems – primary lymphoid organs (thymus, bone marrow) – secondary lymphoid tissues (lymph nodes, spleen and MALT).

Unit - III

Antigens – types – properties – Haptens – adjuvant –immunoglobulins – structure, types, properties and functions – Complements: components and pathways. Major Histo compatibility Complex (MHC)- Human leukocyte antigen (HLA) - Humoral immune response - cell mediated immune response.

Unit – IV

Antigen – antibody reactions – In vivo methods (Precipitation reactions, agglutination and complement fixation) – Immuno-fluorescence – ELISA – RIA –Transplantation immunology.

Unit – V

Hypersensitivity reactions – Antibody mediated – Type I : Anaphylaxis – Type II: Antibody – dependent cell cytotoxicity – Type : III: immune complex reactions –Type IV hypersensitivity reaction – Auto immune disease (Rheumatoid arthritis)

Text Books:

1. Rajan, S. 2007. *Medical microbiology*. MJP Publisher, Chennai.
2. Fathimunisa Begum, 2008. *Monoclonal antibodies: The hopeful drugs*. MJP Publisher, Chennai.
3. Kannan I , 2007. *Immunology*. MJP Publisher, Chennai.
4. VamanRao. C. 2007. *Immunology*. Second Edition. Narosa Publishing House, New Delhi.

Books for Reference:

1. Donald. M. Weir and john Steward. 1993. *Immunology* (7^{th} Education). ELBS, London.
2. Ivan M.Roit. 1998. *Essential Immunology*- Blackwell Scientific Publications, Oxfored.
3. Paul 1998. *Essential Immunology*, (2^{nd} Education), Raver Press, New York.
4. Peter J. Delves and Ivan M. Roit (Eds) 1998.*Encyclopedia of Immunology* – (2^{nd} Education) Academic Press.
5. Roit, J.M.Brostaff, J.J. and Male, D.K. 1996. *Immunology* (4^{th} Education C.V. Mosby publisher, St.Loius.
6. Stewart Sell. 2001. *Immunology, Immunopathology and Immunity*. (6^{th} Education), ASM Press, USA.
7. Ananthanrayanan, R., and Panicker, J. 2000. *Text Book of Microbiology*. Orient longmans.
8. Wiley, Sherwood, Woolverton. 2014. *Prescott's Microbiology*. Ninth Edition. McGraw Hill
   International Edition.
9. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne. 2007. *Kuby Immunology*. Sixth
   Edition. W. H. Freeman and Company, New York.

SEMESTER-V			
Core - IX- Clinical Microbiology			
Code:18UMIC53	**Hrs/Week: 5**	**Hrs/Sem: 75**	**Credit: 4**

Vision:

To inculcate knowledge in the field of clinical microbiology and provide the guidelines for improved lab diagnosis.

Mission:

To educate the students to 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 able to	PSO addressed	CL
CO-1	understand the laboratory practices and know how to maintain the laboratory instruments	4	An
CO-2	analyze and distinguish various types of blood cells	2	Un
CO-3	understand the pathological diseases and explain the test for hepatitis, aids, and intestinal parasites.	6	Ev
CO-4	evaluate critical thinking of biochemical test	5	Un
CO-5	demonstrate the proficiency in basic methods of instrumentation and quantitative analytical skills used to conduct biological research.	4	An
CO-6	determines the applied microbiology aspects of clinical technique	1	An
CO-7	interpret different classes of microbes.	3	Cr
CO-8	analyze the level information in the subject of medical microbiology.	6	Ev

SEMESTER-V			
Core - IX- Clinical Microbiology			
Code:18UMIC53	**Hrs/Week: 5**	**Hrs/Sem: 75**	**Credit: 4**

Unit-I:

Normal microbial flora of the human body- Sources of infection: Food, water, vector and air – Modes of transmission – Koch's postulates– Invasiveness and pathogenicity.

Unit-II

Diagnostic microbiology – Collection and transport of specimen for microbiological examination- General methods for isolation and identification of bacteria – skin,LRT,URT and urinary tract infections.

Unit-III

Clinical symptoms- Epidemiology, pathogenesis, laboratory diagnosis, prevention and treatment of the following bacterial (a) Tuberculosis (b) Leprosy, (c) Gastro intestinal disorders-Typhoid, cholera (d) Sexually transmitted diseases- Syphilis and gonorrhea. (e) Anaerobic wound infection- Tetanus.

Unit-IV

Clinical symptoms- Epidemiology, pathogenesis, laboratory diagnosis, prevention and treatment of the following viral infections (a) Respiratory infections-common cold,influenza, measles, and mumps (b) Liver diseases: Hepatitis A & B (c) Immunodeficiency diseases-AIDS and Herpes Simplex Viruses.

Unit-V:

Clinical symptoms- Epidemiology, pathogenesis, laboratory diagnosis, prevention and treatment of the following fungal and protozoan infections (a) Fungal – Superficial (Tinea nigra), subcutaneous and systemic mycoses (Candidiasis), (b) Protozoan: Amoebiasis and malaria, (c) Helminthes – ascariasis (d) zoonotic diseases – Rabies.

Text books:

1. Anathanarayanan, R., and Panicker, J. 2000. *Text book of microbiology*. Orient Longmans.
2. S., Rajan, 2007. *Medical microbiology*. MJP publisher, Chennai.

Books for reference:

1. L.M.,Prescott J.P., Harley and D.A., Klein 2008. *Microbiology.* 7th edition McGraw-Hill Inc, New York.
2.J.R Pelczar ., M.J. Chan E.C.S., and Kreig N.R., 1993. *Microbiology*-McGraw- Hill Inc, New York
3. Tortora, Funke Case Addison 2001, *Microbiology – An Introduction*7th edition Wesley Longman Inc.
4. R.C.Dubey and S.,Maheswari, 2003. *A Text Book of Microbiology*, S.Chand & Co, New Delhi.

SEMESTER-VI			
Core XI- Industrial Microbiology			
Code:18UMIC62	**Hrs/Week:5**	**Hrs/Sem: 75**	**Credits:4**

Vision:

To impart the professional information by increasing the global knowledge, understanding, and application of industrial microbiology.

Mission:

Empower our students to address current and future challenges facing humanity using industrial microbiology.

Course Outcome

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	revise the idea about the usage of microorganisms in the field of industrial microbiology	3	Ap
CO- 2	analyse the knowledge of various industrial products and its impacts on the society.	4	Un
CO- 3	acquire knowledge in industrial fermentation	3	An
CO -4	have an insight on industrial microbiological techniques	2	Cr
CO- 5	understands the in the field of industrial microbiology	1	Un
CO-6	acquire knowledge of basics and applied microbiological aspects of food industries.	1	Un
CO-7	have knowledge on antibiotic production	2,4	Cr
CO-8	get knowledge about analysis of industrial waste and sewage treatment and disposal	2,4	Cr

SEMESTER-VI			
Core XI- Industrial Microbiology			
Code:18UMIC62	**Hrs/Week:5**	**Hrs/Sem: 75**	**Credits:4**

Unit-I

Isolation, screening, preservation and improvement of industrially important microorganisms; Raw materials and media design for fermentation processes; Sterilization; Development of inoculums for industrial fermentations; Types of fermentation: Batch, Continous, Dual or Multiple, Surface, Submerged, Aerobic and Anaerobic.

Unit-II

Fermenter- Design and types, Instrumentation and control-aeration and agitation.Recovery and purification of fermentation products. Enzymes and cell immobilization, Production of recombinant proteins having therapeutic and diagnostic applications: Insulin, Interferon, Somatotropin, Single cell protein.

Unit-III

Biology of industrial microorganisms.Streptomyces, Yeasts (*Saccharomyces*, *Hansenula*) *Spirulina* and *Penicillium*. Mushroom cultivation. Biosensors and Biochips.Biofuels from microbial sources.

Unit-IV

Alcohols (Ethanol and Butanol); Beverages (Beer and Wine); Aminoacids (Glutamic acid and Lysine); Organic acids (Citric acid and acetic acid); Vaccines (Plant – Agrobacterium tumefaciens, Animal – Leptospirosis, Microbes - DPT).

Unit-V

Antibiotics (Penicillin, Cephalosporin and Streptomycin); Vitamins (Riboflavin and Cyanocobalamin); Production of enzymes (Protease, Amylase and Lipase); Biopolymers (Xanthan gum and PHB); Biopreservatives (Nisin); Production of Hormones (Testosterone and Androstenedione).

Text Books:

1. Wulf Crueger A., 2000. *A Text Book of IndustrialMicrobiology*. 2nd edition. Panima Publishing Corporation, NewDelhi.
2. Peter F.Stanbury., Whittaker, A. and Hali.S.J.1997 .*Principles of Fermentation Technology*, 2nd edition., Pergamon Press.
3. Patel A.H.,1996. *Industrial Microbiology*. Macmillan India Limited.

Books for reference:

1. Prescott &Dunn.,1997. *Industrial Microbiology*.CBS publishers and Distributors.
2. Casida,L.E.1986.*Industrial Microbiology*. Eastern Limited, NewYork.
3. Michael J.,Waites, Neil L., Morgan, John S.Rockey and GrayHigton 2001. *Industrial Microbiology* An Introduction, Replika press Pvt.NewDelhi.
4. Purohit,S.S., Kakrani, H.N., Saluja, A.K., 2006 *Pharmaceutical Biotechnology*. Student edition, Jodhpur.
5. Satyanarayana. U. 2013. *Biotechnology*. Books and Allied (P) Ltd, Kolkata.

SEMESTER –VI			
Core - XII - Microbial Biotechnology			
Code: 18UMIC63	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits: 4**

Vision

To impart advanced level information in the subject of Microbial Biotechnology.

Mission

To give an in-depth knowledge in the various microbial biotechnology process and products of biotechnology.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	define the history & concepts of biotechnology.	2	Re
CO-2	assess the intellectual property right & protection.	2	Ev
CO-3	illustrate the knowledge on the production of biotechnological products.	3	Un
CO-4	interpret about the concepts and applications in enzyme biotechnology.	3	Un
CO-5	assume the mechanisms involved in biodegradation of pollutants.	6	An
CO-6	illustrate the cloning process	2	Un
CO-7	analyse the production of biotechnological products	2,3	An
CO-8	recall the concept of biogas, bioleaching, biodegradation of petroleum.	4	Re

SEMESTER –VI			
Core - XII - Microbial Biotechnology			
Code: 18UMIC63	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits: 4**

Unit-I

Biotechnology - Definition – Concepts - History – Achievements - Milestones in biotechnology - Enzyme biotechnology – enzyme production from microbes – applications – enzyme immobilization.

Unit-II

Cloning - History of cloning – Transgenic Plant (Golden Rice) – Transgenic Animal (Dolly) – Genetically Engineered Microorganism (Super bug).

Unit-III

Production of biotechnological products.Food - SCP (Algae, Yeast, Mushroom). Fuel (Ethanol) – Pharmaceuticals – Interferons, Vaccines, Edible vaccines, Hormones and Gene therapy methods – Hybridoma and Monoclonal antibodies .

Unit- IV

Bioconversions – Lignocellulosic waste to ethanol, Bioleaching – microorganisms involved – Mechanism of Bioleaching – Commercial process - Bioleaching of Copper and Uranium, Bio gas – Microbes involved - Factors influencing methane production – stages of methane generation, Biodegradation of Petroleum, Waste water treatment, Solid waste treatment.

Unit- V

Intellectual Property Rights (IPR) and Protection (IPP) – Forms of protection – Patents (reading a patent – description, claims, patenting strategies) – Copy right, Trade mark, Plant variety protection – WTO, GATT, TRIPs.

Text books:

1. Dr.Verma P.S and Dr.Agarwal. V. K. 2009. *Genetic Engineering* – S. Chand and Company Ltd. New Delhi.
2. Dubey R.C. 2014. *A Text Book of Biotechnology*. 5th revised edition. S Chand & Co. New Delhi.
3. Dr.Prakash. S Lohar. 2005.*Text Book of Biotechnology* - MJP Publishers, Chennai.
4. Dubey R.C. and D.K. Maheshwari. 2013. *A Text Book of Microbiology*. S. Chand & Co. New Delhi.

Books for Reference:

1. Glick, B.R. and Pasternak, J.J. 1998. *Molecular Biotechnology* - Principles and Applications of Recombinant DNA. ASM Press, Washington D.C.
2. Satyanarayana,U. 2005. *Biotechnology*.Books and Allied (P).Ltd. Kolkata.
3. Kalaichelvan. P.T., Arul Pandian. I., 2007.*Bioprocess Technology*. MJP Publishers, Chennai.
4. Singh.B.D., *Biotechnology*. 2008. Kalyani Publishers.
5. Shiva Aithal, C. 2010. *Modern approaches in Soil, Agricultural and Environmental Microbiology.*Himalaya Publishers, New Delhi.

6. Rastogi S.C.2007. *Biotechnology Principles and applications*. Narosa Publishing House Pvt. Ltd. New Delhi.
7. Mohan P. Arora. 2005. *Biotechnology*.Himalaya Publishing House, Mumbai.
8. Jogdhand. S.N. *Gene Biotechnology*. 2009. Himalaya Publishing House Pvt. Ltd. Mumbai.

SEMESTER V			
Core Practical V - Laboratory in Immunology and Clinical Microbiology			
Code : 18UMICR5	**Hrs/Week :4**	**Hrs/Sem : 60**	**Credit : 2**

Vision:

To impart advanced practical knowledge in Immunology and Clinical Microbiology.

Mission:

To perform highly specific advanced methodologies for the study of human immune system towards the pathogens.

Course Outcome:

CO No	Upon completion of this course students will be able to	PSO addressed	C L
CO-1	demonstrate various immuno diffusion test.	1,2	Re
CO-2	develop their ability to perform qualitative and quantitative assay of widal test.	2	Un
CO-3	improve their ability to perform rpr test for syphilis	3	Un
CO-4	analyze how to perform latex agglutination and blood grouping techniques.	3	An
CO-5	examine various types of bacterial pathogens	5	Un
CO-6	demonstrate antibiotic susceptibility test	6	An
CO-7	test urine samples	6	An
CO-8	examine stool sample	4,6	An

SEMESTER V			
Core Practical V - Laboratory in Immunology and Clinical Microbiology			
Code : 18UMICR5	**Hrs/Week : 4**	**Hrs/Sem : 60**	**Credits 2**

1. WIDAL test – qualitative assay
2. Latex agglutination test (ASO)
3. Agglutination reaction with reference to blood grouping
4. Agglutination reaction with reference to RH typing.
5. Demonstration of Antigen – Antibody reaction – Ouchterlony technique - ODD
6. Demonstration of Antigen – Antibody reaction - Single radial immuno diffusion
7. Biochemical identification of bacterial pathogens.
   Following tests to be performed – TSI, Indole, MR, VP, Citrate, Urease, Catalase test for
   a. *Staphylococcus aureus*
   b. *Escherichia coli*
8. Antibiotic susceptibility testing by Disc diffusion method (*Escherichia coli* and *Staphylococcus aureus*).
9. Isolation of normal flora of the skin and throat
10. Urine culture and its microbiological analysis (*E.coli)*
11. Stool examination by Zinc-sulphate floatation method.

Books for Reference:

1. J.G. Cappuccino and N.Sherman 1996 MB – *A lab manual Benjamin Cummins,* New York.
2. Murray P.R; Baron E.J; Jorgerson J.H; Pfaller M.A. and Yolker R.H. 2003. *Manual of Clinical microbiology*, 8th edition. Vol. 1 & 2 ASM Poem Washington D.C.
3. Gunasekaran, P. 1996. *Laboratory Manual in Microbiology*. New Age International Ltd., Publishers, New Delhi.
4. Dubey, R.C. and Maheswari,D.K. 2002.*Practical Microbiology*, 1st Edition Chand and Company Ltd., India.
5. Harley Precott 2002. *Laboratory Exercises in Microbiology*. 5th edition. The Mac Graw – Hill companies.
6. Myer's and Koshi's *Manual of Diagnostic Procedures in Medical Microbiology and Immunology/Serology*. Published by Department of Clinical Microbiology, CMC and Hospital, Vellore, Tamil Nadu.
7. T. Sundaraj, Aswathy Sundararaj , 2002.*Microbiology laboratory manual*, Chennai.
8. Kanika L. Mukherjee, *Medical Laboratory Technology* – A procedure manual for routine diagnosis tests – Tata McGraw – Hill Publishing Co., Ltd., New Delhi. Vol.I-III.
9. Kannan, N.1996. *Laboratory Manual in General Microbiology*. Palani Paramount Publication, Palani.
10. Aneja KR, 2005. *Experiments Microbiology, Plant pathology and Biotechnology*, 4th Edition. New age International publishers, Chennai.

SEMESTER-IV			
NME II - Clinical Microbiology			
Code:18UMIN41	**Hrs/Week: 2**	**Hrs/Sem:30**	**Credit: 2**

Vision:

Highlighting the students about diverse microbial pathogens and its effects on human health.

Mission:

To be aware of the diagnosis, treatment and prevention of pathogens and good medical practice.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	C L
CO- 1	provide knowledge on the importance of clinical microbiology	1,4	Un, An
CO -2	acquire knowledge on normal flora on human body.	1	Un
CO- 3	acquire knowledge on various types of diseases.	6	Co
CO- 4	provide information about the mechanisms of infectious disease transmission	1,6	Un
CO- 5	acquire knowledge on causative agent, treatment , prevention and control measures.	1,6	Un
CO- 6	provide interpretation of laboratory tests in the diagnosis of infectious diseases.	2	Co
CO- 7	understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.	6	Co
CO- 8	develop basic skills necessary to work in the microbiology laboratory.	1,2	Un

SEMESTER-IV			
NME II - Clinical Microbiology			
Code:18UMIN41	**Hrs/Week: 2**	**Hrs/Sem:30**	**Credit: 2**

Unit - I

Sources of infection - Routes of transmission - control measures - Testing by Koch's postulates - Antibiotic sensitivity testing

Unit - II

Bacterial pathogens - *Streptococcal, Staphylococci, E.coli, Vibrio, Salmonella, Shigella* and *Mycobacterium*

Unit – III

Fungal pathogens - *Candida, Aspergillus - Dermatophytes*

Unit - IV

Viral pathogens - Pox virus, Mumps virus, Rabies virus and HIV

Unit - V

Protozoan pathogens - Malarial, Amoebic , Giardiasis and Yellow fever

Text Books:

1. Ananthanaryanan R and Panikar J , 2000. *Text book of Microbiology*, Orient Longmans.
2. Rajan.S. 2007 . *Medical Microbiology*, MJP Publisher, Chennai

Books for Reference:

1. Kanika L Mukherjee, *Medical Laboratory Technology*, Mc Graw Hill Publishing Co., Ltd., New Delhi Vol I-III
2. Salle, A.J.,1996. *Fundamental Principles of Bacteriology*. (7^{th} edition), Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Pelczar Jr.,M.J., Chan E.C.S. and Kreig, N.R. 1993. *Microbiology.* McGraw Hill Inc., New York.

SEMESTER - I			
Allied – I - Dairy Technology			
Course Code -21UMIA11	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credits: 3**

Objectives:

To provide the leadership, voice and programs for a vibrant dairy industry where farm families, dairy businesses and associated organizations can thrive and be profitable.

To create a sustainable environmentally and technologically advanced dairy farm.

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO addressed	C L
CO-1	understand the process involved in production of milk and milk products	1,2	Un
CO-2	classify and explain the different types of milk products	2	Un
CO-3	understand purpose and functions of hygiene in dairy industry	2	Un
CO-4	produce flow chart for the production processes of various milk products	1, 2	Ap
CO-5	explain organization and operations involved in milk processing units	2	Co
CO-6	outline precautions when processing milk and dairy products	2	An
CO-7	organize students to processing of milk and its products	2 ,3,4	Un
CO-8	understand the various agents causing food infection, toxi-infection and intoxication that can be transmitted through consumption of milk and milk products which be immensely useful in preventing the food borne illnesses ensuring the safety of the consumers.	2 ,3,4	Un

SEMESTER – I			
Allied – I - Dairy Technology			
Course Code -21UMIA11	**Hrs/ Week: 4**	**Hrs/ Sem: 60**	**Credits: 3**

Unit I Clean milk production technique

Clean milk production technique- secretion of milk in the udder- sources of micro organisms- cleanliness of the animal- Udder- Utensils- Detergents and Sanitizers- Different micro organisms of milk – Differences between goat's, buffaloe's and cow's milk - Colostrums- Importance of colostrums

Unit II Importance of milk and its composition

Importance of milk and its composition, properties and nutritive value of milk - Specific gravity of milk- Lactometer reading- Acidity test estimation of fat, SNF, total solids of milk- Factors that alter the quality and quantities of milk – common adulterants of milk, detection of adulterants- water adulteration- MBRT- Resazurin Test

Unit III Milk processing

Chilling – Heat processing – Sterilization- pasteurization- test for effective pasteurization – phosphates test – Holding the milk – packing – transport- various types of transports – marketing of fluid milks – special milks- Toned milk, standard milk, UHT milk

Unit IV Starter culture and milk products

Starter culture preparation and their biochemical activities- Methods of manufacture and uses of fermented and non fermented milk products, yoghurt, cheese skim milk, condensed milk.

Unit V Milk borne disease

Milk Borne disease- An Introduction to milk Borne disease, Milk borne infections, *Salmonella* poisoning, bacillary dysentery (Shigellosis). Milk borne intoxication – *Staphylococcal* poisoning, Botulism. Other milk borne diseases- Tuberculosis, Brucellosis

Text book:

1. Sugumar De.. *Outlines of dairy technology*, Oxford University press, 1997.

Books for Reference:

1. Clarence Henry, Heckles, *Milk and Milk products,* New Delhi: Tata. McGraw Hill Publishing company Ltd. 4th edition, 1957.
2. Sugumar D. *Outlines of dairy technology*, Oxford University press. 1997.
3. Ramasamy. *Hand book of Dairy technologies*, International Book distributing and Company, 1996.

SEMESTER – I			
Allied Practical– I - Laboratory in Dairy Technology			
Course Code - 21UMIAR1	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credit: 1**

Objectives:

To create the ability to be multi-skilled in the field of dairy microbiology with a good technical knowledge.

To educate with the prime intension of providing practical training in the area of milk processing and preparation of various milk products

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	C L
CO-1	prepare students to scientifically undertake all operations of dairy technology	1, 2	Ap
CO-2	create entrepreneur in dairying and dairy associated activities	2	Sy
CO-3	organize students to processing of milk and its products	2, 3, 4	Sy
CO-4	develop skill, instill confidence by enhancing life skill	1, 2	Ap
CO-5	establish nutritional status of community through dairy farming.	2	Ap
CO-6	establish income of community through dairy farming.	2	Ap
CO-7	develop organizational capabilities among youth in dairy industry.	2 ,3,4	Ap
CO-8	examine the production in small and large scale production.	2,3,4	An

Practicals:

1. Sampling of milk
2. Platform test, COB, MBRT, acidity test
3. Estimation of fat in milk and skim milk
4. Estimation of SNF and total solids
5. Detection of adulterants and preservatives
6. Preparation and enumeration of cream, yoghurt
7. Preparation and enumeration of butter and ghee
8. Preparation and enumeration of koha and flavoured milk
9. Preparation and enumeration of ice cream
10. Grading of milk and milk products by standard plate count
11. Grading of milk and milk products by coliform count
12. Visit to important places related to dairy products and dairy federations.

Books for Reference:

1. Clarence Henry, Heckles, *Milk and Milk products.* New Delhi: 4th edition Tata Mc Graw Hill Publishing Company Ltd., 1957.
2. Sugumar D. *outlines of dairy technology*, Oxford University press. 1997.
3. Ramasamy. *Hand book of Dairy technologies*, Lucknow: International Book distributing and Company. 1996.

SEMESTER – II			
Allied Practical - II Laboratory in Biochemistry			
Course Code 21UMIAR2	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credit: 1**

Objectives:

To extend the fundamental knowledge of biochemistry to understand life at molecular level, application of scientific methods in innovative research and provide health care to the community.

To promote basic practical skills in conducting and interpreting laboratory investigations.

Course Outcome:

CO No	**Upon completion of this course, students will be able to**	**PSO addressed**	**CL**
CO-1	know hazards and safety measure in laboratory.	2	Kn
CO -2	perform normality, molarity, percent solution.	2	Sy
CO-3	perform qualitative tests for carbohydrates, lipids, and amino acid.	2	Sy
CO-4	determine saponification and acid values of fats.	2, 4	An
CO-5	identify the effect of various factors on enzymes.	2	An
CO-6	know and separate the amino acids by paper chromatography technique	2,4	Kn
CO-7	estimate proteins, carbohydrates, and amino acids.	2	Ev
CO-8	know the working principle of spectrophotometer and able to handle.	2 ,3	Kn

Practicals:

1. Qualitative analysis of carbohydrates.
2. Qualitative analysis of proteins.
3. Qualitative analysis of urea.
4. Qualitative analysis of creatinine
5. Qualitative analysis of cholesterol.
6. Qualitative test for amino acids.
7. Qualitative saponification test.
8. Determination saponification value of fats.
9. Determination of acid value of fats.
10. Effect of pH on activity of enzyme
11. Effect of temperature on activity of enzyme
12. Estimation of carbohydrates (Anthrone method) Demonstration.
13. Estimation of proteins (Lowry's method) Demonstration.
14. Separation of amino acids paper chromatography

Books for Reference:

1. Jayaraman, J. *Laboratory Manual in Biochemistry.* New Delhi: Wiley Eastern Ltd.,. 1985.
2. Plummer, D.T. *An Introduction to Practical Biochemistry*. NewDelhi: Tata McGraw-Hill. 1998.
3. Palanivelu. P. *Analytical Biochemistry and Separation Techniques.* 21st Century Publications. 1998.
4. Keith Wilson.K and Walker.*J Principles of Practical Biochemistry* – Cambridge Univ Press. 2003.

SEMESTER – III			
Core– III - Microbial Physiology and Metabolism			
Course Code: 21UMIC31	**Hrs/ Week:4**	**Hrs/ Sem: 60**	**Credits: 4**

Objectives

1. To understand the basic concepts of aerobic and anaerobic metabolic pathway
2. To analyse the role of individual components in overall cell function
3. To provide information on sources of energy and its utilization by microorganisms
4. To study about many different types of metabolic strategies

Course outcome

CO No	Upon completion of this course, students willbe able to	PSO addressed	CL
CO-1	Know the basic knowledge about microbial metabolism	2	Kn
CO-2	Know the applications of the various culture and their pathways	4	Kn
CO-3	Know the process of reporting the reportableDisease	5	Kn
CO-4	Interpret the techniques used in clinical microbiology	2	Co
CO-5	Determine the mechanism of nitrogen fixation by microbes	4	An
CO-6	Demonstrate the mechanism involved in bio-luminescence	1	Co
CO-7	Demonstrate the growth and sporulation process of microbes	4	Co
CO-8	Compare the mechanism of photosystem I & II	2	An

SEMESTER –III			
Core– III-Microbial Physiology and Metabolism			
Course Code :21UMIC31	**Hrs / Week:4**	**Hrs / Sem:60**	**Credits:4**

Unit-I: Introduction to Metabolism

Basic concept of metabolism – Membrane transport system – Passive and Active transport system – Facilitated diffusion, group Translocation – Iron transport – Requirements of growth- Micro & Macro nutrient elements. Role of osmo regulatory proteins

Unit-II: Metabolic pathway

Assimilatory and dissimilatory pathways – Respiratory pathways – Glycolysis, Krebs cycle – ETS – ATP generation – Fermentation pathways- Homo and Hetero lactate fermentation- Ethanol- Fermentation by bacteria and yeast – Mixed acid fermentation- Butanediol, acetate and propionate. Metabolism of protein

Unit-III: Respiration and photosynthesis

Anaerobic respiration: Nitrate, Sulphur, carbonate and methane – Bioluminescence components. Phototrophic metabolism- Historical account of photosynthesis.

Unit-IV: Growth and sporulation

Growth – Batch, continuous– Growth curve – Factors affecting growth – Physical, chemical and biological factors. Endospore – structure and mechanism of sporulation. Regulation of nitrogen assimilation and fixation by bacteria

Unit-V: Nutrition and Phosynthetic pigments

Characteristics and metabolism of autotrophs. – Chemolithotroph – Brief account on Sulphur, Hydrogen and Iron oxidation. Phosynthetic and accessary Pigments –Bacterio chlorophyll, rhodopsin and carotenoids. Energy rich compounds in cell metabolism

Text Book:

1. Meena Kumari S. *Microbial Physiology*.Chennai:1st edition MJP Publishers. 2006.

Books for Reference:

1. Rajapandian K. *Microbial physiology.*Chennai: PBS Book Enterprises India, 2010.
2. Lansing M. Prescott John.P. Harley and Donald A, Klein. *Microbiology.* Newyork: (5thedition). McGraw –Hill Company, 2003.
3. Tortora, Funke Case Addison. Introduction to Microbiology, Newyork: (7thedition)Wesley Longman Inc. 2001.
4. Dubey R.C. and Maheswari, S. *A. Text Book of Microbiology*. New Delhi: S.Chand &Co, 2003.
5. Pelczar Jr., M.J. Chan E.C.S., and Kreig N.R. *Microbiology.* NewYork : McGraw- HillInc,

SEMESTER – IV			
Core – IV– Molecular Biology and Microbial Genetics			
Course Code: 21UMIC41	**Hrs/Week- 4**	**Hrs/Sem: 60**	**Credit: 4**

Objectives:

1. To provoke excellence about various aspects of microbial genetics and molecular biology of microorganisms.
2. To enhance knowledge about genetic material of microbes and their mutations.

Course Outcome:

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	explain the basic knowledge about the microbial genetic material and its functions.	6	U n
CO-2	compare various types of bacterial plasmids, their types, and its functions.	5	U n
CO-3	interpret the role and properties of transposons and IS elements.	7	U n
CO-4	illustrate various mechanisms involved in bacteriophage cycle.	5	U n
CO-5	improve the knowledge about structure and classification of bacteriophage and their mode of replication.	6	Cr
CO-6	classify various mutations takes place in microbial genetics.	8	Un
CO-7	compare various gene transfer mechanisms	7	Un
CO- 8	recall transformation and transduction and their classification	5	Re

SEMESTER – IV			
Core – IV– Molecular Biology and Microbial Genetics			
Course Code: 21UMIC41	**Hrs/Week- 4**	**Hrs/Sem: 60**	**Credit: 4**

Unit –I: Basics of Genetics

Genetics- Historical Introduction- experiments of Griffith, Avery, Hershey and Chase - DNA structure - RNA – types, structure. RNA as the genetic material - Genetic code. Replication of DNA and enzymology of DNA replication.

Unit –II: Bacterial plasmids

Bacterial plasmids (F-plasmid, R plasmid, col plasmid, degradative plasmid, virulence plasmid, Ti Plasmid) - Structure, types and properties of plasmids- Plasmid replication- Transposons and IS elements- Structure, types and properties.

Unit- III: Central Dogma and Bacteriophages

Transcription – Reverse transcription, Reverse transcriptase -Translation – Bacteriophages - Classification based on structure and genetic material - Lytic cycle and lysogenic cycle (T4 and Lambda phage only).

Unit- IV: Mutations

Mutations- Spontaneous (Substitution, Spontaneous Deamination of 5-Methyl cytosine, Frameshift Mutation) induced (Chemical mutagens-Base Analogues, Chemicals changing the specificity of hydrogen bonding, Alkylating agents, intercalating agents) Rations as mutagens (UV and X-rays) Genotypic and phenotypic mutants- Reversion and suppression- Ames test.

Unit –V: Gene transfer mechanisms

Gene transfer mechanisms- Conjugation (Cell transmissible plasmids, F factor and Hfr strains- Transformation (Natural transformation, competence, DNA uptake, role of natural transformation, artificially induced competence and electroporation) - Generalized and specialized transduction.

Text Books:

1) Dubey R.C., and Maheshwari, S. *A Text Book of Microbiology,* NewDelhi: S.Chand & Co, 2003.
2) Jayanthi G.P. *Molecular biology,* Chennai: MJP publishers, 2008.
3) Freifelder D., *Molecular Biology*, New Delhi: Narosa publishing house, 1991.

Books for Reference:

1. Watson, J.D., Hopkins N.H., Roberts JW.,Steitz J.A and Weiner A.A.M. *Molecular Biology of the gene.* The Benjamin cummings publishing company. 1987.
2. Lewin B. *Genes IX*. UK: Oxford University press, 2007.
3. Talaro, K.P., Andtalaro. A. *Foundations in Microbiology.* New York: WCP McGraw- Hill,1999.
4. Pelczar Jr., M.J. Chan E.C.S., and Kreig N.R. *Microbiology*. New York: McGraw-Hill Inc,1993.
5. Prescott L.M., Harley J.P., and Klein D.A., *Microbiology.* New York: McGraw-Hill Inc, 7th edition. 2008.

SEMESTER - I			
Core Practical –I Laboratory in Introduction to Microbiology			
Course Code : 21UMICR1	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credit: 1**

Objectives:

To introduce the general public to microbiology and encourage interest in it, stressing its importance and possibilities for man and nature.

To impart advanced level information in the field of techniques in general microbiology and diversity.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	know bio-safety procedures in microbiology.	1, 2	Un
CO -2	develop basic skill in aseptic techniques	2	Un
CO-3	perform various staining techniques.	2	Ap
CO-4	cultivate bacteria with different cultivation techniques.	1,2	Ap
CO-5	be acquainted with various sterilization techniques.	2	Ap
CO-6	understand the preparation of various culture media	2	Un
CO-7	isolate bacteria on solid media	2 ,3,4	Ev
CO-8	isolate and characterize bacteria by streak plate method.	2, 3,4	Ev

SEMESTER – I			
Core Practical –I Laboratory in Introduction to Microbiology			
Course Code : 21UMICR1	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credit: 1**

Practicals:

1. Safety guidelines
2. Sterilization – Physical method (Filtration) - Demonstration
3. Instruments used in Microbiology
4. Preparation of media – Soild, Liquid and Semi solid media.
5. Preparation of slant, deep tube and deep agar plate.
6. Microscopic handling – Cell shape and arrangement.
7. Hanging drop technique
8. Simple staining
9. Negative Staining
10. Gram's staining
11. Serial dilution technique
12. Pure culture technique
    a) Pour plate
    b) Spread plate
    c) Streak plate
13. Enumeration of bacteria - water and soil samples

Books for Reference:

1. Cappuccino J.G. and Sherman N. Microbiology : *A Laboratory manual*, San Francisco: Benjamin Cummings Publishing Co. Inc,. 1996.
2. Kannan, N. *Laboratory Manual in General Microbiology.* Palani Paramount Publication, 1996.
3. Murray P.R, Baron E.J, Jorgerson J.H, Pfaller M.A. and Yolker R.H *Manual of Clinical Microbiology,*. Vol. 1 & 2 ASM Poem Washington D.C. 8th edition . 2003.
4. Sundararaj. T. *MB Lab Manual* . publications Sundararaj. A. 1st edition, 2005.
5. Gunasekaran, P. *LaboratoryManual in Microbiology*. New Delhi: New Age International Ltd.,Publishers,.1996.

SEMESTER - II			
Core Practical –I Laboratory in Microbial Diversity			
Course Code : 21UMICR2	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credit: 1**

Objectives:

To introduce the concept of microbial diversity and its importance.

To impart the knowledge of the techniques adapted in Microbial diversity.

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	know about the knowledge on evolution and microbial diversity	1, 2	Un
CO -2	develop a knowledge on study of Bacteria	2	Un
CO-3	perform the techniques of microbial diversity	2	Ap
CO-4	cultivate Cyanobacteria from natural sources	1,2	Ap
CO-5	be acquainted with the ultra structure of prokaryotic and eukaryotic cell	2	Ap
CO-6	understand Bacterial taxonomy	2	Un
CO-7	understand the structure of Protozoa, Algae, Virus	2 ,3,4	Un
CO-8	develop a knowledge on isolation of microbes from different sources	2, 3,4	Un

SEMESTER - II			
Core Practical –II Laboratory in Microbial Diversity			
Course Code : 21UMICR2	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credit: 1**

1. Cultural characteristics of microorganisms
2. General morphology of Bacteria
   a) Cocci – Mono, Diplo, Tetra, Chain
   b) Rod – Thick, Thin
   c) Vibrio
   d) Spirillum
3. Study of ultra structure of prokaryotic and eukaryotic cell – (Demonstration)
4. Study of *Candida albicans* – Germ tube test
5. Isolation of fungi from bread
6. Isolation of Actinomycetes from soil sample.
7. Microscopic examination of Cyanobacteria.
8. Isolation of algae from fresh water sample
9. Study of virus using photographs
   a) TMV
   b) Adeno virus
10. Study of protozoa using photographs

a) Entamoeba histolytica

b) Plasmodium

10. Study of symbiotic association between algae and fungi

Books for Reference:

1. Cappuccino J.G. and Sherman N. Microbiology : *A Laboratory manual*, San Francisco: Benjamin Cummings Publishing Co. Inc,. 1996.
2. Kannan, N. *Laboratory Manual in General Microbiology*. Palani: Palani Paramount Publication, 1996.
3. Murray P.R; Baron E.J; Jorgerson J.H; Pfaller M.A. and Yolker R.H *Manual of Clinical Microbiology*, Vol. 1 & 2 ASM Poem Washington D.C. 8th edition, 2003.
4. Gunasekaran, P. *Laboratory Manual in Microbiology*. New Delhi: New Age International Ltd., Publishers, 1996.
5. Jayaraman, J., *Laboratory Manual in Biochemistry*. New Delhi: Wiley Eastern Ltd., 1985
6. Plummer, D.T, *An Introduction to Practical Biochemistry*. New Delhi: Tata McGraw-Hill. 1998.
7. Palanivelu. P. *Analytical Biochemistry and Separation Techniques*.21st Century Publications. 1998.
8. Kanai L. Mukherjee, - *Medical Laboratory Technology*- New Delhi: A procedure Manual for routine diagnosis tests- Tata McGraw-Hill.. Vol.I- III. 1998.

SEMESTER –III			
Core Practical-III- Laboratory in Microbial Physiology and Metabolism			
Course Code :21UMICR3	**Hrs/Week:2**	**Hrs/Sem:30**	**Credits:2**

Objectives:

1. To demonstrate various techniques employed in the cultivation of microorganisms.
2. To discuss on the different phases of microbial growth.
3. To explain the basic concepts of microbial identification based on biochemical tests
4. To demonstrate the basic principle of microbial metabolism

Course Outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Perform IMViC test and identify bacteria of entero bacteriaceae.	1	Sy
CO-2	Perform various biochemical test.	1	Sy
CO-3	Know the effect of various environmental factors.	1	Kn
CO-4	Prepare buffer and determine the pH.	1	Sy
CO-5	Various hydrolysis for the production of extra-cellular enzymes.	1	Sy
CO-6	Explain the concept of microbial growth, its measurement and growth curve	1	Co
CO-7	know the working principle of spectrophotometer and be able to handle	1	Kn
CO-8	Demonstrate the working principle of SDS-PAGE and Agarose gel electrophoresis.	1	Kn

SEMESTER –III			
Core Practical-III- Laboratory in Microbial Physiology and Metabolism			
Course Code: 21UMICR3	**Hrs/Week:2**	**Hrs/Sem:30**	**Credits:2**

Practicals:

1. IMVIC test
2. Carbohydrate fermentation-Glucose.
3. TSI test
4. Production of extracellular enzyme
   a) Starch hydrolysis
   b) Casein hydrolysis
   c) Lipid hydrolysis
   d) Gelatin hydrolysis
5. Urease test
6. Nitrate reduction test
7. Catalase test
8. Construction of growth curve - Demonstration
9. Effect of pH and Temperature on bacterial growth
10. Bacterial population count by turbidity method - Demonstration
11. Isolation of photosynthetic microorganism from environment
12. Estimation of calcium ions present in sporulating bacteria by EDTA method.

Books for Reference:

1. Cappuccino J.G. and Sherman N. Microbiology : *A Laboratory manual*, San Francisco: Benjamin Cummings Publishing Co. Inc,. 1996.
2. Kannan,N. *Laboratory Manual in General Microbiology*. Paramount Publication, 1996.
3. MurrayP.R; BaronE.J;Jorgerson J.H;Pfaller M.A.and Yolker R.H. *Manual of Clinical microbiology*. Washington D.C: 8th edition.Vol.1&2ASM .2003.
4. Sundararaj.T. *Laboratory manual.* Chennai. (1st edition) publn Sundararaj.A. 2005.
5. Jayaraman,J. *Laboratory Manual in Biochemistry*. New Delhi: Wiley Eastern Ltd.,. 1985.
6. Plummer,D.T. *An Introduction to Practical Biochemistry.* New Delhi: Tata McGraw-Hill. 1998.
7. Palanivelu.P. *Analytical Biochemistry and Separation techniques*. Chennai: 21st Century Publications. 1998.

SEMESTER IV			
Core Practical IV - Laboratory in Molecular Biology and Microbial Genetics			
Course Code:21UMICR4	**Hrs/Week: 2**	**Hrs/Sem : 30**	**Credit : 2**

Objectives:

1. To impart basic level laboratory training in the subject of Microbial genetics.
2. To extend the fundamental knowledge of molecular biology and to provide the highest of genetical studies towards research field.

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO Addressed	CL
CO-1	examine spontaneous mutants.	4	An
CO-2	examine induced mutant by UV	5	An
CO-3	analyze antibiotic resistant mutant by gradient plate technique.	6	An
CO-4	examine UV induced auxotrophic mutants by replica plate technique.	4,5	An
CO-5	demonstrate plasmid DNA from *E.coli*	8	Un
CO-6	demonstrate AGE	7	Un
CO-7	demonstrate conjugation in bacteria by genetic recombination.	8	Un
CO-8	demonstrate PCR.	7,8	Un

SEMESTER IV			
Core Practical IV - Laboratory in Molecular Biology and Microbial Genetics			
Course Code: 21UMICR4	**Hrs/Week : 2**	**Hrs/Sem: 30**	**Credit : 2**

1. Plasmid DNA isolation from *E.coli*
2. Isolation of spontaneous mutants.
3. Isolation of induced mutant by UV
4. Isolation of antibiotic resistant mutants by gradient plate technique
5. UV induced auxotrophic mutants production and isolation of mutants by replica plating technique
6. Screening and isolation of phage from sewage.
7. Agarose Gel Electrophoresis
8. Genetic recombination in Bacteria by conjugation (Demonstration)
9. Preparation of competent cell
10. Bacterial Transformation (Demonstration).

Books for Reference:

1. Cappuccino., and Sherman. N. *Microbiology – A Laboratory Manual.* New York: Benjamin Cummins. 1996.
2. Gunasekaran. *Laboratory Manual in Microbiology*. New Delhi: New Age International Ltd.,Publishers, 1996.
3. Jayaraman, J., *Laboratory Manual in Biochemistry.* New Delhi: Wiley Eastern Ltd., 1985.
4. Kannan. N. *Laboratory Manual in General Microbiology*. Palani: Palani Paramount Publication, 1996.
5. Sunderaraj., *Microbiology – Laboratory Manual.* Chennai: Publn. Sunderaraj. T, 1st Edition.2005.

SEMESTER-IV			
NME II-Clinical Microbiology			
Course Code: 21UMIN41	**Hrs/Week:2**	**Hrs/Sem:30**	**Credit:2**

Objectives

1. To gain knowledge on the relevant clinical examples of bacterial, viral, fungal, and parasitic pathogens and the diseases they cause. To understand pathogenic microorganisms and the mechanisms by which they cause disease in thehuman body.
2. To develop informatics and diagnostic skills, including the use and interpretation of laboratory test in the diagnosis of infectious diseases

Course Outcome:

CO No	Upon completion of this course students will be able to	PSO addressed	CL
CO-1	Provide knowledge on the importance of Clinical microbiology	1,4	Un,An
CO-2	Acquire knowledge on normal flora on human body.	1	Un
CO-3	Acquire knowledge on various types of diseases.	6	Co
CO-4	Provide information about the mechanisms of Infectious disease transmission	1,6	Un
CO-5	Acquire knowledge on causative agent, treatment, prevention and control measures.	1,6	Un
CO-6	Provide interpretation of laboratory tests in the Diagnosis of infectious diseases.	2	Co
CO-7	understand the importance of pathogenic bacteria in human disease with respect to in-fections of the respiratory tract, gastrointes-tinal tract, urinary tract, skin and soft tissue.	6	Co
CO-8	Develop basic skills necessary to work in the Microbiology laboratory.	1,2	Un

SEMESTER-IV			
NME II-Clinical Microbiology			
Course Code:21UMIN41	**Hrs/Week:2**	**Hrs/Sem:30**	**Credit:2**

Unit-I: Basics of Clinical Microbiology

Sources of infection- Routes of transmission-control measures-Testing by Koch's postulates – Antibiotic sensitivity testing

Unit-II: Bacterial pathogens

Bacterial pathogens- *Streptococcal,Staphylococci, E. coli Pseudomonas,and Vibrio cholerae.*

Unit–III: Fungal pathogens

Fungal pathogens- Mycosis, *Candida, Aspergillus-Dermatophytes*

Unit-IV: Viral pathogens

Viral pathogens- Polio, Rabies virus, Dengue, AIDS and CoronaVirus.

Unit-V: Protozoan pathogens

Protozoan pathogens - *E.histolytica*, Plasmodium, Giardia, Taenia solium, Ascaris

Text Books:

1. Ananthanaryanan R and Panikar J, *Textbook of Microbiology*, Orient Longmans. 2000.
2. Rajan.S. *Medical Microbiology*, Chennai, MJP Publisher, 2007.

Books for Reference:

1. Kanai L Mukherjee, *Medical Laboratory Technology,* India, McGraw Hill Education; 2nd edition. 24 June 2010.
2. Salle, A.J. *Fundamental Principles of Bacteriology*. New Delhi, TataMcGraw-Hill Publishing Company Ltd.(7thedition), 1996.
3. PelczarJr.,M.J,.Chan.E.C.S. and Kreig, N.R.*Microbiology,* New York: McGrawHillInc.,

SEMESTER I			
Skill Enhancement Course – I Professional English for Microbiology - I			
Course Code -21UMIPE1	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credits: 2**

Objectives:

- To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year students.
- To develop the language skills of students by offering adequate practice in professional contexts.
- To focus on developing students' knowledge of domain specific registers and the required language skills.
- To develop strategic competence that will help in efficient communication
- To sharpen students' critical thinking skills and make students culturally aware of the target situation.

Course outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Recognise their own ability to improve their own competence in using the language	1	An
CO-2	Use language for speaking with confidence in an intelligible and acceptable manner	2	Ap
CO-3	Understand the importance of reading for life	1	Un
CO-4	Read independently unfamiliar texts with comprehension	1,2,3	Re
CO-5	Understand the importance of writing in academic life	7	Un
CO-6	Write simple sentences without committing error of spelling or grammar	1	Re
CO-7	Know presentation skills	1	An
CO-8	Get critical thinking skills	1	Un

SEMESTER I			
Skill Enhancement Course – I Professional English for Microbiology – I			
Course Code : 21UMIPE1	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credits: 2**

Unit 1: Communication

Listening: Listening to audio text on history of Microbiology and answering questions

- Listening to Scope of Microbiology

Speaking: Pair work and small group work on difference between prokaryotes and eukaryotes.

Reading: Comprehension passages on bacterial cell wall – Differentiate between facts and opinion

Writing: Developing a story with pictures on structure of bacterial cell**.**

Vocabulary: Register specific - Incorporated into the LSRW tasks

Unit 2: Description

Listening: Listening to process description of Gram's staining - Drawing a flow chart.

Speaking: Role play about the contributors of Microbiology

Reading: Skimming/Scanning- Reading passages on Smear preparation

Writing: Process Description – Sterilization

Paragraph-Sentence Definition and Extended definition on methods of sterilization.

Vocabulary: Register specific -Incorporated into the LSRW tasks.

UNIT 3: Negotiation strategies

Listening: Listening to interviews of specialists / Inventors in fields of Microbiology

Speaking: Brainstorming on Microscopy (Mind mapping).

Small group discussions (Development of Microbiology)

Reading: Longer Reading text on culture media preparation.

Writing: Essay Writing (250 words) types of media.

Vocabulary: Register specific - Incorporated into the LSRW tasks

UNIT 4: Presentation skills

Listening: Listening to lectures on Electron Microscope.

Speaking: Short talks on importance of Microscope.

Reading: Reading Comprehension passages on Whittaker's five kingdom classification.

Writing: Writing an essay on Algae. Interpreting Visuals inputs

Vocabulary: Register specific -Incorporated into the LSRW tasks

UNIT 5: Critical thinking skills

Listening: Listening comprehension- Audio on Virus - Listening for information.

Speaking: Making PPT on structure of virus.

Reading : Comprehension passages on Life cycle of

Virus –Note making. Comprehension:

Research article on current trends about

virus

Writing: Problem and Solution essay– Creative writing –

Summary writing on vaccine production

Vocabulary: Register specific - Incorporated into the LSRW tasks

Text Books:

1. Tamil Nadu State Council for Higher Education (TANSCHE*),*

Professional Englishfor Life Science- I

2. Rajan S., Selvi Christy R*., Essentials of Microbiology*. CBS Publishers and Distributers. 2015

Books for Reference:

1. Prescott L.M., Harley J.P., and Klein D.A., *Microbiology* New York: McGraw- Hill Inc, 7th edition, 2008.
2. Dubey R.C., and Maheswari, S. *A Text Book of Microbiology*, New Delhi: S.Chand & Co, 2003.
3. Pelczar Jr., M.J. Chan E.C.S., and Kreig N.R. *Microbiology,* New York: McGraw- Hill Inc, 1993.
4. Pelczar, *Microbiology*, Tata McGraw-Hill Education. 1998.

SEMESTER II			
Skill Enhancement Course – II Professional English for Microbiology – II			
Course Code -21UMIPE2	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credits: 2**

- **Objectives:**

• Develop their competence in the use of English with particularreference to the workplace situation.

• Enhance the creativity of the students, which will enable them tothink of innovative ways to solve issues in the workplace.

• Develop their competence and competitiveness and therebyimprove their employability skills.

• Help students with a research bent of mind develop their skills inwriting reports and research proposals.

Course outcome:

CO No	Upon completion of this course, students will be able to	PSO addressed	CL
CO – 1	Attend interviews with boldness and confidence.	6	Ev
CO – 2	Adapt easily into the workplace context, having become communicatively competent.	8	Cr
CO – 3	Apply to the Research & Development organisations/ sections in companies and offices with winning proposals.	8	Ap
CO – 4	Know digital competence	6, 1	Kn
CO – 5	Get an idea about academic writing	1, 6	Un
CO - 6	Get communicative competence	6, 8	Un
CO - 7	Get work place communication	8	Un
CO - 8	Develop creativity and imagination	2	Un

SEMESTER II			
Skill Enhancement Course – II Professional English for Microbiology – II			
Course Code -21UMIPE2	**Hrs/ Week: 2**	**Hrs/ Sem: 30**	**Credits: 2**

Unit 1- Communicative Competence

Listening – Listening to two talks/lectures by specialists on Microbial growth- (TED Talks) and answering comprehension exercises (inferential questions)

Speaking: Small group discussions on microbial metabolism- open ended questions

Reading: Two subject-based reading texts followed by comprehension activities/exercises on Buffer and it's preparation

Writing: Summary writing based on the reading passages on Buffer and it's preparation

Unit 2 - Persuasive Communication

Listening: listening to sample preparation for TEM and SEM

Speaking: debate on pros and cons of Micro organisms.

Reading: reading texts on advertisements and answering inferential questions on Butter

Writing: dialogue writing- writing an argumentative /persuasive essay on ice cream making.

Unit 3- Digital Competence

Listening: Listening to interviews of renowned alumnae.

Speaking: Interviews with subject specialists (using video conferencing skills)

Creating Vlogs (How to become a vlogger and use vlogging to nurture interests – subject related)

Reading: Selected sample of Web Page of a life science virtual lab.

Writing: Creating Web Pages

Reading Comprehension: Essay on Digital Competence for Academic and Professional Life.

Unit 4 - Creativity and Imagination

Listening: Listening to short (2 to 5 minutes) academic videos (prepared byEMRC/ other MOOC videos on Indian academic sites – E.g.https://www.youtube.com/watch?v=tpvicScuDy0)

Speaking: Making oral presentations through short films on impact of COVID 19.

Reading: Essay on Creativity and Imagination about impact of COVID 19

Writing – Basic Script Writing for short films Awareness about COVID 19

- Creating blogs, flyers and brochures on safety precaution for COVID 19
- Poster making – writing slogans/captions Symptoms of COVID 19

Unit 5- Work place Communication & Basics of Academic Writing

Speaking: Short academic presentation using PowerPoint opportunities in microbiology

Reading &Writing: Product Profiles, Circulars, Minutes of Meeting.

Writing an introduction, paraphrasing
Punctuation (period, question mark, exclamation point, comma, semicolon, colon, dash, hyphen, parentheses, brackets, braces, apostrophe, quotation marks, and ellipsis)
Capitalization (use of upper case)

Text Books:

1. Tamil Nadu State Council for Higher Education (TANSCHE), Professional English for LifeScience- I
2. Rajan S., Selvi Christy R., *Essentials of Microbiology*. CBS Publishers and Distributers. 2015

Books for References:

1. Prescott L.M., Harley J.P., and Klein D.A., *Microbiology* (7th edition) New York: McGraw- Hill Inc,. 2008.
2. Dubey R.C., and Maheswari, S. *A Text Book of Microbiology*, New Delhi: S.Chand& Co, 2003.
3. Pelczar Jr., M.J. Chan E.C.S., and Kreig N.R. *Microbiology*- New York: McGraw- Hill Inc,. 1993.
4. Pelczar, *Microbiology*, Tata McGraw-Hill Education. 1998

SEMESTER –III			
Skill Based Elective – Bioinstrumentation			
Course code-21UMIS31	**Hrs/Week:2**	**Hrs/Sem:30**	**Credits:2**

Objectives

1. To know the fundamental principles and applications of basic instruments in biology
2. To learn the types of electrophoresis and spectroscopy
3. To understand, design and evaluate systems and devices that can measure, test and/or acquire biological information
4. To apply advanced control theory to practical research problems.

Course Outcome:

CO No	Upon completion of this course, Students will be able to	PSO Addressed	CL
CO-1	Understand the concept about the basic instrumentation.	2	Un
CO-2	Know about pH measurements and important Of buffer.	2,3	Un
CO-3	Develop basic principles and application of centrifuge.	2,3	Co
CO-4	Develop basic principles and application of spectrophotometer.	2	Un
CO-5	Demonstrate an understanding of Electrophoresis.	2	Sy
CO-6	Develop basic principles and application of colorimetry	2,4	Co
CO-7	Grasp the principles and applications of Various instruments	2	Un
CO-8	Grasp the knowledge about advanced instrumentation.	2	Un

SEMESTER –III			
Skill Based Elective – Bioinstrumentation			
Course code-21UMIS31	**Hrs/Week:2**	**Hrs/Sem:30**	**Credits:2**

Unit-I: Basics of instrumentation

Balance, pH meter, Reagent preparations. Buffers – Preparation of buffers-Standard buffers -Basic principle of centrifugation, and its types - Ultra Centrifugation (Preparative and analytical), Density gradient Centrifugation, Rate zonal centrifugation, Differential centrifugation.

Unit–II: Photometry

Colorimetry: Instruments of Colorimetry, components and their functions – Beer Lambert's Law. Spectrophotometer, UV-Visible Spectrophotometer, Types of Spectrophotometer instrumentation and application. Flame Photometry.

Unit–III: Chromatographic techniques

Chromatography - Principle, instrumentation and application of Paper Chromatography, Adsorption chromatography, Ion exchange Chromatography, Thin layer Chromatography, Affinity chromatography, HPLC and GC.

Unit-IV: Electrophoresis

Electrophoretic techniques –principle, Agarose Gel Electrophoresis, SDS-PAGE, Native Gel, 2D gel and gradient Gel Electrophoresis, Pulsed field Gel Electrophoresis (PFGE).

Unit–V: Advanced instrumentation

Spectroscopy – Raman effect, UV-Visible, Mass spectroscopy, Atomic Absorption spectroscopy, NMR –Experimental techniques and instrumentation.

Textbooks

1. Upadhyay, Upadhyay and Nath, *Biophysical chemistry – principles and techniques*, Himalaya publishing home, 3 rd edition , 2002
2. J.Jayaram *Laboratory manual in biochemistry*, Wiley publisher. 1981
3. L.Veerakumari *Bioinstrumentation*, MJP publishers, 1st edition. 2011**.**

BooksforReference:

1. Jayaraman.J. *Laboratory Manual in Bio chemistry*. NewDelhi Wiley Eastern Ltd. 1985.
2. Plummer.D.T. *An Introduction to Practical Biochemistry,* NewDelhi TataMcGrawHill. 1998.
3. P.Palanivelu *Analytical biochemistry and separation techniques-A laboratory manual*, tulsi books centre2nd edition 2001.

4. Keith Wilson and John walker *Principles and techniques of practical biochemistry*, Cambridge University press., 5th edition 2000.
5. Gurumani.N. *Research Methodology for Biological sciences*, Chennai. MJP publishers.2006.
6. D. Holme and H. Peck *Analytical biochemistry*, longman, 3rd edition 1998.
7. Freifelder, *Physical biochemistry- application to biochemistry and molecular biology*, San Fransisco. W.H. Freeman and company, 2nd edition, 1982.

SEMESTER – IV			
Skill Based Elective- Practical in Parasitology			
Course Code:21UMIS42	**Hrs/week : 2**	**Hrs/Sem : 30**	**Credit:2**

Objectives:

Parasitology focuses on medical parasites and includes their morphology, lifecycle, and the relationship with host and environment. These graduates play a vital role in the provision of quality health care and in scholarship for the advancement of self, the profession and society.

Course Outcome:

CO NO.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the laboratory practices and know how to maintain the laboratory instruments	1,2	Un
CO-2	analyze and distinguish various types of stool samples	2,3,4	An
CO-3	evaluate the culture tests and understand the patho-logical diseases of humans	2,4	An
CO-4	analyze the detection of Ascaris, *E. histolytica* in from sputum sample.	2,3	An
CO-5	perform various techniques on isolation of micro-organisms for various sources	2	Ap
CO-6	understand the blood smear by field's stain.	1,2	Un
CO-7	perform the examination of *Leishmania* spp. from blood parasites	2	Ap
CO-8	analyze and isolate the microbes from blood	3,4	An

SEMESTER – IV			
Skill Based Elective- Practical in Parasitology			
Course Code: 21UMIS42	**Hrs/week : 2**	**Hrs/Sem : 30**	**Credit:2**

1. Laboratory safety guidelines.
2. Collection and Preservation of stool specimen.
3. Identification of intestinal parasites- microscopic method
4. Examination of stool sample by saline wet mount method.
5. Iodine wet preparation of the fresh stools.
6. Formalin-Ether concentration method for stool sample.
7. Concentration of stool parasites.
8. Sedimentation method of stool sample.
9. Floatation method of stool sample.
10. Agar plate test for strongloides.(Demonstration)
11. Detection of *Schistosoma haematobium* in urine sample.
12. Detection of *Trichomonas vaginalis* from vaginal swabs.
13. Detection of Ascaris, *E. histolytica*in from sputum sample.
14. Preparation and staining of thick and thin smear for *plasmodium* spp.
15. Examination of blood smear by field's stain.
16. Examination of blood smear by Giemsa stain.
17. Examination of *Leishmania* spp. from blood parasites by Leishman's staining
18. Hematoxylin stain for microfilaria. (Demonstration)

REFERENCES

1. LTLP Broad sheet 11 . *Methodology update.* Section 4.3.oct 11,1990.
2. Garcia LS, Bruckner DA. *Diagnostic Medical Parasitology.* Washington DC: ASM press. 3rd edition. 1997.
3. Neva FA, Brown HW. *Basic clinical parasitology.* Appleton and Norwalk Connecticut. 6th edition. 1994.
4. Ash LR Oreil TC. *Atlas of human parasitology.* Chicago: ASCP press. 4th edition. 1997.
5. Honigberg, B.M. *Trichomonads parasitic in human* . New York: springer-verlag, 1989.

6. Wilcox .A. *Manual for the microscopical diagnosis of malaria in man.* Washington, D.C: U. S department of health,Education and welfare. 1960.
7. Basic malarial microscopy World health organization, Geneva, Switzerland.1991.
8. National committee for Clinical Laboratory Standards. Use of film examination for parasites tentative guideline M15-T National committee for Clinical laboratory standards ,Villanova, PA, 1992.