BACHELOR OF SCIENCE (MICROBIOLOGY)

REGULATIONS

ELIGIBILITY

A Candidate who has passed higher secondary examination in any one of the biological sciences namely Botany and Zoology or Biology subjects under higher secondary board examination, Tamil Nadu or as per norms set by the Government of Tamil Nadu or an examination accepted as Equivalent thereto by the Syndicate subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the **B.Sc., Microbiology** degree examination of this University after a course of study of three years.

DURATION OF THE COURSE

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

OBJECTIVES OF THE COURSE

1. The three year B.Sc., program is designed to create innovative & versatile personality students in the field of Life Science especially in microbiology through our quality education.
2. To equip the practical skills in Microbiology, Immunology and Molecular Biology techniques.
3. The programme gives a wide range of knowledge in microorganisms and its role in industry, food plant, and animal and in the field of microbial biotechnology aspects.
4. Various job oriented core papers have been introduced to train the students for entrepreneurship.

SCHEME OF EXAMINATION

Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Max Marks			Credit Points
				CA	CE	Total	
First Semester							
Part I							
15UTALA101/ 15UHILA101/ 15UMMLA101/ 15UFRLA101	Tamil I /Hindi I/ Malayalam I/ French I	5	3	25	75	100	3
Part II							
15UENLA101	Foundation English I	5	3	25	75	100	3
Part III							
15UMBM101	Core I: Basics in Microbiology	5	3	25	75	100	5
15UCHMBA101	Allied I: Chemistry	4	3	25	75	100	3
15UMBMP101	Core Practical I	4	6	40	60	100	2
15UCHMBAP101	Allied Practical I: Volumetric and organic analysis	3	3	40	60	100	2
Part IV							
15UVE101	Value Education I: Yoga	2	3	25	75	100	2
		28				**700**	**20**
Second Semester							
Part I							
15UTALA201/ 15UHILA201/ 15UMMLA201/ 15UFRLA201	Tamil II /Hindi II/ Malayalam II/ French II	5	3	25	75	100	3
Part II							
15UENLA201	Foundation English II	5	3	25	75	100	3
Part III							
15UMBM201	Core II: Microbial Taxonomy	6	3	25	75	100	5
15UBCMBA201	Allied II: Biochemistry I: Biomolecules	3	3	25	75	100	3
15UMBMP201	Core Practical II	4	6	40	60	100	2
15UBCMBAP201	Allied Practical II: Biochemistry	3	3	40	60	100	2
Part IV							

15UVE201	Value Education II: Environmental Studies	2	3	25	75	100	2
		28				**700**	**20**
Third Semester							
	Part I						
15UTALA301/ 15UHILA301/ 15UMMLA301/ 15UFRLA301	Tamil III / Hindi III/ Malayalam III / French III	5	3	25	75	100	3
	Part II						
15UENLA301	Foundation English III	5	3	25	75	100	3
	Part III						
15UMBM301	Core III: Microbial Physiology	5	3	25	75	100	5
15UBCMBA301	Allied III: Biochemistry II: Enzymes and Bioenergetics	3	3	25	75	100	3
15UMBMP301	Core Practical III	4	6	40	60	100	2
15UBCMBAP301	Allied Practical III: Biochemistry	3	3	40	60	100	2
	Part IV						
15UMBSBC301	SBC I : Bioinstrumentation	2	3	25	75	100	2
	NMEC I	2	3	25	75	100	2
	Non credit						
15ULS301	Career Competency Skills I	1					
		30				**800**	**22**
	***Diploma**						
Fourth Semester							
	Part I						
15UTALA401/ 15UHILA401/ 15UMMLA401/ 15UFRLA401	Tamil IV / Hindi IV / Malayalam IV/ French IV	5	3	25	75	100	3
	Part II						
15UENLA401	Foundation English IV	5	3	25	75	100	3
	Part III						
15UMBM401	Core IV: Molecular Biology	4	3	25	75	100	4
15UCSMBA401	Allied IV: Computer for Biology	2	3	25	75	100	2
15UMAMBA401	Allied V: Mathematics and Statistics for Microbiology	4	3	25	75	100	4
15UMBMP401	Core Practical IV	3	6	40	60	100	2
15UCSMBAP401	Allied Practical IV: Office Package for Biology	2	3	40	60	100	2
	Part IV						
15UMBSBC401	SBC II : Pharmaceutical Microbiology	2	3	25	75	100	2
	NMEC II	2	3	25	75	100	2

Non credit							
15ULS401	Career Competency Skills II	1					
		30				**900**	**24**
***Diploma**							
Fifth Semester							
Part III							
15UMBM501	Core V: Fundamentals in Virology	5	3	25	75	100	5
15UMBM502	Core VI: Immunology	5	3	25	75	100	5
15UMBM503	Core VII: Fermentation Technology	5	3	25	75	100	5
15UMBM504	Core VIII: Food and Dairy Microbiology	5	3	25	75	100	5
15UMBM505	Core IX: Microbial Ecology	4	3	25	75	100	4
15UMBMP501	Core Practical V	5	6	40	60	100	2
Part IV							
15UMBSBC501	SBC III : Entrepreneurial Microbiology (Self study & 100% Internal evaluation)		3	100	-	100	2
Part V							
15UMBE501	Extension Activity	-	-	-	-	-	2
		29				**700**	**30**
Sixth Semester							
Part III							
15UMBM601	Core X: Medical Microbiology	5	3	25	75	100	5
15UMBM602	Core XI: Genetic Engineering	5	3	25	75	100	5
15UMBM603	Core XII : Microbiology for Social welfare (Self study & 100% External evaluation)	-	3	-	100	100	4
	Elective I	4	3	25	75	100	4
15UMBMP601	Core Practical VI	5	6	40	60	100	2
15UMBPR601	Project & Viva-Voce	8	-	40	60	100	5
Part IV							
15UMBSBC601	SBC IV: Nanomicrobiology	2		25	75	100	2
		29				**700**	**27**
					Grand Total	**4500**	**143**

*Students have to complete their diploma course during their second year (III & IV Semester)

*Students have to undergo a Field visit in Semester V, Semester VI and a report to be submitted.

ELECTIVE

The students shall opt one of the following subjects as Elective in sixth semester

Subject code	Subject
15UMBEL601	Biophysics and Bioinformatics
15UMBEL602	Basic and Applied Botany

Non Major Elective Course (NMEC)

Course Code	Subject	Semester
15UMBN301	Personal Hygiene	III
15UMBN401	Microbes and Human health	IV

DIPLOMA COURSE

The student shall complete the diploma course during their third and fourth Semester of their course

Third and Fourth Semester		
Subject code	**Subject**	**Duration**
15UMBD401	Diploma in Clinical Microbiology	90 Hours (45 Hrs in each semester)

TOTAL MARKS AND CREDIT DISTRIBUTION

S.NO	PART	MARKS	NO. CREDITS
1.	PART I: Language	400	12
2.	PART II: Foundation English	400	12
3.	PART III : Core, Allied and Elective	2900	101
4.	PART IV: Value Education (Yoga) Environmental Studies NMEC & SBC	800	16
5.	PART V: Extension Activity		2
TOTAL		**4500**	**143**

FOR COURSE COMPLETION

Student shall complete

- Language subjects (Tamil/Hindi/Malayalam/French, English) in I, II, III and IV semester.
- Value education: Yoga and Environmental Studies in I and II semester respectively.
- Allied subjects in I, II, III and IV semester.
- One Diploma course in the second year of their course of study.
- Two Non Major Elective Courses in III and IV semester.
- Four Skill Based Courses in III, IV, V and VI semester.
- Self study subjects in V and VI semester.
- Extension activity in V semester.
- Elective subject in VI semester.
- Field visit in V and VI semester.
- Group project at the end of VI semester.

15UMBM101	CORE I: BASICS IN MICROBIOLOGY	SEMESTER – I

Total Hours: 50

OBJECTIVES:

1. To learn about the early developments of microbiology
2. To understand the basic concepts of microscopy, staining, sterilization and chemotherapeutic techniques.

CONTENTS

UNIT - I **(10 Hours)**

Introduction to Microbiology: Scope of Microbiology – Groups of Microorganisms. Historical developments - Spontaneous generation – Germ theory of diseases. Contributions of Leeuwenhoek- Louis Pasteur - Joseph Lister - Edward Jenner – Robert Koch – Alexander Fleming.

UNIT- II **(10Hours)**

Microscopy: Principles of microscopy- light microscopy – Dark field, Phase Contrast and Fluorescent microscopy. Electron microscopy - Scanning and Transmission electron microscopy. Confocal microscopy. Staining techniques: Staining types - Simple, Differential and Special – Spore, Capsule.

UNIT - III **(10 Hours)**

Culture techniques - Media preparation – Culture media - Types of media – Methods of obtaining pure cultures – Preservation of culture. Microbial cell: Ultra structure of bacteria, sub cellular structures and cell envelope –capsule, cell wall, pili and flagella.

UNIT - IV **(10 Hours)**

Sterilization Principles: Physical agents - dry heat, moist heat, Radiation, Filtration. Chemical agents –Alcohols, phenol, aldehydes and gaseous agents.

UNIT - V **(10 Hours)**

Antimicrobial chemotherapy: Antibiotics – Classification based on structure and function. Mechanism of drug resistance. Tests for antimicrobial susceptibility – Kirby Bauer Method and Stokes Method.

TEXT BOOK:

1. *Lansing M Prescott, John P Harley and Donald A Klein*.2010. **Microbiology**. [Eighth Edition]. Mc Graw Hill, New York.

REFERENCE BOOKS:

1. *Atlas, R.M.* 1997. **Principles of Microbiology.** [Second Edition]. WCK. Mc Graw – Hill.
2. *Black, J. G.* 1999. **Microbiology - Principles and Exploration.** [Fourth Edition]. Prentice Hall International Inc.
3. *Madigan, M.T. Martinko, J.M. and Parker, J.* 2000. **Brock Biology of Microorganisms.** [Ninth Edition]. Prentice Hall International, Inc.

15UCHMBA101/ 15UCHBTA101	**ALLIED I: CHEMISTRY** **(For B.Sc Microbiology and Biotechnology)**	**SEMESTER – I**

Total hours: 30

OBJECTIVES:

- To understand the fundamentals of atomic structure and chemical bonding and electrochemistry.
- To understand the basics of nucleic acids and vitamins.
- To understand the chemistry of rubber, cement and explosives.
- To understand the principles involving in the volumetric analysis.

CONTENTS

UNIT - I **(6 Hours)**

Atomic structure: Aufbau principles-Hund's rule-atomic orbitals (s, p and d orbitals) - their pictorial representation- electronic configurations of elements. **Chemical bonding:**Kossel -Lewis approach to chemical bond formation-types of bonding-Ionic Bonds-Covalent Bond- Co-ordinate Bond- Hybridization - shapes of covalent molecules and bonds- Hydrogen Bond- types of hydrogen bond with examples.

UNIT - II **(6 Hours)**

Nucleic acids - Types of sugars – Nucleosides and Nucleotides –Types of nucleic acids - Structure and functions of DNA and RNA-differences between RNA and DNA. **Vitamins**- classification, biological importance of vitamins A, B_1, B_2, B_6,B_{12}, D and C – Sources and deficiency disorders

UNIT-III **(6 Hours)**

Rubber-Natural and synthetic rubber – composition of natural rubber – Neoprene rubber, styrene butadiene rubber (SBR). Vulcanization – Uses of rubber. **Cement** – Manufacture of Portland cement – Setting of cement - Special cements –Mortars and Concretes. **Chemical Explosives**-Origin of explosive, preparation and chemistry of nitrocellulose, TNT, gunpowder-Classification of Propellants and Rocket fuels – Properties of a good propellant.

UNIT-IV **(6 Hours)**

Electrochemisty-definition-electrode-electrolyte-Faraday's laws-Conduction in metals and in electrolyte solutions-measurement of conductance. Variation of equivalent and specific conductance with dilution-Ostwalds dilution law. Onsagar equation (no derivation) Significance and limitations. Ionic mobility – transport number –

determination by Hittorf and moving boundary methods- Kohlrausch law and its applications.

UNIT-V **(6 Hours)**

Volumetric analysis-Terminology- basic requirements of a titration reaction- standard solution- primary standard- expressing concentration of standard solution- acid-base titration –types and their indicators. Errors-types of errors-Determinate-Indeterminate errors-Normal error curve- Accuracy – Precision- relative and standard deviation-Methods for minimizing errors- introduction to Significant figures.

TEXT BOOK:

1. *Madan, R.L.* 2010. **Chemistry for degree students**, S.Chand and Company Ltd, New Delhi.

REFERENCE BOOKS:

1. *Mukherjee, S.M. Singh, S.P.* and *Kapoor, R.P.* 1985. **Organic Chemistry.** [First Edition]. New Age International (P) Ltd. Publishers, New Delhi.
2. *Puri, B.R., Sharma, L.R.* and *Pathania, M.S.* 1998. **Principles of Physical Chemistry.** Shoban Lal Nagin Chand and Co., Jalandhar, Punjab.

15UMBMP101	CORE PRACTICAL I : BASICS IN MICROBIOLOGY	SEMESTER - I

LIST OF EXPERIMENT

1. Sterilization Techniques – Dry Heat (Hot air Oven), Moist Heat (Autoclave) & Membrane filter.
2. Cleaning of Glassware.
3. Staining techniques – Simple Staining.
4. Gram's staining.
5. Acid Fast (Ziehl-Neelsen) Staining.
6. Spore Staining.
7. Capsular Staining.
8. Media preparation -Liquid media –Nutrient broth, Solid media – Nutrient agar.
9. Preparation of agar slants and agar deeps.
10. Pure culture techniques – Serial dilution method and pour plate method.
11. Streak plate method.
12. Spread plate method.
13. Stab culture method.
14. Antibiotic sensitivity test – Kirby- Bauer disc diffusion method.

REFERENCE BOOKS:

1. *Cappucino, J.G and Sherman, N.* 2012. **Microbiology – A laboratory manual.** [Seventh Edition]. Pearson Education Inc.
2. *Kannan, N.* **Laboratory manual in General Microbiology.** [Second Edition]. Panima publishing corporation, New Delhi.

15UCHMBAP101/ 15UCHBTAP101	**ALLIED PRACTICAL I: VOLUMETRIC AND ORGANIC ANALYSIS (For B.Sc Microbiology and Biotechnology)**	**SEMESTER – I**

OBJECTIVES:

- To understand the principles of quantitative analysis.
- To understand the qualitative analysis of simple organic Compounds.

CONTENTS

1. Quantitative analysis

1. Estimation of $KMnO_4$.
2. Estimation of Hydrochloric acid.

2. Qualitative analysis

Organic analysis of Carbohydrate, Phenol, Acid, ketone, aldehyde and Amide.

REFERENCE BOOK:

1. *Venkateswaran V, Veeraswamy R., Kulandaivelu A.R.*, 1997. **Basic Principles of Practical Chemistry**, New Delhi, Second edition, Sultan Chand & Sons, New Delhi.

15UVE101	VALUE EDUCATION I: YOGA (மனவளக்கலை யோகா)	SEMESTER - I

Total Hours: 30

CONTENTS

UNIT - I **(6 Hours)**

YOGA AND PHYSICAL HEALTH

1:1Physical Structure-Three bodies- Five limitations

1:2Simplified Physical Exercises - Hand Exercises - Leg Exercises- Breathing Exercises – eye Exercises - Kapalapathi

1:3Maharasanas 1-2– massages – acu-puncture – Relaxation

1:4Yogasanas-Suriya Namaskar – Padamasana –Vajrasanas – Chakrasanas(Side) – Viruchasanas –Yoga muthra –Patchimothasanas-Ustrasanas–Vakkarasanas Salabasanas.

UNIT- II **(6 Hours)**

ART OF NURTURING THE LIFE FORCE AND MIND

2:1Maintaining the youthfulness - postponing the ageing process

2:2 Sex and spirituality– significance of sexual vital fluid – Married Life–Chastity.

2:3 Ten Stages of Mind

2:4 Mental Frequency – Methods for Concentration

UNIT - III **(6 Hours)**

SUBLIMATION

3:1 Purpose and Philosophy of life

3:2 Introspection – Analysis of Thought

3:3 Moralization of Desires

3:4 Neutralization of Anger

UNIT - IV **(6 Hours)**

HUMAN RESOURCESDEVELOPMENT

4:1 Eradication of worries

4:2 Benefits of Blessings

4:3 Greatness of Friendship

4:4 Individual Peaceand World Peace

UNIT - V **(6 Hours)**

LAWOF NATURE

5:1 Unified Force – Cause and Effect System

5:2 Purity of thought and Deed and Genetic Centre

5:3 Love and Compassion

5:4 Cultural Education –Five fold Culture

TEXT BOOK:

1. Manavalakalai Yoga – World Community Service Center
   VethathiriPathippagam,
   156, Gandhij Road, Erode – 638 001.
   PH: 0424 – 2263845.

REFERENCE BOOKS:

1. Yoga for Modern Age
2. Journey of Consciousness
2. Simplified Physical Exercises – World Community Service Center
   VethathiriPathippagam,
   156, Gandhij Road, Erode – 638 001.
   PH: 0424 – 2263845.

15UMBM201	CORE II: MICROBIAL TAXONOMY	SEMESTER - II

Total Hours: 50

OBJECTIVES:

1. Deals with the classification of microorganisms.
2. To understand the basic characteristic features of microorganism.
3. To learn the importance of the various cellular organization, taxonomic groups and their economic importance.

CONTENTS

UNIT - I **(10 Hours)**

Microbial evolution - Classification – Taxonomy hierarchy. Classical systems of classification – Chemotaxonomy, numerical taxonomy, molecular based classification (rRNA).

UNIT- II **(10 Hours)**

Haeckel's three kingdom concepts – Whittaker's five kingdom concepts – Classification and Salient features of bacteria according to the Bergey's manual of determinative bacteriology.

UNIT – III **(10 Hours)**

Bacterial diversity: Spirochetes, Pseudomonas, Methylotrophic bacteria. Enterobacteriaceae, Vibrionaceae, Phototrophic bacteria. Cyanobacteria

UNIT – IV **(10 Hours)**

Gram + ve cocci and spore forming bacteria. Asporogenous Gram positive rods – regular non spore forming Gram +ve rods – irregular non spore forming Gram +ve rods – Mycobacteria.

UNIT – V **(10 Hours)**

Actinomycetes – Morphological and biochemical differentiation of Actinomycetes – Taxonomic group of actinomycetes – methanogens – methanotrophs.

TEXT BOOK:

1. *Atlas, R.M.* 1997. **Principles of Microbiology.** [Second Edition]. WCK. Mc Graw – Hill.

REFERENCE BOOKS:

1. *Madigan, M.T. Martinko, J.M. and Parker, J.* 2000. **Brock Biology of Microorganisms.** [Ninth Edition]. Prentice Hall International, Inc.
2. *Balows, A. Truper, H.G. Devorkin, M. Harder and Schleife, K.H.* 1992. **The Prokaryotes.** Springerlink. New York.
3. *Lansing, M Prescott, John, Harley, P. and Donald Klein. A.* 2010. **Microbiology**. [Eighth Edition]. Mc Graw Hill, New York.

15UBCMBA201	ALLIED II: BIOCHEMISTRY I (BIOMOLECULES)	SEMESTER - II

Total Hours: 39

OBJECTIVE:

1. To enable the learners to have a strong foundation in the structural aspects of biomolecules, which is the basic requirement of all life sciences.

CONTENTS

UNIT – I **(8 Hours)**

Carbohydrates: Introduction, classification, monosaccharide - Structure, stereo isomers and structural isomers, mutarotation and chemical reactions- reduction, oxidation and phenyl hydrazine. Oligosaccharides – Disaccharides - Structure and importance of sucrose, lactose. Polysaccharides - Structure and importance of homopolysaccharides – Starch and Glycogen. Heteropolysaccharides - Hyaluronic acid and Heparin.

UNIT – II **(8 Hours)**

Amino acids: Classification, Structure and properties. Essential, Non- essential and Non-protein amino acids.

Protein: Classifications and Functions: Structural organization of Proteins - Primary, secondary, tertiary and quaternary structure. Forces involved in stabilization of tertiary structure of proteins.

UNIT – III **(8 Hours)**

Lipids: Classification. Triacylglycerol – Structure, physical & chemical properties. Phospholipids - Structure of lecithin. Phospholipids in cell membrane – Fluid Mosaic model. Derived lipids. Essential fatty acids, Saturated and unsaturated fatty acids: Structure. Sterol – Structure of Cholesterol.

UNIT – IV **(8 Hours)**

Nucleic acids: Structural features of Nitrogenous bases, Nucleosides, Nucleotides. DNA - Double helical structure - Watson and Crick model (B-DNA). Properties of DNA - Density-absorption maxima – Denaturation - Tm, Renaturation. RNA – tRNA, mRNA and rRNA - Structure and functions.

UNIT - V **(7 Hours)**

Vitamins - Classification. Sources, daily requirements, physiological functions and deficiency diseases of water and fat soluble vitamins.

Minerals and Trace elements: Macro and micro minerals. Sources, daily requirements, physiological functions and deficiency diseases of calcium, phosphorous, sodium, potassium, iron.

TEXT BOOK:

1. *Jain, J. L.* 2002. **Fundamentals of Biochemistry.** [Fifth Edition]. S. Chand & Company Ltd., New Delhi.

REFERENCE BOOK:

1. *Deb, A.C.* 2000**. Fundamentals of Biochemistry.** Books and Allied (P) Ltd., Calcutta.

15UMBMP201	CORE PRACTICAL II : MICROBIAL TAXONOMY	SEMESTER - II

LIST OF EXPERIMENT

1. Microscopic examinations of Bacteria – *Staphylococcus* sp. *Lactobacillus* sp.
2. Microscopic examinations of Algae –*Oscillatoria*, *Spirulina* sp. *Nostoc* sp. *Anabaena* sp.
3. Microscopic examinations of Fungi – *Mucor* sp., *Aspergillus* sp.,*Penicillium* sp. *and Alternaria* sp.
4. Preparation of Enriched media-Blood agar, Selective media –EMB agar. Differential media- Macconkey agar.
5. Enumeration and Characterization of Bacteria from the given sample.
6. Enumeration and Characterization of fungi from the given sample.
7. Examination of Cyanobacteria from the given water sample.
8. Demonstration of pigment production on Nutrient agar medium (*Staphylococcus aureus, Pseudomonas aeruginosa and Serratia* sp.)
9. Measurement of cell size by Micrometry- Ocular and Stage meters
10. Motility determination – Hanging drop method

REFERENCE BOOKS:

1. *Aneja, K.R.* 2003. **Experiments in Microbiology, Plant pathology and Biotechnology.** [Fourth Edition]. New age international.
2. *Cappucino, J.G and Sherman, N.* 2012. **Microbiology – A laboratory manual.** [Seventh Edition]. Pearson Education Inc.

15UBCMBAP201	ALLIED PRACTICAL II : BIOCHEMISTRY (BIOMOLECULES)	SEMESTER - II

LIST OF EXPERIMENT

Qualitative analysis

1. Carbohydrates: Glucose, fructose, xylose galactose, sucrose, lactose, maltose, starch.
2. Amino acids: Tyrosine, Tryptophan, Histidine, Methionine, Arginine, Cysteine.
3. Proteins: Solubility test, coagulation test, ninhydrin test, biuret test, Folin's phenol, precipitation by metals.
4. Lipids: Solubility, grease spot, Oil spot, emulsification, halogenations, colour reactions.

REFERENCE BOOKS:

1. *Sadasivam, S.* and *Manickam, A*. 2010. **Biochemical Methods.** [Third Edition]. New Age International (P) Ltd., New Delhi.
2. *Jayaraman, J*. 2008. **Laboratory Manual in Biochemistry**. [First Edition Reprint]. New Age International (P) Ltd., New Delhi.

15UVE201	VALUE EDUCATION II: ENVIRONMENTAL STUDIES	SEMESTER - II

Total Hours: 30

CONTENTS

UNIT - I **(6 Hours)**

Environment– Definition– Scope– Structure and function of ecosystems- producers, consumers and decomposers- Energy flow in the ecosystem- Ecological succession– food chain, food webs and ecological pyramids– Concept of sustainabledevelopment.

UNIT- II **(6 Hours)**

Natural resources: Renewable- air, water, soil, land and wildlife resources. Non–renewable – Mineral coal, oil and gas. Environmental problems related to the extraction and use of naturalresources.

UNIT - III **(6 Hours)**

Biodiversity– Definition– Values– Consumption use, productive social, ethical, aesthetic and option values threats to bio diversity – hotspots of bio diversity– conservation of bio- diversity: in– situEx – situ. Bio– wealth - National and Global level .

UNIT - IV **(6 Hours)**

Environmental Pollution :Definition– causes, effects and mitigation measure s– Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution– Nuclear hazards – Solid wastes acid rain–Climate change and global warming environmental laws and rregulations in India– Earth summit.

UNIT - V **(6 Hours)**

Population and environment – Population explosion – Environment and human health – HIV/AIDS – Women and Child welfare – Resettlement and Rehabilitation of people, Role of information technology in environmental health – Environmental awareness.

TEXTBOOK:

1. Department of Biochemistry. Environmental Studies (Study Material). Published by K.S.Rangasamy College of Arts & Science (Autonomous). Tiruchengode.

REFERENCE BOOK:

1. *Erach Bharucha*. **Textbook of Environmental studies**. Universities press. PVT. Ltd. 2005.

15UMBM301	CORE III: MICROBIAL PHYSIOLOGY	SEMESTER - III

Total Hours: 50

OBJECTIVES:

1. To familiarize the students with the basics in structure and function of bacteria.
2. To understand the basics in metabolic reactions.

CONTENTS

UNIT - I **(10 Hours)**

Growth and mode of cell division in bacteria – growth curve – measurement of growth - – batch, continuous and synchronous culture. Physical conditions for growth (temperature, pH, Osmotic pressure, moisture, radiations and different chemicals). Endospore formation.

UNIT - II **(10 Hours)**

Nutritional requirements and types of bacteria. Transport of nutrients by bacteria – active transport, passive diffusion, facilitated diffusion and group translocation.

UNIT- III **(10 Hours)**

Introduction to metabolism **-** Role of ATP in metabolism, Oxidation reduction reactions, Electron carriers and Electron Transport system. Lipid catabolism –β oxidation.

UNIT- IV **(10 Hours)**

Catabolism of carbohydrates - Glycolysis, Pentose phosphate pathway, Entner Doudoroff Pathway, Tricarboxylic acid cycle. Oxidative phosphorylation, Substrate level phosphorylation.

UNIT – V **(10 Hours)**

Photosynthesis - light reaction in oxygenic and anoxygenic photosynthesis, Autotrophic CO_2 fixation. Fermentation – Definition, Types of fermentation – Alcohol, Lactic acid, Butanol, Propionic acid and Butyric acid.

TEXT BOOK:

1. *Michael J Pelczar, Chan, E. C. S. and Noel R Krieg.* 2005. **Microbiology**. [Fifth Edition]. Tata Mc Graw – Hill Publications Ltd., New Delhi.

REFERENCE BOOKS:

1. *Lansing M Prescott, John P Harley and Donald A Klein*. 2010. **Microbiology**. [Eighth Edition]. Mc Graw Hill, New York.
2. *Atlas, R.M*. 1997. **Principles of Microbiology.** [Second Edition]. WCK. Mc Graw – Hill.
3. *Black, J. G.* 1999. **Microbiology-Principles and Exploration.** [Fourth Edition]. Prentice Hall International Inc.

15UBCMBA301	ALLIED III: BIOCHEMISTRY II (ENZYMES AND BIOENERGETICS)	SEMESTER - III

Total Hours: 39

OBJECTIVE:

1. To enable the learners to construct a good foundation in bioenergetics and this provides comprehensive understanding of biological phenomena.

CONTENTS

UNIT - I **(8 Hours)**

Enzymes: Definition, IUB classification. Active site - Definition. Mechanism of enzyme action - Lock & key model and induced fit hypothesis. Enzyme units - IU, katal. Enzyme kinetics - Factors affecting enzyme activity (pH, Temperature and substrate concentration), M-M Equation.

UNIT - II **(7 Hours)**

Enzyme inhibition - Definition. Types - Irreversible (inhibition by DFP). Reversible – mechanism of competitive, non- competitive and un-competitive inhibition.

Coenzyme- Definition. Apo enzyme and holo enzyme - Definition. General functions of coenzymes.

UNIT - III **(8 Hours)**

Bioenergetics: Laws of thermodynamics. Free energy. Redox potential - Definition. Electron Transport chain - Components of Electron Transport chain. Oxidative phosphorylation - Mechanism of ATP formation. Inhibitors of ETC. Uncouplers. High energy compounds - Types and functions.

UNIT - IV **(8 Hours)**

Carbohydrate metabolism - Reactions of glycolysis and citric acid cycle with energetics. HMP shunt.

Lipid metabolism - Biosynthesis of saturated fatty acids. Oxidation of fatty acids - Beta oxidation.

UNIT - V **(8 Hours)**

Amino acid Metabolism - Transamination, oxidative and non-oxidative deamination, decarboxylation, urea cycle. Integration of carbohydrate, lipid and protein metabolism.

Nucleotide metabolism: Nucleotide metabolism – *De novo* synthesis and degradation of purine and pyrimidine nucleotides. Salvage pathways for purine and pyrimidine nucleotides.

TEXT BOOK:

1. *Jain, J. L.* 2002. **Fundamentals of Biochemistry.** [Fifth Edition]. S.Chand & Company Ltd., New Delhi.

REFERENCE BOOK:

1. *Deb, A.C.* 2000**. Fundamentals of Biochemistry.** Books and Allied (P) Ltd., Calcutta.

15UMBMP301	CORE PRACTICAL III: MICROBIAL PHYSIOLOGY	SEMESTER - III

LIST OF EXPERIMENT

1. Growth curve – Turbidity method
2. Preparation of differential (Macconkey agar, Blood agar) and selective (MSA, EMB) media
3. IMViC tests
4. Sugar fermentation tests
5. Triple sugar iron agar (TSI) and Hydrogen sulphide production test
6. Nitrate reduction test
7. Starch hydrolysis
8. Catalase and Oxidase tests
9. Urease test
10. Gelatin hydrolysis test
11. Effect of various factors on growth of bacteria
12. i. Temperature ii. pH iii. Nutrients – carbon source
13. Thermal Death Point and Thermal Death Time

REFERENCE BOOKS:

1. *Harley Prescott.* **Laboratory exercises in microbiology.** [Fifth Edition]. The Mcgraw-Hill companies.
2. *Kannan, N.* **Laboratory manual in General Microbiology.** Panima publishing corporation, New Delhi.
3. *Benson.* 2001. **Microbiological applications laboratory manual in general microbiology.** [Eighth Edition]. The McGraw-Hill Companies.

15UBCMBAP301	ALLIED PRACTICAL III: BIOCHEMISTRY (QUANTITATIVE ANALYSIS)	SEMESTER - III

LIST OF EXPERIMENT

I. Biochemical Preparation

1. Starch from potato.
2. Casein from milk.

II. Quantitative Analysis

1. Estimation of glucose by Nelson Somogyi method.
2. Estimation of Glycine by formal titration method.
3. Estimation of Total protein by Lowry's method.
4. Estimation of Ascorbic acid by 2, 6-dichlorophenol indophenol dye.
5. Determination of Acid Number.
6. Determination of Saponification value.

REFERENCE BOOKS:

1. *Sadasivam, S. and Manickam, A*. 2010. **Biochemical Methods.** [Third Edition]. New Age International (P) Ltd., New Delhi.
2. *Jayaraman, J*. 2008. **Laboratory Manual in Biochemistry**. [First Edition-Reprint]. New Age International (P) Ltd., New Delhi.

15UMBSBC301	SBC I: BIOINSTRUMENTATION	SEMESTER - III

Total Hours: 30

OBJECTIVES:

1. To learn the working mechanism and applications of biological instruments.
2. To study various analytical techniques in the field of Microbiology

CONTENTS

UNIT - I **(6 Hours)**

Microbiology: Good Laboratory practices, Basic Instrumentation: Handling and Maintenance – Weighing balance, pH meter, Autoclave. Hot air oven, Laminar Air Flow, Centrifuge.

UNIT - II **(6 Hours)**

Centrifugation: Principles of Sedimentation, RCF and RPM, Rotors – Fixed angle, vertical tube and swinging bucket. The Ultracentrifuge, Density gradient centrifugation, sedimentation coefficient, determination of molecular weight.

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UNIT - III **(6 Hours)**

Electrophoresis: Basic principles –Principles and applications - Paper electrophoresis, Agarose Gel Electrophoresis. SDS-PAGE, Two-dimensional, Pulse-field.

UNIT - IV **(6 Hours)**

Radioactivity- half-life, Radioactive decay, Excitation, Ionization. Isotopes used in biological studies. Measurement of Radioactivity - Geiger-Muller counter, Scintillation counter.

UNIT - V **(6 Hours)**

Chromatography: Principle and applications - Paper, TLC, column, Adsorption, Ion exchange and Affinity chromatography. HPLC.

TEXT BOOK:

1. *Upadhyay, Upadhyay and Nath*, **Biophysical Chemistry**, Himalaya Publishing Ltd.

REFERENCE BOOKS:

1. *Wilson, K., and Walker, J.* 2003. **Practical Biochemistry, Principles and Techniques**. Cambridge University Press, Cambridge.
2. *Skoog, D.A*. 2006. **Principles of Instrumental Analysis**. [Sixth Edition]. Thompson Brooks/Cole: Belmont, CAs

15ULS301	CAREER COMPETENCY SKILLS I	SEMESTER - III

Total Hours: 15

OBJECTIVE:

To enhance employability skills and to develop career competency

UNIT – I **(3 Hours)**

Speed Maths: Squaring of Numbers - Multiplication of Numbers – Finding Square Roots - Finding Cube Roots - HCF, LCM - Decimals - - Averages - Powers and Roots.

UNIT – II **(3 Hours)**

Problems on ages- Ratio and proportion- Chain rule-Percentages- Simple and Compound Interest.

UNIT – III **(3 Hours)**

Time and Work- Time and Distance- Problems on Trains

UNIT – IV **(3 Hours)**

Analogies - Sentence Formation - Sentence Completion - Sentence Correction - Idioms & Phrases - Jumbled Sentences-- Reading Comprehension –Deriving conclusions

UNIT – V **(3 Hours)**

Tenses- Articles and Preposition - Change of Voice - Change of Speech - Synonyms & Antonyms - Phrasal Verbs-One Word Substitution- Odd Man Out - Spelling & Punctuation

15UMBM401	CORE IV: MOLECULAR BIOLOGY	SEMESTER - IV

Total Hours: 50

OBJECTIVES:

1. Gives the basic idea about the central dogma of the organism
2. To learn the mechanisms of central dogma involving various control factors.

CONTENTS

UNIT - I **(10 Hours)**

Nucleic acids: Different forms of DNA –A DNA, B DNA, Z DNA. Prokaryotic DNA replication – Semi-conservative mode of DNA replication – Meselson and Stahl experiment. Enzymology of DNA replication. Rolling circle model of replication.

UNIT - II **(10 Hours)**

Gene expression (Prokaryotes): Transcription process – RNA polymerase - structure and function. Initiation of transcription – promoters. – Elongation – termination – Rho-dependant and Rho-independent process. Inhibitors of transcription. Post transcriptional modifications of m-RNA.

UNIT - III **(10 Hours)**

Translation (Prokaryotes): Translation in prokaryotes – structure of ribosomes – aminoacid activation, charging of t–RNA – Initiation of protein synthesis. Elongation and termination – inhibitors of translation. Post translational modifications.

UNIT - IV **(10 Hours)**

Prokaryotic gene regulation: Operon concept – trp, lac operon. Positive and negative control of gene expression – attenuator control. Eukaryotic gene regulation- regulatory strategies in Eukaryotes.

UNIT - V **(10 Hours)**

Bacteriophage – general properties and structure of phages. Stages in lytic life cycle - specificity in phage infection. Lysogenic Life cycle .Gene analysis: Chromosome walking, Chromosome jumping, Site directed mutagenesis.

TEXT BOOK:

1. *Weaver, R.F.* 1999. **Molecular Biology**, WCB Mc Graw- Hill.

REFERENCE BOOKS:

1. *David Freifelder.* 1987. **Molecular Biology**. Jones and Bartlett, New Zealand.
2. *Benjamin Lewin.* 2007. **Genes IX.** Pearson Prentice Hall, USA.
3. *Waston, J.D., Baker, T.A., Bell, S.P., Alexander Gann, Michael Levine and Richard Losick.* 2004. **Molecular Biology of the Gene.** [Fifth Edition]. Pearson Education Pvt. Ltd., New Delhi.

15UCSBCA401/ 15UCSMBA401	ALLIED - IV:COMPUTER FOR BIOLOGY (For the students of B.Sc., Biochemistry and Microbiology)	SEMESTER – IV

Total hours: 30

OBJECTIVES:

On completion of the course the students shall have knowledge on:

1. Basics terminologies of Computer.
2. The importance of Office package in Biology.

CONTENTS

UNIT - I **(6 Hours)**

Introduction to Computers: History and Generations of Computers-Characteristics of Computers-Applications of Computers-Classification of Computers-Organization of Computer System-Computer Hardware-Software Definition, Role and Categories. **The Processor:** The Central Processing Unit. **The Input-Output Media:** Inputs and Outputs: CRT Monitors-Flat Panel Monitors-Keyboards-Graphics and Graphical Terminals-Printers.

UNIT - II **(6 Hours)**

Introduction to Microsoft Office Word 2007: Working with Documents in Microsoft Word 2007-Saving the File- Formatting the Text- Alignment of Text- Applying Fonts-Spell Checking- Consulting Thesaurus- Assign a Character Style- Borders and Shading-Closing of the File-Save as Option- Printing your Document- Editing the Document-Editing Tools- Auto Correct- AutoFormat- Find and Replace- Find- Replace Text- Page Numbering- Header and Footer- Foot Notes and End Notes.

UNIT - III **(6 Hours)**

Introduction to Microsoft Office Word 2007: Splitting Panes- Tiling of the Document-Using Mail Merge in Word 2007- Opening Screen of Microsoft Word Screen.

Introduction to Microsoft Office Excel 2007: Understanding Spreadsheets-Creating a Worksheet in Excel 2007-Copying Formula-Formulas that Make Decisions-Styles-Functions in Excel-Using Auto calculate-References-Sum Function-Average Function-Creating Charts in Excel-Auditing a Workbook-Comments Inserting-Outlines-Worksheet Fitting on a Page.

UNIT - IV **(6 Hours)**

Introduction to Microsoft Office Excel 2007: Function Wizard-Goal Seeking-Scenarios Manager-Creating a Pivot Table Report-Typing with AutoFill-Formatting Numbers and Labels-Changing the Size of Rows and Columns-Adding and Deleting Rows and Columns-Inserting (and Removing) Page Breaks-Applying Themes-Add or Remove a Sheet Background-Convert Text to Columns-Protect Worksheet or Workbook Elements-Functions in Excel.

UNIT - V **(6 Hours)**

Working with Microsoft Office PowerPoint 2007: Creating Presentation from Template-Creating a New Presentation-PowerPoint Views-Entering the Text-Moving the Text-Changing the Color-Adding Graphics to a Slide-Reordering Slides-Duplicating Slides-Deleting Slides-Adding a Animated Cartoon to a Slide-Adding Slide Transitions-Adding Text Transitions-Viewing a Presentation-Making Slide Shows-Hiding a Slide-Notes, Handouts and Masters for Presentation-Packing Presentation to Go-Add a Caption to a Picture in a Photo Album-Overview of Creating a Photo Album-Add a Picture to a Photo Album-Change the Appearance of a Picture in a Photo Album.

TEXT BOOKS:

1. *Atul Kahate.* 2008**. Information Technology. [**Third Edition]. Tata McGraw-Hill Edition Ltd, New Delhi. (UNIT I)
2. *Law Point.* 2008. **Microsoft Office 2007**. [First Edition]. Ashok Lodha Publication, Kolkata. (UNIT II, III, IV and V)

REFERENCE BOOKS:

1. *Alexis Leon and Mathews Leon***. 1999. Introduction to Computers.** [First Edition]**.** LeonTechworld, New Delhi.
2. *Dennis, P. Curtin, Kim Foley, Kunal Sen and Cathleen Morin.* 2001**. Information Technology: The Breaking Wave.** [Nineth Reprint]. Tata McGraw-Hill Edition, New Delhi.
3. *Sanjay Saxena.* 2007. **MS-Office 2000 for Everyone**. [Second Reprint]. Vikas Publishing House Pvt Ltd., New Delhi.

15UMAMBA401	ALLIED V: MATHEMATICS AND STATISTICS FOR MICROBIOLOGY	SEMESTER – IV

Total Hours: 50

OBJECTIVE:

1. To understand the concepts of Mathematics and Statistics and to apply these concepts in biology.

CONTENTS

UNIT – I **(10 Hours)**

Theory of Equations: Formation of quadratic and cubic equations and solution of quadratic and cubic equations (Statement and problems only)

Problems using Logarithm and Simplification - Problems using Ratio and Proportions.

UNIT – II **(10 Hours)**

Sphere: Area of sphere – Surface area of sphere – Volume of sphere - Cone: Area of cone – Surface area of cone – Volume of cone.

Cylinder: Area of cylinder – Surface area of cylinder – Volume of cylinder.

UNIT – III **(10 Hours)**

Measures of Central Tendency: Mean, Median and Mode only – Merits and demerits – Empirical relation. Measures of Dispersion: Range, Standard Deviation and Co-efficient of variation only - Merits and Demerits.

UNIT-IV **(10 Hours)**

Correlation – Types of correlation – Karl Pearson's Correlation Coefficient - Rank correlation - Regression – Simple regression equations.

UNIT-V **(10 Hours)**

Population and sample – Sampling Methods – Standard Error – Test of significance – Hypothesis – Simple Hypothesis – Small sample Tests based on t and F distribution with regard to mean, difference of mean and difference of variance - Chi-Square test of independent of attributes.

TEXT BOOKS:

1. *Agarwal, R.S,* **Quantitative Techniques,** 2008. S.Chand and Company New Delhi. (For Units I and II).
2. *Gurumani, N.* 2005. **An Introduction to BioStatistics**. [Second Edition]. MJP Publishers, Chennai. (For Units III, IV and V).

15UMBMP401	CORE PRACTICAL IV: MOLECULAR BIOLOGY	SEMESTER - IV

LIST OF EXPERIMENT

1. Isolation of genomic DNA.
2. Isolation of Plasmid DNA.
3. Estimation of DNA (colorimetric method).
4. Estimation of RNA (colorimetric method).
5. Protein estimation by Lowry's method.
6. Estimation of purity of DNA & RNA.
7. Determination of UV killing effect.
8. Isolation Auxotrophic mutants by Replica plating method.
9. Isolation of Antibiotic resistant mutants by Gradient plate technique.
10. Bacterial transformation.

REFERENCE BOOKS:

1. *Maniatis Sambrook and David W.Russel.* **Molecular Cloning: A laboratory manual.** [Third Edition]. Cold Spring Harbor laboratory press.
2. *Janarthanan,S. and Vincent,S.*2009. **Practical Biotechnology: Methods and Protocols.** [Second Edition]. Universities press, (India) Pvt Ltd, Hyderabad.

15UCSBCAP401/ 15UCSMBAP401	**ALLIED PRACTICAL IV: OFFICE PACKAGE FOR BIOLOGY (For the students of B.Sc., Biochemistry and Microbiology)**	**SEMESTER - IV**

LIST OF PRACTICAL:

MS – Word

1. Creating a Personal Profile.
2. Designing a Document for Lab Requirements using following options
   - Font styles.
   - Page layout, Page Setup (Setting Margins, Changing Page Size, Changing Page Orientation and Applying Page Background).
   - Table.
3. Creating a Document for topic presentation with following options
   - Single and Double Column.
   - Page numbers.
   - Headers and Footers.
   - Date and time, Pictures and Shapes.
4. Mail Merge – Invitation to Multiple Recipients for Conducting Seminar in the Department.

MS-Excel

5. Entering Data for Stock Analysis and Formatting the Cells.
6. Working with Sorting and Filtering.
7. Creating a Chart for an Experiment with sample data.
8. Stock Maintenance for Lab Equipments.

MS- PowerPoint

9. Creating a Presentation for the given topic.
10. Creating a Presentation for the Department Profile.
11. Creating a Presentation with Animation effects.
12. Creating a photo album for the Department event.

15UMBSBC401	SBC II: PHARMACEUTICAL MICROBIOLOGY	SEMESTER-IV

Total Hours - 30

OBJECTIVES:

1. To learn about the synthetic antimicrobial agents and its mechanism of action.
2. Microbial contamination and spoilage of various pharmaceutical products.
3. Know about the Good Manufacturing Practices and Good Laboratory Practices in Pharmaceutical Industry.

CONTENTS

UNIT - I **(06 Hours)**

History of Pharmaceutical Microbiology– Contributions of Paul Ehrlich, Alexander Fleming, Louis Pasteur, Edward Jenner. Scope of pharmaceutical microbiology. Recent developments.

UNIT - II **(06 Hours)**

Mechanism of action of antibiotics – inhibitors of cell wall synthesis, nucleic acid and protein synthesis. -– Antimicrobial resistance.

UNIT - III **(06 Hours)**

Microbial contamination and spoilage of pharmaceutical products - sterile injectables – Intravenous infusions and total parenteral nutrition (TPN), non injectables – non injectable water and haemodialysis solutions, ophthalmic preparations and implants.

UNIT - IV **(06 Hours)**

Regulatory practices, biosensors and applications in Pharmaceuticals; Macromolecular, cellular and synthetic drug carriers.

UNIT - V **(06 Hours)**

Quality Assurance and Validation: Good Manufacturing Practices (GMP) and Good Laboratory Practices (GLP) in Pharmaceutical Industry.

TEXT BOOK:

1. *Hugo and Russell.* 2004. **Pharmaceutical Microbiology.** [Seventh Edition]. Wiley-Blackwell Publishers, UK.

REFERENCE BOOKS:

1. *Purohit, S.S., Saluja, A.K. and Kakrani, H.N.* 2003. **Pharmaceutical Microbiology**. Agrobios, New Delhi.
2. *Lansing M Prescott, John P Harley and Donald A Klein*.2010. **Microbiology**. [Eighth Edition]. Mc Graw Hill, New York.

15ULS401	CAREER COMPETENCY SKILLS II	SEMESTER- IV

Total Hours: 15

OBJECTIVE:

To enhance employability skills and to develop career competency

UNIT – I **(3 Hours)**

A to Z Placement Terms-Assertiveness and Self Confidence-Career Opportunities-Skill set (Industry Expectations)

UNIT – II **(3 Hours)**

Principles of Communication (LSRW)-Describing Objects / Situations / People-Information Transfer - Picture Talk - News Paper and Book Review

UNIT – III **(3 Hours)**

Self Introduction - Situational Dialogues / Role Play (Telephonic Skills) - Oral Presentations- Prepared -'Just A Minute' Sessions (JAM)

UNIT – IV **(3 Hours)**

Dress code- Body Language- - Manners and Etiquettes -Resume Writing

UNIT – V **(3 Hours)**

Presentation Skills **–** Group Discussion - Interviewing Techniques- Mock Interview

15UMBM501	CORE V: FUNDAMENTALS IN VIROLOGY	SEMESTER - V

Total Hours: 50

OBJECTIVES:

1. Gives the knowledge about the virus and its structure, characteristics and cultivation of viruses
2. To learn the basics about bacteriophage, animal and plant viruses.

CONTENTS

UNIT - I **(10 Hours)**

Virus: History of virology, General properties of Viruses – Structure of viruses – capsids, nucleocapsid, nucleic acids – Viral envelopes and enzymes. Classification of viruses.

UNIT - II **(10 Hours)**

Cultivation of viruses: in embryonated eggs, experimental animals and cell cultures; primary and Continuous cell cultures. Viral purification and assays.

UNIT - III **(10 Hours)**

Bacteriophages: Classificaion. Structure and Life cycle of Single stranded DNA phages- Φx 174 and M13 – double stranded DNA phages – T_4 and λ. Mycophages, Phycophages and Actinophages.

UNIT - IV **(10 Hours)**

Animal viruses: Reproduction of animal viruses – Structure, replication, epidemiology, pathogenesis and diagnosis of Pox virus, Herpes simplex virus, Polio virus Influenza virus, Rabies virus and HIV.

UNIT - V **(10 Hours)**

Plant viruses**:** Structure, symptoms, mode of transmission, prevention and control of Tobacco Mosaic Virus, Cucumber Mosaic Virus and Potato Spindle Tuber Virus. Cauli flower Mosaic Virus. Mode of transmission of plant virus by insect vector and its control.

TEXT BOOK:

1. *Edward K.Wagner, Martinez J. Hewlett.* 1999. **Basic Virology.** Blackwell Science, Inc

REFERENCE BOOKS:

1. *Dimmock, K.J. and Primrose, S.B.* 1994. **Introduction to** M**odern Virology**. [Fourth Edition]. Blackwell Science Ltd., UK.
2. *Lewy, J.A, H.C Fraenled and Owens. R.A.* 1994. **Virology.** [Third Edition]. Prentice Hall, New Jersey, USA.
3. *Ananthanarayanan, R. and Jayaram Panicker, C.K.* 1994. **Text Book of Microbiology**. Orient Longman.
4. *Biswass, S.B. and Amita Biswass.* 1984. **An Introduction to Viruses**. [Third Edition]. Vikas Publishing House Pvt. Ltd., New Delhi.

15UMBM502	CORE VI: IMMUNOLOGY	SEMESTER - V

Total Hours: 50

OBJECTIVES:

1. To understand the working of immune system and immune molecules.
2. To know the mechanism of immune response and immuno diagnosis.

CONTENTS

UNIT - I **(10 Hours)**

Historical perspective of Immunology. Hematopoiesis - Cells of the immune system, Organs and tissues of the immune system – Primary lymphoid organs – Secondary lymphoid tissues.

UNIT - II **(10 Hours)**

Immunity types and response- Innate and Acquired immunity, Humoral and Cell mediated immunity, Antigens, Types and properties, Antibodies, Structure, types and properties, Adjuvants. Monoclonal antibody production.

UNIT - III **(10 Hours)**

Antigen–Antibody reactions - Primary and secondary reactions, Chemical interactions, Agglutination, Agglutination inhibition, Precipitation, Immunofluorescence, ELISA, RIA, Complement fixation test, Immunohaematology – ABO & Rh incompatibility.

UNIT – IV **(10Hours)**

Complement system - Properties, Classical and alternative pathway, Cytokines structure and functions, MHC and its role. Transplantation - types of grafting, graft acceptance and rejection. Autoimmunity – Grave's disease, Myasthenia Gravis.

UNIT - V **(10 Hours)**

Effector mechanisms - Hypersensitive reactions – Classification – IgE mediated (type – I) – Antibody mediated cytotoxic (Type – II) – Immune complex mediated (Type - III) - T_{DTH} - Mediated (Type - IV). Cancer immunology – Origin and terminology, Immune responses to tumour, Cancer Immunotherapy.

TEXT BOOK:

1. *Nandhini Shetty.* 2007. **Immunology: Introductory Text Book**. New Age International Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. *Tizard, K.* 1983. **Immunology.** Saunders College Publishing, Philadelphia.
2. *Roitt.* 1988. **Essentials of Immunology.** Blackwell Scientific Publishers, London.
3. *C.A. Janeway, P. Travers, M. Walport and M.J. Shlomchik* (2001**), Immunobiology**: The Immune System in Health and Disease. Garland Publishing, USA.
4. *Richard Goldsby, Thomas. J. Kindt, Barbara. A. Osborne.* 2004. **Immunology**. [Fourth Edition]. W.H.Freeman and Co., New York

15UMBM503	CORE VII: FERMENTATION TECHNOLOGY	SEMESTER - V

Total Hours: 50

OBJECTIVES:

1. To learn about the isolation of industrially important organism, industrial medium formulation and sterilization.
2. To know the various component parts of the fermentor and its function.

CONTENTS

UNIT - I **(10 Hours)**

Screening techniques – Primary and secondary. Culture preservation – Lyophilization, Cryogenic storage. Characteristics of an ideal strain. Strain improvement- Mutation and recombination.

UNIT - II **(10 Hours)**

Fermentor design – Body construction, aeration & agitation. Types of fermentor – CFTR, Airlift, Tower fermentor. Control of temperature, pH and foam. Computer application (Direct Digital Control) in fermentation technology.

UNIT - III **(10 Hours)**

Types of fermentation: Submerged and solid state. Upstream Processing: Medium formulation – Water, carbon, nitrogen, minerals and antifoams. Characteristics of an ideal medium. Medium sterilization - Batch & Continuous – Del factor.

UNIT - IV **(10 Hours)**

Downstream processing- Brief account on recovery and purification of intra and extra cellular products. Foam separation, Precipitation, filtration, centrifugation, sonicaion, solvent recovery, dying.

UNIT - V **(10 Hours)**

Industrial production of wine – preparation of substrate, fermentation and recovery: Organic acid-Citric acid –Antibiotic- Penicillin , Amino acid- Lysine, Enzyme-Amylase, Vitamin- Riboflavin.

TEXT BOOK:

1. *Stanbury, P.F., Whittaker, A. and Hall, S.J.* 1997. **Principles of Fermentation Technology.** [Second Edition]. Aditya Books Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. *Hugo, W.B. and Russell, A.D.* 1998. **Pharmaceutical Microbiology.** [Sixth Edition]. Blackwell scientific company Ltd., USA.
2. *Agarwal, A.K., and Pradeep Parihar* 2005. **Industrial Microbiology: Fundamentals and Applications.** [First Edition]. Published by Agrobios (India).
3. *Patel, A.H., 2005*. **An Introduction to Industrial Microbiology.** Macmillan India Ltd., Chennai.

15UMBM504	CORE VIII: FOOD AND DAIRY MICROBIOLOGY	SEMESTER - V

Total Hours - 50

OBJECTIVES:

1. To learn the basics of contamination, spoilage and preservation of food.
2. To know about the preservatives and various fermented products.

CONTENTS

UNIT - I **(10 Hours)**

Introduction: Importance of food and dairy Microbiology – Types of microorganisms in food – Source of contamination (primary sources) – Factors influencing microbial growth in foods (extrinsic and intrinsic).

UNIT - II **(10 Hours)**

Spoilage and preservation of different kinds of foods: cereals and cereal products – milk and milk products – vegetable and fruits – meat and meat products – fish and eggs.

UNIT - III **(10 Hours)**

Food borne infections and intoxications – bacterial, non-bacterial (*Staphylococcus*, *Clostridium*, *Escherichia coli* and *Salmonella* infections, Hepatitis, Amoebiosis and Mycotoxins)–Food borne disease outbreaks – Laboratory testing – preventing measures.

UNIT - IV **(10 Hours)**

Food preservation: Principles of food preservation – methods of preservation. Physical methods (irradiation, drying, heat processing, chilling and freezing, modification of atmosphere) Chemical preservatives.

UNIT - V **(10 Hours)**

Fermented food products – Bread, Sauerkraut, cheese, Yoghurt, Butter milk, Tempeh. Food sanitation and its control

TEXT BOOK:

1. *Frazier, W.C. and Westhoff, D.C.* 2001. **Food Microbiology**. [Fourth Edition]. Tata Mc Graw-Hill Publishing Company Limited, New Delhi.

REFERENCE BOOKS:

1. *Banwart, G.J.* 1989. **Basic Food Microbiology.** Chapman and Hall New York.
2. *Jay, J.M.* 1987. **Modern Food Microbiology**. CBS Publishers and distributors, New Delhi.
3. *Adams, M.R. and Moss, M.O.* 1995. **Food Microbiology.** The Royal Society of Chemistry, Cambridge.

15UMBM505	CORE IX: MICROBIAL ECOLOGY	SEMESTER- V

Total Hours - 50

OBJECTIVES:

1. The study of the function and diversity of microbes in their natural Environments.
2. Microbial mediated nutrient cycling, geomicrobiology, environmental aspects of microbial interactions.

CONTENTS

UNIT – I **(10 Hours)**

History – scope of microbial ecology – Concepts of ecology- Autecology, Synecology, Microorganisms in their natural habitats - Atmo-ecosphere, Hydro-ecosphere, Litho-ecosphere. Extreme habitats - Habitats of thermophiles, psychrophiles, barophiles, halophiles.

UNIT - II **(10 Hours)**

Interactions among microbial populations – Positive interactions, Negative interactions. Interaction between diverse microbial populations – Neutralism, Commensalism, Synergism, Mutualism, Amensalism, Parasitism and Predation. Populations within biofilms.

UNIT - III **(10 Hours)**

Bio Geochemical cycle: Role of microorganisms in Carbon cycle, Nitrogen cycle, Phosphorous cycle, Sulphur cycle and Iron cycle.

UNIT - IV **(10 Hours)**

Sample collection – Soil samples, Water samples, Air samples. Detection of microbial populations – Phenotypic detection, Lipid Profile Analysis and Molecular detection. Detection of nonculturable bacteria.

UNIT - V **(10 Hours)**

Biodegradation – Crude oil, DDT, Herbicides, and Plastic. Bioremediation - contaminated soils, marine oil pollutants and air pollutants. Biosensor for detection of pollutants.

TEXT BOOK:

1. *Atlas, R.M. and Bartha, R.* 1980. **Microbial Ecology**. **Fundamentals and applications**. [Fourth edition]. An imprint of Adiision Wesley Longman Inc.

REFERENCE BOOKS:

1. *Martin Alexander* 1997. **Introduction to Soil Microbiology**. John Wiley & Sons, Newyork.
2. *Raina, M Maier, Ian L Pepper and Charles P Gerba.* 2000. **Environmental Microbiology.** Academic Press. USA.
3. *Coyne, M.S*. 1999. **Soil Microbiology**. **An explanatory approach**. Delmar publishers, London, UK.

15UMBMP501	**CORE PRACTICAL V: Virology, Fermentation technology, Immunology, Food and Dairy Microbiology and Microbial Ecology**	**SEMESTER - V**

LIST OF EXPERIMENT

1. Isolation of coliphages from sewage.
2. Haemagglutination
3. Wine production (Demonstration)
4. ABO blood grouping and cross matching
5. WIDAL test (Slide and tube methods)
6. Double Immunodiffusion
7. Counter Immunoelectrophoresis
8. Examination of fungi from spoiled vegetables.
9. Methylene blue reduction test.
10. Microbiological analysis of milk by standard plate count method.
11. Isolation of amylase producing microorganisms from soil.
12. Isolation of antibiotic producing micro organism from soil
13. Estimation of Biological Oxygen Demand
14. Estimation of Chemical Oxygen Demand

REFERENCE BOOKS:

1. *Gerald Collee, J. Barie P. Marmion, Andrew, G. Fraser and Anthony Simmons*. 1996. **Mackie & MacCartney Practical Medical Microbiology.** Fourteenth edition. Churchill Livingstone Publishers.
2. *Monica Cheesbrough* 1994. **Medical Laboratory Manual for Tropical countries**. Volume II: Microbiology. ELBS Publishers.
3. *Rajan, S and Selva Christy, R.* 2010. **Experimental procedures in Life Sciences.** [First Edition]. Anjanaa Book House, Chennai.
4. *Kannan, N.* **Laboratory manual in General Microbiology.** [Second Edition]. Panima publishing corporation, New Delhi.
5. Aneja, K.R. 2003. **Experiments in Microbiology, Plant pathology and Biotechnology.** [Fourth Edition]. New age international.

15UMBSBC501	SBC III : ENTREPRENEURIAL MICROBIOLOGY	SEMESTER - V

OBJECTIVE:

1. To introduce, update and strengthen the entrepreneurship potential among students
2. To learn the basic rules and regulations for entrepreneurship.

CONTENTS

UNIT - I

Introduction to Entrepreneurship – Entrepreneurship- definition and characteristics of an entrepreneur. Scope of Entrepreneurship in microbiology. Type & Barriers to Entrepreneurship in Microbiology.

UNIT - II

Microbial Bioengineering - Isolation and screening of industrially important microbes. Improvement of strains- mutation and recombination. Culture preservation techniques. GMOs and its impact.

UNIT - III

Microbial Enzyme technology – Production, recovery and Applications of microbial enzymes- Amylase, Protease and Lipase. Immobilization techniques - Immobilization of enzymes and microbial cells,

UNIT - IV

Environmental Microbiology- Microbiology of air- Enumeration of microbes in air- Airborne diseases. Microbiology of water- potability of water, indicator organisms, water borne diseases. Sewage treatment- Physical, chemical and biological methods.

UNIT - V

Skills for entrepreneurs –HACCP – steps of the HACCP System – explanation and application of HACCP principles – standards. Certification procedures. Biosafety – Guidelines and its regulations.

TEXT BOOK:

1. *Bernard, R., Glick and Jack J Pasternik*. 1996. **Molecular Biotechnology Principles and Application of Recombinant DNA**. Panima Publishing Corporation, New Delhi.

REFERENCE BOOKS:

1. *Primerose, S.B., Twyman, R.M. and Old, R.W.* 2003. **Principles of Gene Manipulation**. [Sixth Edition]. Blackwell Science Ltd. UK.
2. *Stanbury, P.F., Whittaker, A. and Hall, S.J.* 1997. **Principles of Fermentation Technology.** [Second Edition]. Aditya Books Pvt. Ltd., New Delhi.
3. *Patel, A. H. 2005*. **An Introduction to Industrial Microbiology**. Macmillan India Ltd., Chennai.

15UMBM601	CORE X: MEDICAL MICROBIOLOGY	SEMESTER - VI

Total Hours: 50

OBJECTIVES:

1. Deals with the study of medically important bacteria, fungi and protozoan.
2. To study the morphology, epidemiology, lab diagnosis and control of selected Microbial pathogens.

CONTENTS

UNIT - I **(10 Hours)**

Infections- sources of infections- Types of infections- methods of infections - Definitions- Epidemic, Pandemic, Endemic diseases- Epidemiology of Infectious diseases. Normal flora of human body. Nosocomial infection.

UNIT - II **(10 Hours)**

Morphology, cultural characteristics, pathogenesis, epidemiology, laboratory diagnosis and control of *Staphylococcus aureus, Streptococcus pyogenes, Nesseria gonorrhoae, Mycobacterium tuberculosis, Clostridium tetani* and *Corynebacterium diptheriae.*

UNIT - III **(10 Hours)**

Morphology, cultural characteristics, pathogenesis, epidemiology, laboratory diagnosis and control of *Escherichia coli, Klebsiella* sp., *Salmonella* sp., *Vibrio cholera, Pseudomonas aeruginosa, Listeria monocytogenes, Treponema pallidum* and *Mycoplasma*

UNIT - IV **(10 Hours)**

Morphology, epidemiology, clinical symptoms, Lab diagnosis and control of Superficial mycosis -Tinea, Piedra. Cutaneous mycosis - Dermatophytoses, Systemic mycosis - Histoplasmosis. Subcutaneous mycosis - Sporotrichosis, Opportunistic mycosis – *Candida* and *Aspergillus*.

UNIT - V **(10 Hours)**

Morphology, life cycle, pathogensis, clinical manifestation of *Entamoeba histolytica*, *Plasmodium falciparum, Giardia lamblia, Taenia and Ascaris.*

TEXT BOOKS:

1. *Ananthanarayanan, R. and Jayaram Panicker C.K.* 1994. **Text Book of Microbiology**. Orient Longman. (UNIT I,II,III and IV)
2. *Jagdish Chander.* 1996. **A Text Book of Medical Mycology**. Interprint, New Delhi. (UNIT IV)
3. *Parija, S.C.* 2008. **Text Book of Medical Parasitology, Protozology & Helminthoogy.** [Third Edition]. All India Publishers & Distribution., New Delhi. (UNIT V)

REFERENCE BOOKS:

1. *Jawetz, E, Melnic, J.K. and Adelberg, E.A.* 1998. **Review of Medical Microbiology**, Lange Medical Publications, U.S.A.
2. *Mackie and McCarthy* 1994. **Medical Microbiology Volume-I and Volume-II**. [Fourteenth Edition], Churchill Livingston, USA.
3. *Slimeld, L.A. and Rodgers, A.T.* 1999. **Essentials of Diagnostic Microbiology**. Delmer Publications, London, UK.
4. *Karyakarte, R.P. and Damle, A.S. 2005.* **Medical Parasitology**. Book & Alied Pubishers Pvt. Ltd., Kolkata.
5. *Mehrotra, R.S. and Aneja, K.R. 1990.* **An Introduction to Mycology**. New Age International Publishers, New Delhi.

15UMBM602	CORE XI: GENETIC ENGINEERING	SEMESTER - VI

Total Hours: 50

OBJECTIVE:

1. To learn the basics of genetic engineering techniques.
2. Acquire an idea about gene cloning mechanisms.

CONTENTS

UNIT - I **(10 Hours)**

Tools of genetic engineering: Introduction to genetic engineering. Steps involved. Restriction enzymes – types – nomenclature – classification – uses. DNA modifying enzymes – nucleases – polymerases – phosphatases – methylases – DNA ligases.

UNIT - II **(10 Hours)**

Cloning vectors: Plasmid vectors (pBR322, , pUC8, pGEM32), Bacteriophages, λ, M13 vectors, Hybrid vectors-Cosmids, Phagemid Phasmids. Yeast vectors (YEp, YIp, YRp and YAC). Bacterial Artificial Chromosome .

UNIT - III **(10 Hours)**

Gene cloning: basic steps – cloning – construction of cDNA and genomic DNA libraries. DNA delivery systems- Electroporation, Biolistics, Microinjection, Lipofection. Screening of recombinants.

UNIT - IV **(10 Hours)**

Techniques in genetic Engineering: Radiolabelling and non radiolabelling of nucleic acids - End labeling - Nick translation. Blotting techniques – Southern – Northern – Western. DNA sequencing: Chemical, enzymatic methods. Polymerase Chain Reaction – applications. RAPD analysis.

UNIT – V **(10 Hours)**

Genetic Manipulation of plant and Animals: Plant transformation with Ti plasmid of *Agrobacterium tumefaciens* –Ti plasmid- derived vector systems (Binnay vector, Co-integrated vector). Development and use of Transgenic animals – Transgenic mice Transgenic cattle and their applications.

TEXT BOOK:

1. *Brown, T.A*. 1995. **Gene Cloning – An Introduction**. [Third Edition]. Chapman and Hall, UK.

REFERENCE BOOKS:

1. *Old, R.W. and Primrose, S.B.* 1995. **Principles of Gene Manipulation – An Introduction to Genetic Engineering**. [Fifth Edition]. Blackwell Scientific Publications, London.
2. *Winnacker, E.C.* 1987. **From Genes to Clones - Introduction to Gene Technology.** VCH, Weinheim.
3. Bernard R. Glick and Jack J. Pasternak. **Molecular Biotechnology –Principles and Applications of Recombinant DNA.** Panima Publishing Corporation. New Delhi.

15UMBM603	CORE XII: MICROBIOLOGY FOR SOCIAL WELFARE	SEMESTER - VI

OBJECTIVES:

1. To learn the beneficial microorganisms and its role.
2. To acquire the knowledge about application of microbial biotechnology in different field.

CONTENTS

UNIT – I

Microbial technology - Bioactive compounds from microorganisms - Antibiotics – Production of Streptomycin. Novel Microbial products- Production of human insulin. Biopolymers – Engineering of *Xanthomonas campestris*. Biosequestration of heavy metal pollutants.

UNIT - II

Institutions and schemes of government of India – Schemes and programmes, Department of science and technology schemes, Nationalized banks – other financial institutions etc – SIDBI – NSIC – NABARD – IDBI – IFCI – ICICI etc. Opportunities in & as NGO sectors.

UNIT - III

Microbial Products - Biofertilizers –algal fertilizers. Composting – domestic waste, agricultural and industrial waste, vermi – composting. SCP production – mushroom cultivation. Probiotics and its use as animal feed.

UNIT - IV

Patenting in Microbial Biotechnology - Patents – patenting strategies. Copy rights. Trade secrets, Trademarks, WIPO, GATT& TRIPs. Patenting of Biological materials

UNIT - V

Molecular diagnosis of diseases – Definition of microbial and genetic diseases diagnosis – PCR, RAPD, RFLP and Microarray analysis. Biosensors – Types and applications in diagnostic microbiology.

TEXT BOOK:

1. *Dubey, R.C* (2009). A text book of Biootechnonoly, S.Chand & CompanyLtd, New Delhi

REFERENCE BOOKS:

1. *Subba Rao, N.S., 1995.* **Biofertilizer in agriculture and forestry.** *Oxford and IBH, New york.*

2. *Bernard, R., Glick and Jack J Pasternik*. 1996. **Molecular Biotechnology Principles and Application of Recombinant DNA**. Panima Publishing Corporation, New Delhi.

15UMBMP601	**CORE PRACTICAL – VI** **Medical Microbiology, Agricultural Microbiology, Biophysics and Genetic Engineering**	**SEMESTER - VI**

LIST OF EXPERIMENTS

1. Isolation and Identification of bacteria causing urinary tract infection.
2. Isolation and Identification of bacterial pathogens causing throat infection.
3. Identification of unknown pathogen of pus from infected wound.
4. Isolation of phosphate solubilizing bacteria.
5. Isolation of symbiotic Nitrogen fixers from root nodule.
6. Study of Cyanobacteria.
7. Isolation of Bacterial and fungal Plant Pathogens.
8. Paper chromatography.
9. Thin Layer Chromatography.
10. Polymerase Chain Reaction (Demo)
11. SDS – PAGE
12. Restriction digestion of DNA

REFERENCE BOOKS:

1. *Kannan, N.* **Laboratory manual in General Microbiology.** Panima publishing corporation, New Delhi.
2. *Aneja, K.R.* 2003. **Experiments in Microbiology, Plant pathology and Biotechnology.** [Fourth Edition]. New age international.
3. *Maniatis Sambrook and David W.Russel.* **Molecular Cloning: A laboratory manual.** [Third Edition]. Cold Spring Harbor laboratory press.
4. *Janarthanan,S. and Vincent,S.*2009. **Practical Biotechnology: Methods and Protocols.** [Second Edition]. Universities press, (India) Pvt Ltd, Hyderabad.

15UMBEL601	ELECTIVE I: BIOPHYSICS AND BIOINFORMATICS	SEMESTER –VI

Total Hours- 40

OBJECTIVES:

1. To make the students aware about the physico-chemical mechanisms involved in biological process.
2. To learn about the significance of biological data banks.

CONTENTS

UNIT - I **(8 Hours)**

Nature of chemical bonds in Biological molecules. pH, Henderson-Hasselbach equation, common buffers: phosphate, tris, EDTA, good buffers. Zwitter ions, biological buffers.

UNIT - II **(8 Hours)**

Electrode potential, Reference Electrode: Hydrogen electrode, calomel electrode, Ag/AgCl electrode, glass electrode, pH meter. Colloids - classification, protective colloids, salting in, salting out, Viscosity, osmotic pressure, surface tension.

UNIT - III **(8 Hours)**

Principles of Absorption- Beer Lambert's law- Principles of Colorimeter, - UV-Vis Spectrophotometer, Mass spectrometry. Atomic Absorption Spectrophotometry, NMR Spectroscopy, FTIR.

UNIT - IV **(8 Hours)**

Bioinformatics: Definition and scope. Biological Databases- Sequence databases-Nucleic acid (NCBI, EMBL, DDBJ), Proteins-(SWISSPROT, PIR), Structural databases- PDB, CATH, SCOP.

UNIT - V **(8 Hours)**

Sequence analysis – Local Alignment, Global alignment- BLAST, Multiple sequence alignment-ClustalW, Phylogenetic analysis- WPGMA, UPGMA methods. Human Genome Project.

TEXT BOOKS:

1. *Upadhyay, Upadhyay and Nath*, **Biophysical Chemistry**, Himalaya Publishing Ltd.(UNIT I,II and III)
2. *S.C.Rastogi, N.Mendiratta and P.Rsatogi.* **Bioinformatics- Methods and applications**. Third edition. PHI Learning Pvt Ltd, New Delhi. (UNIT IV and V)

REFERENCE BOOKS:

1. *Srivastava R.K.* 2011. **Elementary Biophysics,** Narosa Publishing House.
2. *Jack A.Tuszynski and Michal Kurzynki.* **Introduction to Molecular Biophysics**
3. *David H Mount,* **Bioinformatics**. 2005. Second Edn. CBS Publishers, New Delhi.

15UMBEL602	ELECTIVE II: BASIC AND APPLIED BOTANY	SEMESTER – VI

Total Hours: 50

OBJECTIVES:

1. To learn the morphology, occurrence and properties of major groups of plants
2. To study the economic importance of algae, fungi, lichens and other groups of plants

CONTENTS

UNIT - I **(10 Hours)**

Algae: Distribution, Morphology – Thallus structure - Sexual reproduction. Asexual Reproduction - algal nutrition. Algal importance - Algae as food. Commercial products derived from algae- Agar Agar, Carrageenin, SCP, Chlorellin.

UNIT - II **(10 Hours)**

Fungi: Distribution – Fungal divisions: Characteristics of Ascomycetes, Basidiomycetes, Deuteromycetes, Zygomycetes – Cell structure – reproduction- sexual and asexual modes. Fungi – economic and agricultural importance.

UNIT - III **(10 Hours)**

Lichens: General characteristics, occurrence, classification, structure, reproduction and economic importance. Thallophyta : Structure, Reproduction and life cycle of Clamydomonas and Agaricus – Economic importance.

UNIT - IV **(10 Hours)**

Bryophyta, Pterdophyta and Gymnosprms: General characters – Structure, reproduction and life cycle of Funaria, Lycopodium, Cycas (Development details are not required) Economic importance of Bryophytes.

UNIT - V **(10 Hours)**

Applied and Economic Botany: production of biodiesel (Jatropha), Biocontrol agents – Neem. Mushroom cultivation – Oyster. Plant tissue culture, MS medium Applications. Medicinal plants and their applications

TEXT BOOKS:

1. *Vashishta B.R*. **Botany for Degree Students – Algae**. S. Chand & Co (UNIT I)
2. *Sharma, O.P.* **Text Book of Fungi**. Tata McGraw Hill Publishing Co., New Delhi. (UNIT II)
3. *Misra, A. and Agarwal, R.Pl* (1970) **Lichens, A Preliminary Text**, Oxford & IBH Publishing Co. (UNIT III)
4. Pandey. B.P. 1977. **A Text Book of Bryophyta, Pteridophyta and Gymnosperms**. K.Nath and Co., Meerut. (UNIT IV)
5. *Pandey, B.P*. 1980. **Economic Botany**. S. Chand & Co. (UNIT V)

REFERENCE BOOK:

1. *Vashista, B.R*. 1969. **Botany for Degree students**. S. Chand and Co.

15UMBSBC601	SBC IV: NANOMICROBIOLOGY	SEMESER- VI

Total Hours - 30

OBJECTIVES:

1. To enable the learners to construct a good foundation in nanotechnology .
2. To understand the role of microbes in the synthesis of nano particles.
3. To know about the modern applications of nanobiology.

CONTENTS

UNIT - I **(06 Hours)**

Nanobiology-concepts, definitions, prospects. Nanoscale systems. Biological Nanoobjects –DNA, protein, lipids. Bionanoparticles-Nanostarch, Nano composites-Dendrimers.

UNIT - II **(06 Hours)**

Antimicrobial properties of metal nanoparticles; (Ag, Cu, Au nanoparticles), antibiofilm properties of nanoparticles. Biogenesis of bacterial silver nanoparticles, platinum nanoparticles.

UNIT - III **(06 Hours)**

Methods of Nanobiology - Analysis of bimolecular Nanostructures by Atomic Force Microscopy, Scanning Probe Electron Microcopy and FTIR. Nanofabrication-Lithography- Photolithography , Electron beam lithography.

UNIT - IV **(06 Hours)**

Methods for Susceptibility Testing of Nanoparticles: Growth inhibition assay by spectrophotometer, Broth dilution method, standard agar well diffusion method, Estimation of colony forming units (CFU).

UNIT - V **(06 Hours)**

Use of microbs in relation to Bimedical applications of nanoparticles. Application of Biogenic Silver Nanoparticles in Fabrics. Nanobiosensors and their applications. Nano drug deliverysystems.

TEXT BOOK:

1. *Balaji Subbaih.* 2010. **Nanobiotechnology**. MJP Publishers, India.

REFERENCE BOOKS:

1. *Pradeep,T.* 2008. **Nano:The Essentials: Understanding Nanoscience and Nanotecnology**. Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. *Mahendra Roi and Nelson Dura.* 2011. **Metal nanoparticles in Microbiology**, Springer.
3. *Christof M. Niemayer, Chad A. Mirkin*. 2004. **Nanobiotechnology: Concepts, applications and perspectives,** Wiley VCH publishers.

15UMBN301	NMEC I : PERSONAL HYGIENE (Course offered to other department students)	SEMESTER - III

Total Hours: 30

OBJECTIVE:

- To equip the student with procedures of good basic Hygiene and Sanitation requirements, prevention of health hazard situation through unhygienic handling of food, equipment used in food production and food production work areas.

CONTENTS

UNIT - I: (6 Hours)

Introduction to hygiene and healthful living - Concepts of health and disease - Factors influencing health and healthful living. Scientific principles related to maintenance of normal circulation - normal respiration - normal digestion and elimination - normal sensory functions - normal skeletal alignment.

UNIT - II: (6 Hours)

Physical health - Skin care, cleanliness, clothing; care of the hair, prevention of pediculosis. Dental care and oral hygiene. Care of hands, hand washing, care of nails. Hygiene of elimination, menstrual hygiene.

UNIT - III: (6 Hours)

Health habits and practices - recognizing positive and negative practices in the community. Care of the face, footwear; care of eyes, nose and throat, Food values - nutritious diet, selection, preparation and handling of food.

UNIT - IV: (6 Hours)

The periodic health examination. The health examination; health record; infection-types; immunization; detection and correction of defects; prevention and early treatment of common ailments - common colds, indigestion, headache.

UNIT - V: (6 Hours)

Health in the home. The home as a center for healthful living. Household measures for disposal of refuse, waste; latrines and sanitation; ventilation. Safety in the home; common home hazards. Sanitation in animal sheds; insects and pests.

TEXT BOOK:

1. Nicholas Johns (2000); **Managing Food Hygiene,** Macmillan Publishers. Hongkong.

REFERENCE BOOK:

1. *Lansing M Prescott, John P Harley and Donald A Klein*.2010. **Microbiology**. [Eighth Edition]. Mc Graw Hill, New York.

15UMBN401	NMEC II - MICROBES AND HUMAN HEALTH	SEMESTER- IV

Total Hours: 30

OBJECTIVES:

1. To learn the basics of microbiology and microorganisms
2. To know about the common microbial diseases

CONTENTS

UNIT - I **(06 Hours)**

Microbiology – Introduction and Scope, Microorganisms – Types – Viruses – Bacteria – Algae – Fungi – Protozoans – General Characteristics.

UNIT - II **(06 Hours)**

Distribution and occurrence of the normal microflora skin – eye - respiratory tract - mouth- intestinal tract - genitourinary tract.

UNIT - III **(06 Hours)**

Microbial diseases- Causative agent, Transmission, symptoms and prevention of viral diseases-influenza, Rabies, Hepatitis, HIV. Bacterial diseases- Tuberculosis, Syphilis, Typhoid, Cholera

UNIT – IV **(06 Hours)**

Microbial diseases -Causative agent, Transmission, symptoms and prevention of Fungal Diseases - Cutaneous mycoses, Candidiasis, Aspergillosis. Protozoan disease – Amoebiosis, Malaria, Filariasis, Nosocomial infections.

UNIT - V **(06 Hours)**

Concept of Immunology: Immunity Natural and acquired immunity. Antibiotics- Definition, Mode of action of antibacterial – Penicillin, Streptomycin, Ciprofloxacin, antifungal- Zoles, antiviral- acyclovir.

TEXT BOOK:

1. *Chakraborthy, P.* 1995. **A Textbook Microbiology.** New central Book Agency Pvt. Ltd., Calcutta.

REFERENCE BOOKS:

1. *Lansing M Prescott, John P Harley and Donald A Klein* 2010. **Microbiology**. [Eighth Edition]. Mc Graw Hill, New York.
2. *Michael J Pelczar, Chan, E. C. S. and Noel R Krieg.* 2005. **Microbiology**. [Fifth Edition]. Tata Mc Graw – Hill Publications Ltd., New Delhi.

15UMBD401	DIPLOMA IN CLINICAL MICROBIOLOGY	SEMESTER - III

Total Hours – 45

OBJECTIVES:

1. To enable the learners to know about microbial infection and its types.
2. To learn the diagnosis of infectious diseases.
3. To know about the modern approaches in clinical microbiology.

CONTENTS

UNIT - I **(9 Hours)**

Infection. Sources of infection. Transmission of infection. Types of infection. Classification of microbes based on hazard. Types of diseases. Disease carriers.

UNIT - II **(9 Hours)**

Collection and transport of clinical specimens- Urine, Pus, Faeces, sputum and blood.

UNIT - III **(9 Hours)**

Microbiological examination of sputum, pus, faeces and urine. Diagnosis of anaerobic infections.

UNIT - IV **(9 Hours)**

Serological diagnosis of microbial diseases: Antigen tests - Agglutination test for pregnancy, Elek's gel precipitation test, ELISA. Antibody tests- WIDAL, ASO. Monoclonal antibodies in clinical microbiology.

UNIT - V **(9 Hours)**

Molecular diagnosis of infectious diseases- tuberculosis, malaria, AIDS. RFLP as a molecular marker in disease diagnosis.

TEXT BOOKS:

1. *Ananthanarayan, R. and Jayaram Paniker, C.K*. 2008. **Text book of Microbiology**. [Seventh edition]. University Press (India) Private Limited, Hyderabad. (UNIT I)
2. *Monica Cheesbrough* 1994. **Medical Laboratory Manual for Tropical countries**. Volume II: Microbiology. ELBS Publishers. (UNIT II, III,IV)
3. *Sathyanarayana, U*. 2010. **Biotechnology**. Books and Allied (P) Ltd, Kolkatta. (UNIT V)

15UMBD401	DIPLOMA IN CLINICAL MICROBIOLOGY PRACTICALS	SEMESTER -IV

1. Colony morphology of pathogenic bacteria on different selective media
2. Identification of pathogenic bacteria by preliminary test, biochemical test and special test.
    a) *Staphylococcus aureus* b) *Salmonella typhi*
    c) *Klebsiella pneumoniae* d) *Pseudomonas aeruginosa*
3. Blood smear examination for malarial parasite
4. Culture methods of fungi
    i. Media usage – PDA, SDA, Corn meal agar
5. Examination of fungi by Lactophenol cotton blue stain
6. Examination of by *Candida albicans* Gram's stain, Germ tube test
7. Examination of *Cryptococcus neoformans* by Negative staining

REFERENCE BOOKS:

1. *Gerald Collee, J. Barie P. Marmion, Andrew, G. Fraser and Anthony Simmons*. 1996. **Mackie & MacCartney Practical Medical Microbiology.** Fourteenth edition. Churchill Livingstone Publishers.
2. *Sundararaj, T.* **Microbiology Laboratory Manual.** Dr.A.L.Mudaliyar Post Graduate Institute of Basic Medical Sciences, Chennai.

GUIDELINES

1. SUBMISSION OF RECORD NOTE BOOKS AND PROJECT DISSERTATION:

Candidates appearing for Practical Examinations and Project Viva-voce shall submit Bonafide Record Note Books/ Dissertation prescribed for Practical/ Project Viva-voce Examinations, otherwise the candidates will not be permitted to appear for the Practical/ Project Viva-voce Examinations.

2. PASSING MINIMUM AND INTERNAL MARK DISTRIBUTION

(Theory, Practical and Project)

A. THEORY

The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Theory paper with a passing minimum of 30 marks in External out of 75.

Internal Marks Distribution [CA- Total Marks: 25]

Attendance	: 5 Marks
Assignment	: 5 Marks
Internal Examinations	: 15 Marks
Total	**: 25 Marks**

B. (i) THEORY (If Internal Evaluation is for 100 Marks)

The candidate shall be declared to have passed the Examination, if the candidate secures not less than 40 marks out of 100 in the Comprehensive Examination (Internal Evaluation only).

Internal Marks Distribution [CA- Total Marks: 100]

Attendance	: 10 Marks
Assignment	: 30 Marks (3 Assignments Compulsory)
Internal Examinations	: 60 Marks
Total	**: 100 Marks**

(ii) PRACTICAL

The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in each Practical paper with a passing minimum of 24 marks in External out of 60.

Internal Marks Distribution [CA- Total Marks: 40]

Experiment	: 10 Marks (10-12 Experiments)
Attendance	: 5 Marks
Record	: 5 Marks
Internal Examinations	: 20 Marks
Total	**: 40 Marks**

(iii) PROJECT WORK

- The project work shall be carried out by group of students in VI Semester.
- Upon completion of the project work/dissertation the candidate will be required to appear for a Viva Voce conducted by an external examiner.
- The Student has to attend 3 reviews before completing his/her Project.
- All 3 reviews will be reviewed by Internal Resource Persons.
- A candidate failing to secure the prescribed passing minimum in the dissertation shall be required to resubmit the dissertation with the necessary modifications.
- The assessment of students performance in a semester is calculated by Continuous Internal Assessment (CA.) for 40 marks and External Assessment for 60 marks.

The candidate shall be declared to have passed the Examination, if the candidate secure not less than 40 marks put together out of 100 in the Comprehensive Examination in Project with a passing minimum of 24 marks in External out of 60.

***Internal Mark Distribution* [CA - Total Marks: 40 Marks]**

1. Research work done	: 10 Marks
2. Attendance	: 5 Marks
3. Record	: 5 Marks
4. Review	: 20 Marks (Three reviews)
Total	**: 40 Marks**

3. QUESTION PAPER PATTERN AND MARK DISTRIBUTION

THEORY

Question Paper Pattern and Mark Distribution **(For 75 marks)**

1. PART – A (10 x 2 = 20 Marks)

Answer ALL questions

Two questions from each UNIT

2. PART – B (5 x 5 = 25 Marks)
Answer ALL questions
One question from each UNIT with Internal Choice

3. PART – C (3 x 10 = 30 Marks)
Answer ANY THREE questions
Open Choice – 3 out of 5 questions
One question from each UNIT

Question Paper Pattern and Mark Distribution **(For 100 marks)**
1. PART – A (10 x 2 = 20 Marks)
Answer ALL questions
Two questions from each UNIT

2. PART – B (5 x 7 = 35 Marks)
Answer ALL questions
One question from each UNIT with Internal Choice

3. PART – C (3 x 15 = 45 Marks)
Answer ANY THREE questions
One question from each UNIT
Open Choice – 3 out of 5 questions
One question from each UNIT

Question paper pattern for Core Practical Examinations (Maximum marks: 60)

Time: 6 Hours

Experiment – I (Major)	- 30 Marks
Experiment – II (Minor)	- 15 Marks
Spotters (5 x 3)	- 15 Marks
Total	**- 60 Marks**

FIELD VISIT – Report to be submitted individually.

ALLIED MICROBIOLOGY PRACTICAL

Question paper pattern for Allied practical (Maximum marks: 60) Time: 3 Hours

Experiment – I	- 40 Marks
Spotters (5 x 4)	- 20 Marks
Total	**- 60 Marks**

Computer Practical Distribution

Internal marks distribution

Experiment	: 10 Marks
Attendance	: 5 Marks
Record	: 5 Marks
Internal Examinations	: 20 Marks
Total	**: 40 Marks**

External marks distribution

For each practical question the marks shall be awarded as follows:

i) Aim	: 5 Marks
ii) Algorithm/Flow chart	: 10 Marks
iii) Writing the source code	: 15 Marks
iv) Test and debug the source code	: 15 Marks
v) Displaying the Output	: 10 Marks
vi) Result Declaration	: 5 Marks
Total	**: 60 Marks**

ALLIED COURSE OFFERED BY THE DEPARTMENT

S NO	SUBJECT CODE	SUBJECT	SEMESTER	OFFERED TO THE STUDENTS OF
1	15UMBBCA301/ 15UMBBTA301	Allied III: Microbiology	III	Biochemistry/ Biotechnology
2	15UMBBCAP301/ 15UMBBTAP301	Allied Practical III: Microbiology	III	