

THIRUVALLUVAR UNIVERSITY

BACHELOR OF SCIENCE

DEGREE COURSE

B.Sc. MICROBIOLOGY UNDER CBCS

[with effect from 2008-2009]

The Course of Study and the Scheme of Examinations

Year / Semester	Part	Subject	Paper	Title of the Paper	Ins. Hrs / Week	Credit	Exam Hrs	Marks		
								IA	Uni. Exam.	Total
I Year I Semester	I	Language	Paper I		6	3	3	25	75	100
	II	English	Paper I		6	3	3	25	75	100
	III	Core	Paper I	Fundamentals of Microbiology	6	4	3	25	75	100
	III	Core Practical	-		3	-	-	-	-	-
	III	Allied I	Paper I	Biochemistry I	4	4	3	25	75	100
	III	Allied Practical	-		3	-	-	-	-	-
	IV			Environmental Studies	2	2	3	25	75	100
I Year II Semester	I	Language	Paper II		6	3	3	25	75	100
	II	English	Paper II		6	3	3	25	75	100
	III	Core	Paper II	Microbial Physiology	6	5	3	25	75	100
	III	Core Practical	Practical I	Subjects covering Core Papers I & II	3	2	6	40	60	100
	III	Allied I	Paper II	Biochemistry II	4	4	3	25	75	100
	III	Allied Practical	Practical I	Biochemistry	3	2	3	20	30	50
	IV			Value Education General Awareness	2	2			50	50
II Year III Semester	I	Language	Paper III		6	3	3	25	75	100
	II	English	Paper III		6	3	3	25	75	100
	III	Core	Paper III	Immunology	4	4	3	25	75	100
	III	Core Practical	-		2	-	-	-	-	-
	III	Allied II	Paper III	Economic Entomology	4	4	3	25	75	100
	III	Allied Practical	-		3	-	-	-	-	-

B.Sc. Microbiology : Syllabus (CBCS)

Year / Semester	Part	Subject	Paper	Title of the Paper	Ins. Hrs/ Week	Credit	Exam Hrs	Marks		
								IA	Uni. Exam.	Total
	IV	Skill Based Subject I	Paper I	Haematology and blood banking	3	3	3	25	75	100
		Non-Major Elective I	Paper I	Computer applications in biology	2	2	3	25	75	100
II Year IV Semester	I	Language	Paper IV		6	3	3	25	75	100
	II	English	Paper IV		6	3	3	25	75	100
	III	Core	Paper IV	Microbial Genetics	4	4	3	25	75	100
	III	Core Practical	Practical II	Subjects covering Core Papers III & IV	2	2	6	40	60	100
	III	Allied II	Paper IV	Bio-statistics	4	4	3	25	75	100
	III	Allied Practical	Practical II	Economic Entomology and Bio-statistics	3	2	3	20	30	50
	IV	Skill Based Subject II	Paper II	Vermitech	3	3	3	25	75	100
		Non-Major Elective II	Paper II	Bioethics	2	2	3	25	75	100
III Year V Semester	III	Core	Paper V	Molecular Biology and Genetic Engineering	6	6	3	25	75	100
	III	Core	Paper VI	Medical Bacteriology	6	6	3	25	75	100
	III	Core	Paper VII	Medical Virology, Mycology and Parasitology	6	6	3	25	75	100
	III	Core Practical	Practical III	Subjects covering Core Papers V, VI and VII	4	4	6	40	60	100
			Elective I	Paper I	Human microbial diseases, causes and control	5	5	3	25	75
	IV	Skill Based Subject III	Paper III	Mushroom culture techniques	3	3	3	25	75	100
III Year VI Semester	III	Core	Paper VIII	Food, Agriculture and Environmental Microbiology	6	6	3	25	75	100
	III	Core	Paper IX	Industrial and Pharmaceutical Microbiology	6	6	3	25	75	100

B.Sc. Microbiology : Syllabus (CBCS)

Year / Semester	Part	Subject	Paper	Title of the Paper	Ins. Hrs/ Week	Credit	Exam Hrs	Marks		
								IA	Uni. Exam.	Total
	III	Core Practical	Practical IV	Subjects covering Core Papers VIII & IX	5	5	6	40	60	100
		Elective II	Paper II	Bioinoculants technology	5	5	3	25	75	100
		Elective III	Paper III	Microbes in Human Welfare	5	5	3	25	75	100
	IV	Skill Based Subject IV	Paper IV	Tannery Technology	3	3	3	25	75	100
		Extension Activities				1				50
				Total	180	140				3700

THIRUVALLUVAR UNIVERSITY

B.Sc. MICROBIOLOGY

SYLLABUS

UNDER CBCS

[with effect from 2008-2009]

I SEMESTER

PAPER I

FUNDAMENTALS OF MICROBIOLOGY

Objective

To make the students to understand the fundamentals on microbes.

UNIT-I

Definition and scope of Microbiology - History of Microbiology. The origin of Microbial life - Theory of spontaneous generation. Pasteurs's Tyndall experiments fermentation studies. Contributions of Leewenhoek, Lister, Robert Koch, Thomas J.Burrill, Sergei N. Winogeadsky, Willen Beijerinck, Emil Christian Hansen - Impact of Microbiology and the future.

UNIT-II

Microscopy - simple, compound, dark field, phase contrast, Florescence & Electron microscopy.

UNIT-III

Microbial Evolution and Diversity - Endosymbiotic theory. Binomial nomenclature of Microbes. Classification - Five kindom concept - eight kindom concept (Cavalier Smith).

UNIT-IV

Anatomy of prokaryotes - cell wall, cytoplasmic membrane, cilia flagella capsule, cytoplasmic inclusions, sporulation.

UNIT-V

Sterilization - methods of sterilization and Disinfection. Antimicrobial chemotherapy - tests for sensitivity to antimicrobial agents.

Text Books

1. Pelczar Jr. M.J. Chan. E.C.S and Kreig. N.R [2006]. "Microbiology"- 5th Edition Mc Graw Hill Inc. New York.
2. David, B.D., Delbecco, R., Eisen, H.N and Ginsburg, H.S [1990] "Microbiology" 5th Edition. Harper & Row, New York.

Reference Books

1. Lansing M. Prescott., John. P. Harley., Donald A, Klein, "Microbiology"-Mc Graw Hill Inc. New York.
2. Robert F.Boyd., "General Microbiology" 2nd Edition., Times MIRROR/Moshy College Publishing Virginia.

ALLIED I

PAPER I

BIOCHEMISTRY I

UNIT-I : Chemistry of Carbohydrates

Definition and Classification of carbohydrates, linear and ring forms (Haworth formula) for monosaccharides for glucose and fructose. Disaccharides-sucrose and lactose. Physical properties-mutarotation and kiliani cynohydrin synthesis. Chemical properties-Oxidation, reduction, osazone formation. Disaccharide-sucrose and lactose-occurrence, structure; Physical and chemical properties. Polysaccharides: starch and cellulose-occurrence, structure, physical and chemical properties.

UNIT-II : Chemistry of aminoacids:

Definition and classification of aminoacids, common properties of aminoacids, amphoteric nature, isoelectric point, iselectric pH and Zwitter ion. Reaction with ninhydrin, 1-fluoro-2, 4-dinitronitrobenzene (FDNB) and Sieg Fried's carbamino reaction.

UNIT-III : Chemistry of Proteins

Classifications-shape and size, solubility and physical properties and functional properties. Physical properties: salting in and salting out, denaturation, peptide bond. Structure of protein: primary, secondary, tertiary and quaternary. N-terminal determination-Edman's and Dansyl chloride method. C-terminal determination-Van-Slyke reaction, Phosgene reaction.

UNIT-IV : Chemistry of Lipids

Definition, classification and functions. Occurrence, chemistry and biological functions- simple lipids: tertiary compound lipids (e.g. phospholipids), derived lipids: steroids (e.g. cholesterol). Saturated fatty acids: Butyric, arachidic and stearic acid. Unsaturated fatty acids: Oleic, linoleic and linolenic acid. Physical property-

emulsification. Chemical properties-saponification, rancidity, definition of acid number, saponification number, iodine number and Reichert-Meissl number. Bile acid and bile salt functions.

UNIT-V : Chemistry of Nucleic acids

Definition, nucleoside, nucleotide and polynucleotide. Double helical model of DNA and its biological functions. Structure of RNA: tRNA, mRNA and rRNA-occurrence, chemistry and its biological functions. Differences between DNA and RNA properties: cot curve and cot value, T_m , hypo and hyper chromicity.

References

1. Lehninger Principles of Biochemistry-David L. Nelson, Michael M. Cox, Macmillan Worth Publishers.
2. Harper's Biochemistry-Rober K. Murray, Daryl K. Grammer, McGraw Hill, Lange Medical Books. 25th edition.
3. Fundamentals of Biochemistry-J.L. Jain, Sunjay Jain, Nitin Jain, S. Chand & Company.
4. Biochemistry-Dr. Amit Krishna De, S. Chand & Co., Ltd.
5. Biochemistry-Dr. Ambika Shanmugam, Published by Author.
6. Biomolecules-C. Kannan , MJP Publishers,Chennai-5.

ENVIRONMENTAL STUDIES

(For all UG Degree Courses)

UNIT-I: INTRODUCTION TO ENVIRONMENTAL SCIENCES: NATURAL RESOURCES :

Environmental Sciences - Relevance - Significance - Public awareness - Forest resources - Water resources - Mineral resources - Food resources - conflicts over resource sharing - Exploitation - Land use pattern - Environmental impact - fertilizer - Pesticide Problems - case studies.

UNIT-II: ECOSYSTEM, BIODIVERSITY AND ITS CONSERVATION:

Ecosystem - concept - structure and function - producers, consumers and decomposers - Food chain - Food web - Ecological pyramids - Energy flow - Forest, Grassland, desert and aquatic ecosystem.

Biodiversity - Definition - genetic, species and ecosystem diversity - Values and uses of biodiversity - biodiversity at global, national (India) and local levels - Hotspots, threats to biodiversity - conservation of biodiversity - Insitu & Exsitu.

UNIT-III: ENVIRONMENTAL POLLUTION AND MANAGEMENT

Environmental Pollution - Causes - Effects and control measures of Air, Water, Marine, soil, solid waste, Thermal, Nuclear pollution and Disaster Management - Floods, Earth quake, Cyclone and Land slides. Role of individuals in prevention of pollution - pollution case studies.

UNIT-IV: SOCIAL ISSUES - HUMAN POPULATION

Urban issues - Energy - water conservation - Environmental Ethics - Global warming - Resettlement and Rehabilitation issues - Environmental legislations - Environmental production Act. 1986 - Air, Water, Wildlife and forest conservation Act - Population growth and Explosion - Human rights and Value Education - Environmental Health - HIV/AIDS - Role of IT in Environment and Human Health - Women and child welfare - Public awareness - Case studies.

UNIT-V: FIELD WORK

Visit to a local area / local polluted site / local simple ecosystem - Report submission

REFERENCES

1. KUMARASAMY, K., A.ALAGAPPA MOSES AND M.VASANTHY, 2004. ENVIRONMENTAL STUDIES, BHARATHIDASAN UNIVERSITY PUB, 1, TRICHY
2. RAJAMANNAR, 2004, ENVIRONEMNTAL STUDIES, EVR COLLEGE PUB, TRICHY
3. KALAVATHY,S. (ED.) 2004, ENVIRONMENTAL STUDIES, BISHOP HEBER COLLEGE PUB., TRICHY

II SEMESTER

PAPER II

MICROBIAL PHYSIOLOGY

Objective

To make the students to understand the physiology of microbes.

UNIT-I

Basic concepts of metabolism - Nutritional types of microorganisms uptake of nutrient in to the cell. Transport of nutrients by active and passive ways.

UNIT-II

Cultivation of microbes - Bacteria fungi, virus. Culture technique - media preparation. Types of media. Isolation of pure culture - preservation of cultures.

UNIT-III

Microbial growth - Growth curve measurement of microbial growth - Measurement of cell number, measurement of cell mass. Factors affecting growth.

UNIT-IV

Control of microbial growth by Antiseptics. Antimicrobial drugs and Antibiotics - Antimicrobial resistance.

UNIT-V

Basic concepts of metabolism - Mechanism of ATP formation - Substrate phosphorylation. Electron transport, phosphorylation, photophosphorylation. Energy production during oxidation of organic substrate - Amino acid and assimilatory pathway. Bacterial enzymes - coenzymes - isoenzymes - structure, classification and properties.

Text Books

1. Sale, A.J (1992) "Fundamentals Principles of Bacteriology", 7th Edition. McGraw Hill Publishing Co. Ltd., New York.
2. Dubey, R.C. and Maheswari, D.K. (2005) A Text book of microbiology. S. Chand & Company Ltd. New Delhi.

Reference Books

1. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L and Painter, P.R. (1986). "General Microbiology" -Mac Milan Education Ltd. London
2. Dall, D.O and Rao, K.K (1995) "Photosynthesis" –Cambridge University press.

CORE PRACTICAL I

Objective

To impart hand on training on basics of microbiology and microbial physiology.

1. Cleaning of glass ware.
2. Sterilization principle and methods-moist heat - dry heat and filtration methods.
3. Media preparation : Liquid media, solid media, Agar deep, Agar slants, Agar plates, Basal, enriched, selective media preparation - quality control of media, growth supporting properties, sterility check of media.
4. Pure culture technique : Streak plate, pour plate, spread plate, decimal dilution.
5. Cultural characteristics of microorganisms : Growth on different media, growth characteristics and description. Demonstration of pigment production and extraction.
6. Microscopy : Light microscopy, bright field microscopy, dark field microscopy and phase contrast microscopy.
7. Motility demonstration : Hanging drop preparation, wet mount, dark field microscopy, semisolid agar, Craigies tube method.
8. Staining techniques : Smear preparation, simple staining, Gram's staining, Acid fast staining, Staining for metachromatic granules.
9. Morphology of microorganisms: Morphological variations in algae. Morphology of fungi, yeasts, slide culture techniques.
10. Antibiotic sensitivity testing : Disc diffusion test - Quality control with standard strains.
11. Micrometry : Determination of size of Bacteria, yeast. Fungal filaments.
12. Physiological characteristics : IMVic test, MRVP test, H₂S, Oxidase, catalase, urease test, gelatin liquefaction, casein, starch degradation. Carbohydrate fermentation, Maintenance of pure culture, Paraffin method - Stab culture - maintenance of mound culture.

ALLIED I

PAPER II

BIOCHEMISTRY II

UNIT-I : Metabolism

Glycolysis, TCA cycle, HMP shunt and its energy yield. Deamination, transamination reaction, SGOT and SGPT. Urea cycle, Biosynthesis of fatty acids, beta oxidation.

UNIT-II : Metabolic Disorders

Jaundice, hypoxia, glycogen storage diseases, pentosuria, ketosis, lipidosis, edema, gout. Dehydration: definition, causes, symptom and prevention.

UNIT-III : Enzymes

Definition, classification of enzymes with one example. Mechanism of enzyme action. Lock and key mechanism, induced fit theory. Property: specificity. Isoenzyme: Definition with one example. Factors affecting enzyme activity: pH, temperature and substrate concentration. Michaleis- Menton equation. Enzyme inhibition: competitive, uncompetitive and non competitive. Biological functions of enzymes

UNIT-IV : Molecular Biology

Replication: Definition, types, mode of action of replication, mechanism of replication. General mechanism of transcription and translation. Genetic code. DNA and RNA act as genetic material.

UNIT-V : Vitamins and Minerals

A brief outline of occurrence and biological function of Vitamins and minerals (Na, K, Cl, Ca, P, I , Fe, Mg & S)

References

1. Lehninger Principles of Biochemistry-David L. Nelson, Michael M. Cox, Macmillan Worth Publishers.
2. Harper's Biochemistry-Rober K. Murray, Daryl K. Grammer, McGraw Hill, Lange Medical Books. 25th edition.
3. Fundamentals of Biochemistry-J.L. Jain, Sunjay Jain, Nitin Jain, S. Chand & Company.
4. Biochemistry-Dr. Amit Krishna De, S. Chand & Co., Ltd.
5. Biochemistry-Dr. Ambika Shanmugam, Published by Author.
6. Biomolecules-C. Kannan , MJP Publishers,Chennai-5.

**ALLIED PRACTICAL I
BIOCHEMISTRY**

PRACTICAL I

Volumetric Estimation

1. Estimation of HCl using Na_2CO_3 as link and NaOH as primary standard.
2. Estimation of Iron in Ferrous Ammonium Sulphate using potassium permanganate as link solution and oxalic acid as primary standard.
3. Estimation of Glucose by Benedict's method.
4. Estimation of Glycine by formal titration.
5. Estimation of Ascorbic acid.

PRACTICAL II

Qualitative analysis

1. Carbohydrates: Glucose, fructose, galactose, mannose, maltose, lactose and arabinose and xylulose.
2. Amino acids: Arginine, cysteine, tryptophan and tyrosine.

Colorimetric analysis (only for demonstration)

1. Estimation of protein by Biuret method.
2. Estimation of DNA using diphenyl amine.
3. Estimation of glucose by O -Toluidine.

Books Recommended

1. Practical Clinical Biochemistry - Harold Varley, CBS, New Delhi.
2. Medical Laboratory Technology-Kanai L. Mukherjee, Tata McGraw Hill., Vol. I, II, III.
3. Clinical Chemistry - Ranjana Chawla.
4. Laboratory manual in Biochemistry - Jayaraman.
5. Biochemical methods - S.Sadasivan and Manickam.
6. Introduction to Practical Biochemistry - David T. Plummer

VALUE EDUCATION
(For all UG Degree Courses)

UNIT-I

Value Education - Definition - relevance to present day - Concept of Human Values - self introspection - Self esteem.

UNIT-II

Family values - Components, structure and responsibilities of family - Neutralization of anger - Adjustability - Threats of family life - Status of women in family and society - Caring for needy and elderly - Time allotment for sharing ideas and concerns.

UNIT-III

Ethical values - Professional ethics - Mass media ethics - Advertising ethics - Influence of ethics on family life - psychology of children and youth - Leadership qualities - Personality development.

UNIT-IV

Social values - Faith, service and secularism - Social sense and commitment - Students and Politics - Social awareness, Consumer awareness, Consumer rights and responsibilities - Redressal mechanisms.

UNIT-V

Effect of international affairs on values of life/ Issue of Globalization - Modern warfare - Terrorism. Environmental issues - mutual respect of different cultures, religions and their beliefs.

Reference Books

1. T. Anchukandam and J. Kuttainimathathil (Ed) Grow Free Live Free, Krisitu Jyoti Publications, Bangalore (1995)
2. Mani Jacob (Ed) Resource Book for Value Education, Institute for Value Education, New Delhi 2002.
3. DBNI, NCERT, SCERT, Dharma Bharti National Institute of Peace and Value Education, Secunderabad, 2002.
4. Daniel and Selvamony - Value Education Today, (Madras Christian College, Tambaram and ALACHE, New Delhi, 1990)
5. S. Ignacimuthu - Values for Life - Better Yourself Books, Mumbai, 1991.
6. M.M.M.Mascaronhas Centre for Research Education Science and Training for Family Life Promotion - Family Life Education, Bangalore, 1993.

WEBSITES AND e-LEARNING SOURCES:

www.rkmissiondhe.org/education.html/

www.clallam.org/lifestyle/education.html/

www.sun.com/./edu/progrmws/star.html/

www.infoscouts.com

www.secretofsuccess.com

www.1millionpapers.com

<http://militaryfinance.umuc.edu/education/edu-network.html/>

III SEMESTER

PAPER III

IMMUNOLOGY

Objective: To make the students to understand the immune system

UNIT-I

History of Immunology - Immunohaematology. Blood groups - Blood transfusion - Host parasite relationships. Microbial infections.

UNIT-II

Structure and function of the cells, tissues and organs of immune system. Types of immunity - Humoral and cell-mediated, innate, acquired immunity. Complement system - function and pathways.

UNIT-III

Antigen - types, properties. Hapten, adjuvants, Immunoglobulins: Structure types properties and their function - Theory of antibody production.

UNIT-IV

Vaccines and Immunization - Types and their characteristics. Monoclonal Antibody - Hybridoma Technology. Cell mediated immune response - Lymphokines, Cytokines.

UNIT-V

Antigen-antibody interaction in vitro Agglutination, complement fixation, Precipitation, ELISA, RIA, Flow cytometry and Fluorescence immunoblotting – Hypersensitivity. Skin tests (In vivo).

Text Books

1. Roitt, I.M (1998) Essential Immunology Blackwell Scientific Publishers.
2. Kuby, J. (1994) Immunology, 2nd edition, W.H. Freeman and Company. New York.
3. Leffel, Donnenberg, A: and rose, W.1997 hand book of human Immunology Boca Raton Fla: C.R.C Press.

Reference Book

Abbas, A.K. Lichtman, A.M. and Pober, J.S. (1997) Cellular and Molecular immunology 3rd edition Philadelphia : W.B. Saunders

ALLIED II

PAPER III

ECONOMIC ENTOMOLOGY

Objective: To make the students to understand the importance of entomology.

UNIT-I

Major insects pests of crops – Any three pests for each

Food Crops – Rice, Sorghum

Pulses – Red gram, Green gram, Black gram

Cash Crops – Sugarcane

Fibre – Cotton

Oilseeds – Groundnut, Coconut

Vegetables – Brinjal, Tomato, Ladysfinger

Spices, condiments and beverages – Cardamom, Chilly, Tea. Coffee

Fruit trees – Mango, Citrus, Grapes

UNIT-II

Pests of stored products such as:-Beetles - Red grain beetle (*Tribolium castaneum*); rice weevil (*Sitophilus oryzae*), paddy bore beetle (*Rhizopertha dominica*), pulse beetle (*Pachymerus chinensis*), carpet beetle (*Antherus pimpinettae*) moths: - paddy grain moth (*Sitotroga cerealella*), rice meal worm (*Corcyra cephalonica*); termites- insect vectors of plant diseases coconut - wilt, spike disease of sandalwood

UNIT-III

Beneficial insects: - honeybee, silkworm, lac insects - their biology and Commercial products they produce. Insect predators, parasites and parasitoids that destroy pests and other harmful insects of man livestock.

UNIT-IV

Principles of insect pest management under physical mechanical, biological, chemical and legal methods. Classification of pesticides, both inorganic and organic – mode of their action.

UNIT-V

Biocides and their efficacy - Basic concepts in integrated pest management - Plant protection appliances used - a brief outline - precautions in handling pesticides and environmental pollution.

Text Books

1. Mani M.S. (1982) General Entomology. Oxford & IBH publishing Co.
2. David B.V. (2002) Elements of Economic Entomology, popular book depot.
3. Pradhan. S (1969) Insect pest of crops National book trust of India, New Delhi.

Reference Books

1. IMMS. A.D. (1994) A general text book of entomology. Asia publishing house.
2. Jha. L.K. (1994) Applied and agricultural entomology.

SKILL BASED SUBJECT I

PAPER I

HEMATOLOGY AND BLOOD BANKING

UNIT-I:

Blood: Definition , Characters , Composition.

Collection Of Blood - Capillary Blood : from Adults / Infants, Examinations employed. Advantages /Disadvantages - venous blood : from Adults / Infants, Examinations employed. Advantages /Disadvantage.

Anticoagulants :Definition - Type : Wintrob's /EDTA /Heparin /Citrate, Concentration, Examinations, Advantages /Disadvantage.

UNIT-II:

Counting of Blood Cells: - Neubauer counting chamber - Total RBC count : diluting fluids , Macro dilution / Micro dilution technique , Falsely Low and High Counts , Normal values - Total WBC count : diluting fluids , Macro dilution / Micro dilution technique , Falsely Low and High Counts , Normal values - correction for TWBC -Absolute Eosinophil count - Differential Leucocyte count: Granulocyte / Agranulocytes, Morphology / Function, Staining Technique - Platelet Count : Morphological characters / Functions , Direct /Indirect method - Reticulocyte count, Dry/ Wet smear technique.

Haemoglobin: Composition/Normal Values:- Determinations: Tallqvist/Acid Haematin /Alkaline Haematin, Haldane's Carboxy/Drabkins /Dare, Spencers/Specific gravity/ Gasometric, Chemical.

UNIT-III:

Coagulation Mechanism:- Factors: Bleeding time, Clotting time.

Hematological indices:- Packed cell volume : Wintrob's / Micro HCT method - Mean corpuscular Volume - Mean corpuscular haemoglobin - Mean Corpuscular haemoglobin concentration -Volume index- volume thickness index - Mean corpuscular diameter - saturation index. Erythrocyte sedimentation etc:- Principle-Determination: wintrob's / Westergren Method - advantages / disadvantages - Factors influencing.

UNIT-IV:

Preparations of stains and staining techniques :- Wright stain - Leishmans stain -Gienisa's stain — Jaswanth singh and Bhattarcharji stain - Fields stain - Peroxidase stain: Examination of Blood smear :-Peripheral smear report : Size/colour/shapes/inclusions -Blood parasites : Malarial parasite/Microfilaria.

UNIT-V:

ABO Grouping : History/Discovery - slide / Tube technique - Rh. Typing : Slide / Tube technique , Bovine replacement technique - Coombs test : Direct /Indirect - Donor screening - Cross matching : Major / Minor - Collection Of blood / preservation /storage.

TEXT BOOKS :

1. Mukerjee, K.L. (1988). Medical Laboratory Technologies Vol I – III Tata McGraw Hill. Publishers, New Delhi.
2. Mukerjee, K.L. (1988). Medical Laboratory Technology: A Procedures Manual for Routine Diagnostic Tests. Tata McGraw Hill. Publishers, New Delhi.
3. Gadkar, P.B and Gadakar, D.P. Textbook Medical Laboratory Technology by Gudkar.
4. Medical Laboratory Technologies by Samuel.
5. Medical Laboratory Technologies by Malhotra Vol - I.

NON MAJOR ELECTIVE I

PAPER I

COMPUTER APPLICATIONS IN BIOLOGY

Objective

To make the students to understand the applications of computers in biology.

UNIT-I

Introduction to Computers. History of Computers, Basic Anatomy of Computers.

UNIT-II

Input and output devices, hardware and software. Operating system. MS Windows, Desk-top publishing: MS Word, Data baser and graph generation: MS-Excel, project presentation: MS-Powerpoint.

UNIT-III

Programing in C (Basic) Introduction, simple programs, Decision making and looping, functions, structures, input and output filing system.

UNIT-IV

Basic of WEB Design using HTML: Basic HTML, text styles, list and special characters, adding pointers and links, adding pictures, backgrounds and music, tables and frames.

UNIT-V

Computers in Taxonomy and Systemic Data Analysis in Microbiology. Computers in clinical microbiology - Computer applications in fermentation - Technology Computers in Drug - Designing using various softwares in Drug designing.

Text Books

1. Dave Taylor 1995 HTML. Tata McGraw -Hill Publishing Company Ltd, New Delhi
2. Paul McFedries 1997. Microsoft office 97 sams publishing techmedia, New Delhi.
3. Rajagopalan 1987. Understanding Computers Tata McGraw -Hill Publishing Company Ltd, New Delhi.
4. Sharon Crawford 1998. Windows 98 No Experience Required. BPB publications, New Delhi
5. Yashwant Canetrar 1980. Let us C. BPP Publishers, New Delhi.

IV SEMESTER

PAPER IV

MICROBIAL GENETICS

Objective: To make the students to understand the genetics of microbes.

UNIT-I

Genetics - Historical Introduction - Discovery of DNA structure and organization of DNA and RNA - DNA and RNA as genetic material - Genetic code.

UNIT-II

Organization & functioning of prokaryotic genome plasmids - Structure and types - Replication of DNA.

UNIT-III

Gene transfer mechanism - transformation, transduction, Conjugation.

UNIT-IV

Oncogenes and cancer - Mutation - its types, transforming viruses carrying oncogenes - Retroviral oncogenes - Immortalization & transformation.

UNIT-V

RNA and Protein synthesis in prokaryotes and eukaryotes. Operon concept - Lac & Try Operon. Mutagenesis - Mutation - Mutants - Types of mutants - DNA repair mechanism.

Text Book

1. Lodish, H. Baltimore Daerk . A. Zipsury, S.L. Marsudaisa. P. Darnel. J. (1995)
Molecular cell biology.
2. Gardner- Simon snustad Principles of genetics, 8th Edition. John Wiley & sons.
Inc. New York.

Reference book

1. Maloy, S.R. Cronan Jr. J.E, Freifelder D (1994), Microbial genetics. Jones and
Barlett publishers.

CORE PRACTICAL II

Objective: To impart hands on training on immunology and microbial genetics.

1. Blood groups and Rh. typing combb's test.
2. Precipitation reaction in gel. Outchelony, double diffusion, single redial immuno diffusion.
3. VDRL, RPR
4. Agglutination reactions: Slide and Tube methods RBC agglutination IHA, TPHA, Bacterial agglutination: Widal, typing of bacteria Latex agglutination: RA, ASLO (Latex) B HCG.
5. Complement fixation test. Titration of amboceptor complement [Demonstration only]
6. Immunofluorescence, ELISA [Demonstration only].
7. Isolation of Buffy coat, using heparin lymphocytes (T cells, B cells) enumeration of different cells types, Peripheral blood cell counts, absolute cell counts.
8. Antibody productions in rabbits against sheep RBC and its titration [Demonstration only].
9. Anaphylactic reactions in guinea pigs. Authorities reaction in rabbits. [Demonstration].
10. Skin tests. Both immediate and delayed hypersensitivity reactions of egg proteins, bacterial, fungal antigens.

ALLIED II
PAPER IV
BIOSTATISTICS

Objective: To make the students to understand the biostatistics.

UNIT-I

Nature and scope of statistical methods and their limitations - compilation
Classification and tabulation of statistical - data.

UNIT-II

Events and sets - samples space - concepts of probability - Addition and
multiplication theorem on probability - conditional probability and independence of
events.

UNIT-III

Coefficient of correlation - scattered diagram - regression lines.

UNIT-IV

Standard distributions - Binomial Poisson and normal distributions - Standard
distributions - Binomial Poisson and normal distributing. To test based on normal -
t, Chi - square and R-non parametric test run median, Sign, Mann, Whitney and
Wilcox signed rank test.

UNIT-V

Principles of scientific experiment Randomization replication and local control
Analysis of Variance - One way and two way classifications.

ALLIED PRACTICAL II

Objective: To impart hands on training on economic entomology and biostatistics.

ECONOMIC ENTOMOLOGY

1. Method of rearing and mounting of insects. Whole mounts – DPX or Canada balsam mounting of thrips, mosquito, headlouse, etc.
2. Dissection of digestive system of 1. grasshopper, 2. cockroach.
3. Mounting of salivary glands of cockroach, mounting of mouthparts of A. Honeybee, B. Housefly, C. Cockroach, D. Mosquito.
4. Mounting of sting and pollen basket in honey bee.
5. Record

BIOSTATISTICS

1. Diagrammatic and graphical representation of data.
2. Fitting of binomial and Poisson of distribution and testing of goodness of fit.
3. Computation of correlation coefficient - Regression lines - Rank correlation coefficient.
4. Asymptotic and exact test based on normal t and F distribution.
5. Chi - square test for independence of attributes and its application to biological studies.
6. Analysis of variance one-way C4 the way classification
7. Non - Parametric test.

Text Books

1. S. Palanisamy and M. Manoharan, 2002. Statistical methods for Biologists. Palani Paramount Publication, Anna Nagar, Palani, T. N.
2. S.C. Gupta and K. Kapoor, 2002. Fundamentals of Applied Statistics. 3rd Edition. Sultan Sons Educational Publisher, N.D.
3. N. Gurumani, 2002. An introduction to Biostatistics. MJP Publishers, Chennai.
4. P.R. Vittal, and V. Malini, 2002. Statistical and Numerical Methods. Margham Publications, Chennai.

Reference Book

1. Thomas Clover and Kevin Mitchell. 2002. An introduction to Biostatistics. McGraw Hill Higher Education N.D.

SKILL BASED SUBJECT II

PAPER II

VERMITECH

UNIT-I:

General properties of the soil - structure of the soil -sand, clay, salt, types of soils - soil organisms.

UNIT-II:

Physical properties of soil - soil colour, soil moisture, soil temperature, bulk density of soil, chemical properties of soil PH, Electrical conductivity, organic, Nitrogen, Phosphate and potash.

UNIT-III:

Soil biota -Earthworms -Ecological classification of earth worms as Epigeics -Introduction to earthworm biology -physical and chemical effects of earth worms on soils - Role of earthworms in soil -classification of earthworms based on ecological strategies- Burrowing activity of earthworms- Drilospheres -Microorganisms and their relationship with earthworms.

UNIT-IV:

Composing -anaerobic composing, aerobic composing, types of composing, vermicompost- earthworm species used in vermicompost production - endemic species, exotic species.

UNIT-V:

Vermicompost -setting up vermicompost quality N, P, K, C, N, Microbial quality applications —vermiculture -vermiwash —role of vermicompost in organic farming - its quality and advantages over chemical inputs. Earthworms in Bio-reclamation of soil. Problems in vermiculture units - remedial suggestions. Vermicomposting as a tool for solid waste management - a small scale industry and its economics.

REFERENCE

1. Brady, C.N, 1974 "The Nature and Properties of soils" Macmillan publishing Co. New York, London.
2. Edwards, C.A., and Bohlen, P.J., 1996. Biology and Ecology of Earthworms, Chapman and Hall, London Ismail, S.A., 1997, Vermicology: The Biology Earth worm Orient Longman
3. Kale Radha,D 1998. Earthworm: Cinderella of organic farming. Prism Books Pvt. Ltd., Bangalore.
4. Satchell,J.E., 1983 Earthworm ecology: From Darwin to Agriculture. Chapman and Hall, London StephensonJ., 1923. The fauna of British India -Oligo.

NON MAJOR ELECTIVE II

PAPER II

BIOETHICS

UNIT-I:

General Ethical Concerns: The use of nature, Different views of Nature, Dynamic Nature, Interfering with Nature, Integrity of Species; Reducing Genetic Diversity; Biological Warfare; Public perception of Science.

UNIT-II:

Medical Ethics, History and Culture: The Hippocratic tradition: A Profession , Philanthropy, Do no harm. Adoption to the Oath by Western Medicine. Competing Ethical Traditions; Retaining the Hippocratic Oath.

UNIT-III:

Status of Human Embryo: Human Embryonic Development; Ethics through Embryo Development: Fertilization, The Fetus and feeling pain; Scientific Research on Human Embryos:

Experimental goals of Human Embryo Research, Human Development; How much Embryo Experimentation in Ethical?

UNIT-IV:

Animal Rights: Making New Strains of Animal: Ethical limits of Animal use: Religious Views of Animal status; Philosophical views of Animal status; Regulations.

UNIT- V:

Human Gene Therapy: Ethics of Somatic Cell Gene Therapy: Efficiency of treatment; Safety of Transferred Genes; Protecting Human life; Affect on family life; Economic factors; When we should use Gene therapy?

References:

1. Nancy, S. Jecker., Albert R. Johnson, Robert A. Pearlman. Bioethics: An Introduction to history, methods and practice (1997). Sudbury, M.A.; Jones and Barlett Publishers.
2. Tom, L. Beauchamp., Childress, F. Principles of biomedical ethics, 5th Edition, Oxford Univerisity Press. 2000.

V SEMESTER

PAPER V

MOLECULAR BIOLOGY AND GENETIC ENGINEERING

Objective

To make the students to understand the molecular biology and genetic engineering.

UNIT-I

Historical perspectives - Synthetic DNA, DNA amplification technique - PCR.

UNIT-II

Preparation of genomic library, DNA library, gene cloning system, vectors enzymes, expression system.

UNIT-III

Application of genetic engineering in medical field - genetherapy, vaccines preparation, Hybridoma and monoclonal antibody techniques.

UNIT-IV

Application in agricultural field - Production of biotechnological products. Food - SCP (algae, yeast, mushrooms, Biopesticide) 'Nif' gene - transfer - development of resistant plant variety,

UNIT-V

Application in Pharmaceuticals - antigens, interferons, vaccines, insulin, Social impact of recombinant DNA technology.

Text Book

1. Old, R.S. and Primrose, S.B. (1995) Principles of Gene manipulation. An introduction to genetic Engineering. 5th Edition. Blackwell Scientific Publication, London.

Reference Books

1. Click. B.R. and-Pasternat J.J. (1994) Molecular Biotechnology. ASM press. Washington DC.
2. Benjamin Lewin (1997) Genes VI, Oxford University Press.

PAPER VI

MEDICAL BACTERIOLOGY

Objective: To make the students to understand the medical bacteriology.

UNIT-I

Normal microbial flora of human body; General attributes and virulence factors of bacteria causing infections. Host Parasite relationships.

UNIT-II

Specimen Collection, Transport and Storage; Specimen processing. (Blood, Urine, GSF, Sputum, other body fluids)

UNIT-III

Classification morphology, cultural characteristics, pathogenicity, epidemiology, laboratory diagnosis, treatment, prevention and control of diseases caused by: Staphylococci, Streptococci, Pneumococci, Neisseriae (Gonococci and Meningococci), Corynebacterium, Mycobacterium, Clostridium, Bacillus, Pseudomonas and Haemophilus.

UNIT-IV

Human Pathogens - of Salmonella, Shigella, Vibrios, Brucella, Bordetella, Escherichia, Gramnegative anaerobes, Spirochaetes, Rickettsiae, Chlamydiae, Mycoplasmas and Ureoplasmas.

UNIT-V

Zoonotic diseases and their control; Hospital acquired infections and their control; Hospital waste disposal; Ethical committee and their functions.

Text Books

1. Salle, A.J. (1992). Fundamental Principles of Bacteriology. 7th Edition, Mc. Graw Hill Publishing Co. Ltd., New York.
2. Ananthanarayanan R. and Jayaram Panicker C.K. (1994). Text book of Microbiology. Orient Longman.
3. Baron, E.J. and Tenenbaum S.M. (1995). Scientific Company. Diagnostic Microbiology. Blackwell Scientific Company

Reference Book

1. Bergeys Manual of determinative Bacteriology.

PAPER VII

MEDICAL VIROLOGY, MYCOLOGY AND PARASITOLOGY

Objective

To make the students to understand the medical virology, mycology and parasitology.

UNIT-I

General properties of viruses - Detection of viruses and antigens in clinical specimens - Serological diagnosis of virus infections. Cultivation of viruses. Structure & properties of viroids, prions.

UNIT-II

Arthropod borne and rodent borne virus diseases - Picorna viruses and diseases, Hepatitis viruses-Rabies and other neuro viruses - Orthomyxo and paramyxo viruses. Pox, Adeno, Horpes, Reo, Rota and AIDS viruses. Oncogenic viruses. Viral vaccines, their preparation and their immunisation schedules. Viruses of importance to plants and soil.

UNIT-III

Viruses of importance to bacteria - Bacteriophages - Their structure, types - Uses in Microbiology - Typing and application in bacterial genetics.

UNIT-IV

General Introduction Morphology and taxonomy of fungi of medical importance. Detection and recovery of fungi from clinical specimens. Dermatophytes and agents of superficial mycoses. Yeasts of medical importance dimorphic fungi causing systemic mycoses.

UNIT-V

Classification Morphology, Pathogenicity, lab diagnosis of common protozoan diseases - Amoebiasis, Giardiasis, Balantidiosis, Trypanosomiasis, Malaria, Toxoplasmosis, Leishmaniasis. Classification Morphology, Pathogenicity, lab diagnosis of common parasitic metazoan diseases – Ascariasis, Hook worm, Filariasis, Hydatidosis, Taenia infection.

Text Books

1. Morag C. and Timbury M.C. (1994). Medical Virology, 10th Edition. Churchill Livingstone London.
2. Dimmock N.J., Primrose S.B. (1994). Introduction to Modern Virology 4th Edition. Blackwell Scientific Publications. Oxford.
3. Conrat, HF, Kimball, PC and Levy JA, (1994). Virology. 12th Edition. Prentice Hall, Englewood Cliff. New Jersey.
4. Parija, S.C. (1996). Textbook of Medical Parasitology. Orient Longman.
5. Jagdish Chandra (1996) Textbook of Medical mycology. Orient Longman.

Reference Books

1. Baker, F.J. and Brech (1990) Medical Microbiological techniques. Butter worths, London.
2. K.D. Chatterjee, M.D. Parasitology 12th Edi. Chatter (1980) Joe media Publishers Culcutta.

CORE PRACTICAL III

Objective

To impart hands on training on molecular biology, genetic engineering and medical microbiology.

1. General requirements of collections, transport of clinical specimens Direct examinations - staining of specimens, - Methods of enriched, selective and enrichment culture techniques used to isolate organisms from clinical materials.
2. Wet mount examinations of stool for parasites. Cholera stool, vaginal specimens for Trichomonas.
3. KOG and Lacto phenol preparations for skin scrapings, for fungi and for scabies mites.
4. Simple, differential and special staining of clinical materials viz. Throat swab, vaginal swab, slit smears, pus, urine, sputum, stool etc.,
5. Enumeration of Bacteria in urine. Quantitative test for yeasts.
6. Estimation of worm burden in stool. Floatation and sedimentation techniques of stool examination.
7. Germ tube, Assimilation, fermentation tests for yeasts.
8. Isolation and identification of bacterial pathogens from clinical specimens their biochemical reactions.
9. Antimicrobial sensitivity testing and determination of MIC and quality control.
10. Identification of pathogenic microbes including viruses in slides / smears / specimens as spotters.

ELECTIVE I

PAPER I

HUMAN MICROBIAL DISEASES, CAUSES AND CONTROL

UNIT-I:

Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms: Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diphtheriae, Clostridium perfringens, Clostridium tetani. Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.

UNIT-II:

Morphology, pathogenicity and laboratory diagnosis- Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydiae, Rickettsiae.

UNIT-III:

Mycology: superficial infections - Dermatophytes- Microsporum - Trichophyton, Epidermophyton- Madura mycosis - Opportunistic fungal infections- Candida Albicans, Aspergillus, Mucor.

UNIT- IV:

Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT-IV:

Antibiotics and chemotherapeutic agents- Mechanism of actions - Drug resistance - Antimicrobial susceptibility testing- Disc diffusion- Kirby Bauer.

References

1. Mackie and Mc catney, 1994, Medical Microbiology No I and II. Churchill Livingston, 14th edition.
2. Ananthanarayanan R and CK Jayaram Panicker, 1994, Textbook of microbiology Orient Longman.
3. Chakraborty P 1995, A Text book of microbiology, New Central Book Agency Pvt Ltd. Calcutta.
4. Bailey and Scotts, 1994, Diagnostic Microbiology, 9th edition, Baron and Finegold CV Mosby Publications.
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA.

SKILL BASED SUBJECT III

PAPER III

MUSHROOM-CULTURE TECHNIQUES

UNIT-I:

Edible and non-edible mushroom (Historical account, most commonly cultivated mushrooms in the world, distribution and production in various countries).

UNIT-II:

Cultivation of button mushroom -morphology raising a pure culture & spawn preparation. Preparation of compost & cultivation of *Agaricus bisporus*, *Pleurotus flabellatus*, harvest.

UNIT-III:

Cultivation of oyster and paddy straw mushroom - preparation of pure culture & spawn cultivation methods, harvest.

UNIT-IV:

Pests and diseases of Edible mushrooms (Environmental, fungal, bacterial, viral, insect pests and Nematode diseases and competitor moulds).

UNIT-V:

Economics of mushroom cultivation (fixed assets, recurring expenditure, labour, economics of cultivation throughout the year and seasonal growing formulation of project report for getting finance from funding agencies). Precautions in mushroom cultivation (precaution to be taken while selecting the area, spawn preparation, spawn run, during cropping harvesting etc.). Mushroom recipes (western and Indian recipes, pickles, powders, jams etc).

REFERNCE BOOKS:

1. Changs. T. W.A. Hayanes 1978. "Biology and cultivation of Mushrooms" Acad Press.N.Y.
2. Zadrazil. F & K. Grabbe 1983 "Edible Mushroom, Biotechnology" Vol. 3, Weinheim: Verlag Chemie, Berlin.
3. Kannaiyan. 2001. Handbook of Edible Mushrooms" TNAU Publication.

VI SEMESTER

PAPER VIII

FOOD, AGRICULTURE AND ENVIRONMENTAL MICROBIOLOGY

Objective

To enable the students to understand the microbes in the food, agriculture and environment.

UNIT-I

Importance of microorganisms in food microbiology - mold yeast and bacteria - General characteristics classification & importance. Principles of food preservation - Asepsis, Removal of microorganisms, anaerobic condition - High and low temperature, Drying, Food additive. Microbial growth & food spoilage - methods of food preservation and principles. Canning, contamination and spoilage of canned food.

UNIT-II

Food borne diseases - food borne infection and intoxication - Detection of food borne pathogen. Microbiology of milk - pasteurization - various types of microbiological analysis of milk. Contamination and spoilage of milk and milk products. Fermented dairy products - Fermented Cheese - types yogurt. Nutritive value, method of production.

UNIT-III

Soil microorganism - association with vascular plants - phyllosphere, Rhizobium, Rhizoplane associative nitrogen fixation. Biofertilizers - Bacterial, Cyanobacterial and *Azolla*. Biopesticides - Bacterial, Viral and Fungal.

UNIT-IV

Soil microorganism - association with vascular plants - phyllosphere, Rhizobium, Rhizoplane associative nitrogen fixation. Fungal and Bacterial, Endopytes - Mycorrhizae, Azorhizobium, Actinorhizae.

UNIT-V

Aquatic Microbiology - Ecosystems - Fresh water (ponds, lakes, streams - marine - estuaries, mangroves deep sea). Water zonations - eutrophication - food chain, potability of water - microbial assessment of water quality - water purification - Brief account of water borne diseases and preventive measures. Waste Treatment: Types of wastes - characterization of solid and liquid wastes. Waste treatment and useful byproducts, solid - saccharification - gasification - composting - liquid waste treatment - aerobic, anaerobic methods.

Text Books

1. Adams, M.R. and Moss. M.O. (1995) .Food Microbiology. New International (P) Ltd. Publishers.
2. Frazies ,W.C. and Westhoff, D.C. (1988) .Food microbiology. 4th Edition. McGraw Hill NY.
3. Alexander. (1997). Introduction to soil Microbiology. John Wiley and Sons. N.Y.
4. Subba Rao, N.S. (1995) .Soil Micro organisms and plant growth, Oxford and IBH publishing Co. Pvt. Ltd.

Reference Books

1. Robinson R.K. (1990) Dairy Microbiology. Elsevier Applied science, London.
2. Paul, E.A. and Clark. F.E. (1989). Soil Microbiology and Biochemistry. Academic pres New York.
3. Subba Rao, N.S. (1995). Biofertilizers in Agriculture and Forestry. 3rd Edition. Oxford and IBH publication Co. Pvt. Ltd., New Delhi.

PAPER IX

INDUSTRIAL AND PHARMACEUTICAL MICROBIOLOGY

Objective

To enable the students to understand microbial processes in industries and pharmaceutical companies.

UNIT-I

General concepts of Industrial microbiology, Principles of exploitation of microorganisms of their products, screening, strain development strategies.

UNIT-II

Food fermentations and food produced by microbes, bread, cheese, vinegar, fermented dairy products and oriented fermented food. Microbial cells as food. SCP - mushroom cultivation, production of alcohol and fermented beverages, beer and wine.

UNIT-III

Industrial fermentations - Types of Bioreactors - O₂ transfer - Scale-up, Foam and antifoam - Newtonian and non-newtonian fluids - Recovery and purification of intracellular and extracellular products - Downstream Processing.

UNIT-IV

Microbial production of wine, ethanol, organic acids - citric acid and lactic acid - vitamin - vitamin B₁₂ - Amino acid - Lysine - Enzyme - α -amylase, β -amylase. Production of pharmaceutical compounds through microbes - TPA, interferons.

UNIT V

Biotechnological potential of microalgae, food, feed and fuel production-
pharmaceutically valuable of microalgae, pigments and H₂ gas from BGA.

Text Book

1. Hugo, W.B., Russell, A.D, pharmaceutical Microbiology 4th edition. Blackwell scientific publications / Oxford.

Reference Books

1. Russell and Ayliffe, G.A.J(1982) Principles and practice of Disinfection, preservation and sterilization Oxford:
2. Gregory P.H. Microbiology of the atmosphere. 2nd edition. Leonard Hill.

CORE PRACTICAL IV

Objective

To impart hands on training on microbes of food, agriculture and environment and industrial and pharmaceutical microbiology.

1. Water analysis by MPN technique
Presumptive coli forms test
Confirmed coli forms test
Completed coli forms test.
2. Isolation of microorganisms from air - air sampler technique - settle plate method.
3. Isolation and counting of fecal bacteria from water.
4. Detection of bacteria in milk by SPC - Dye reduction test
Detection of number of bacteria in milk.
5. Litmus mil reaction.
6. Isolation of lactobacilli and staphylococcus from curd.
7. Azolla - Morphological study; Seed inoculation with rhizobia.
8. Isolation of bacteria and fungi from spoiled food.
9. Isolation of fungi from molting leaves.

ELECTIVE II
PAPER II
BIOINOCULANTS TECHNOLOGY

UNIT- I

General account of the microbes used as biofertilizers for crop plants and their advantages. Symbiotic N₂ fixers : Rhizobium - Isolation, characterization, identification, Classification, inoculum production and field application. Frankia - Isolation, characterization - actinorrhizal nodules - non-leguminous crop symbiosis.

UNIT- II

Non - Symbiotic N₂ fixers - Azospirillum - Free living - Azotobacter - free isolation, characterization, mass inoculum production and field application.

UNIT-III

Symbiotic N₂ fixers - Cyanobacteria, Azolla - Isolation, characterization, mass multiplication - Role in rice cultivation - Crop response – field application - immobilization.

UNIT-IV

Phosphate solubilizers - Phosphate solubilizing microbes - Isolation, characterization, mass inoculum production, field application - Phosphate solubilization mechanism.

UNIT-V

Mycorrhizal bioinoculants - classification - importance of mycorrhizal Ectomycorrhizae - Endomycorrhizae - Ectendo mycorrhizae - Taxonomy of mycorrhizae - Isolation of VA mycorrhizae - Quantification and assessment of VAM in roots - Mass inoculum production of VAM - field applications of Ectomycorrhizae and VAM.

Reference:

1. Kannaiyan, S. (2003). Bioetchnology of Biofertilizers, CHIPS, Texas.
2. Mahendra K. Rai (2005). Hand book of Microbial biofertilizers, The Haworth Press, Inc. New York.
3. Reddy, S.M. et. al. (2002). Bioinoculants for sustainable agriculture and forestry, Scientific Publishers.
4. Subba Rao N.S (1995) Soil microorganisms and plant growth Oxford and IBH publishing co. Pvt. Ltd. NewDelhi.
5. Subba Rao N.S. (1988) Biofertilizers in Agriculture and forestry Oxford and IBH Publishing Co., Ltd., New Delhi.

ELECTIVE III
PAPER III
MICROBES IN HUMAN WELFARE

UNIT -I:

Isolation and purification of enzymes from microbes - antibiotics and other microbial compounds - Role of microorganisms in various industries - Food: Yeast, mushroom, microalgae and food spoilage organisms.

UNIT-II:

Pharmaceuticals: Production of antibiotics, vaccines, hormones, diagnostic proteins, vitamins, steroids, enzymes and amino acids - role of transformed microorganisms in pharmaceuticals.

UNIT-III:

Agriculture: Biofertilizer, biocontrol of microbial pathogens, biopesticides, plant growth promoters, secondary metabolites - Industrial enzymes: Important enzymes - application in food, leather, textile, paper, detergent, pharmaceutical industries - role of transformed microorganisms in enzyme production.

UNIT-IV:

Pesticides, fungicides and preservatives, waste recycling, industrial effluent treatment - Dairy: Importance of microbe in dairy and dairy products.

UNIT-V:

Production of ethanol, amino acids, organic acids, by conventional and recombinant organisms - methanogens and methylotrops - advantages and disadvantages.

Text Books

1. Adams, M.R. and Moss. M.O. (1995) .Food Microbiology. New International (P) Ltd. Publishers.
2. Frazies ,W.C. and Westhoff, D.C. (1988) .Food microbiology. 4th Edition. McGraw Hill NY.
3. Alexander. (1997). Introduction to soil Microbiology. John Wiley and Sons. N.Y.

4. Subba Rao, N.S. (1995) .Soil Micro organisms and plant growth, Oxford and IBH publishing Co. Pvt. Ltd.
5. Hugo, W.B., Russell, A.D, pharmaceutical Microbiology 4th edition. Blackwell scientific publications / Oxford.

Reference Books

1. Robinson R.K. (1990) Dairy Microbiology. Elsevier Applied science, London.
2. Paul, E.A. and Clark. F.E. (1989). Soil Microbiology and Biochemistry. Academic pres New York.
3. Subba Rao, N.S. (1995). Biofertilizers in Agriculture and Forestry. 3rd Edition. Oxford and IBH publication Co. Pvt. Ltd., New Delhi.

SKILL BASED SUBJECT IV

PAPER IV

TANNERY TECHNOLOGY

UNIT-I:

Types of tannery available in India. Their nature and composition. Present methods of collection and utilisation.

UNIT-II:

Recovery of salt from tannery effluent . Its treatment and re-use. Theoretical and practical aspects of recovery of chrome. Protein and biogas from tannery effluent. Recovery of fat, proteins, chemical and glue and their use. Pet Treats, finished splits, gloves, washers etc.

UNIT-III:

Chemistry of vegetable tannins, extraction criteria for vegetable tannins, solid-liquid ratio for extraction, chemical modification and blending of vegetable tannins.

UNIT-IV:

Types of mineral tanning salts, chemistry of Basic chromium sulphate preparation, basicity and masking systems, factors influencing exhaustion of chromium (III) during tanning.

UNIT-V:

Treatment of tannery effluents by microbes.

1. Mann, I. " Process of Utilisation of Animal by Products ", FAO Rome, 1962.
2. Scaria. K.J. Mahendrakumar and Divakaran, S. " Animal by Products - Their processing and utilisation " CLRI, Madras, 1961.
3. Taiganides, E.P. " Animal Wasters ", Applied Science Publishers Ltd., Essex, 1977.
4. "Low Cost Waste Treatment ", NEERI, Nagpur, 1972.
5. Cawe, M.C. et. al. " Environment and Tannery Centre Technique der Cuir, Lyon, France.

6. Myers, R.R. and Long, J.S. " Treatise on Coatings ", vols., Marcel Dekker, New York, 1975.
7. SAP Board of Consultants and Engineers, " Synthetic resins and their industrial applications ", Small Business Publications No.57.
8. Rajadurai, S. and Kulasekaran, S. " Acrylics and their uses in leather manufacture ", CLRI, Madras, 1982.
