

BHARATHIAR UNIVERSITY:: COIMBATORE – 641 046

PG DIPLOMA IN MICROBIAL BIOTECHNOLOGY

SCHEME OF EXAMINATIONS

(For the Candidates admitted from the Academic year 2016-17 and onwards)

Code	COURSE TITLE	Ins.Hrs/ Week	Dur. Hrs	Maximum Marks		
				CIA	Marks	Total Marks
Semester I						
Paper 1	Basic Microbiology	4	3	25	75	100
Paper 2	Microbial Genetics	5	3	25	75	100
Paper 3	Industrial Biotechnology	4	3	25	75	100
Practical 1	Microbiology and Genetics lab	6	5	40	60	100
Practical 2	Industrial biotechnology lab	6	5	40	60	100
Semester II						
Paper 4	Medical Biotechnology	5	3	25	75	100
Paper 5	Food Biotechnology	4	3	25	75	100
Paper 6	Environmental Biotechnology	4	3	25	75	100
Practical 3	Environmental Biotechnology Lab	6	5	40	60	100
Practical 4	Medical and Food Biotechnology Lab	6	5	40	60	100
				TOTAL		1000

Code No	Subject	Semester No
Paper 1	BASIC MICROBIOLOGY	I
Objective:	To introduce students to the principles of Microbiology to emphasize structure and biochemical aspects of various microbes.	
Unit No	Topics	
Unit I	History and Scope of Microbiology Microscopy: Discovery - Structure and working principles of Dark field microscope – Bright Field microscope – Phase contrast microscope – Fluorescent microscope - – Electron microscope: SEM and TEM.	
Unit II	Shape and structure: Cell Wall: structure and composition of Gram negative and Gram Positive cell wall – Flagella: Structure – Types – function internal organelles.	
Unit III	Microbial Culturing techniques: – Staining: Background – Principle – types: Gram’s Staining; Acid fast staining; Lactophenol cotton blue staining and endospore staining – culture media – types – plating methods – pure culture methods.	
Unit IV	Microbial growth and physiology: Microbial Diversity - Growth curve and kinetics of growth – nutritional and growth requirements – types based on different requirements – glycolysis – TCA and Fermentation. Microbial interactions: mutualism-symbiosis-commensalism-parasitism- synergism-predation- competition (Definition with suitable examples).	
Unit V	Applied Microbiology: Various fields of applications – Fermented food (Cheese and yogurt); Biofertilisers – Nitrogen fixation; Symbiotic and Asymbiotic – Bioremediation – <i>Pseudomonas putida</i> – Antibiotic production (Penicillin) – Organic acid production (Citric Acid) – Microorganism as food – SCP – Edible mushrooms.	

Text Book :

1. Atlas R M, “Principles of Microbiology “, WCB McGraw Hill Publications, New Delhi, 1997, Edition: 2.

Reference Books

1. Black J G, “Microbiology: Principles and Explorations”, , Prentice Hall International, Inc. 1999, Edn 4.
2. Prescott L M, Harley J P and Klein D A, “Microbiology” - Tata Mc Graw Hill, New Delhi. 2005, Edn 6.
3. Alcamo E, “Fundamentals of Microbiology” Jones and Bartlett Publishers, New Delhi, 2001, Edition: 6.

Code No	Subject	Semester No
Paper 2	MICROBIAL GENETICS	I
Objective:	At the conclusion of this course students will be expected to have acquired knowledge of the facts, concepts, principles and procedures in microbial genetics	
Unit No	Topics	
Unit I	Genetic Materials DNA and RNA as genetic material, Characters of a genetic material, Chemistry & Molecular structure of DNA, Topology of DNA, Structure and types of RNA. Bacterial chromosome, Organization of genes in prokaryotes & Eukaryotes.	
Unit II	Replication Replication of DNA – Replication in prokaryotes & Eukaryotes –Mechanism & enzymology of replication – Theta replication & Rolling circle replication. and repair	
Unit III	Transcription and Operon Concept Transcription in prokaryotes and Eukaryotes – Post transcriptional modifications. – Genetic code, Post translational modifications. Regulation of gene expression in prokaryotes – Operon concept – lac & trp Operon.	
Unit IV	DNA mutation and Repair Mutation - spontaneous and induced Mutagen & Mutagenesis – deletions, insertion and point mutations – DNA repair mechanism.	
Unit V	Genetic exchange Transduction (specialized & generalized), Transformation, Conjugation - Hfr mapping, genetic recombination.	

Text Book :

1. David Freifelder .S, 1987, “Microbial Genetics”, Jones & Bartlett, Boston.

Reference Books

1. Gardner, E. J, Simmons, M J& D P Snustard ,1991 , “Principles of Genetics”, 8th edition. John Wiley & Sons.NY.
2. Robert H .Tamarin, “Principles of Genetics”, 5th edition, WmC Brown Publishers.
3. Lewin.B, 1990. “Genes”, 6th edition, Oxford University Press.

Code No	Subject	Semester No
Paper 3	INDUSTRIAL BIOTECHNOLOGY	I
Objective:	To make the students aware of the overall industrial bioprocess so as to help them to manipulate the process to the requirement of the industrial needs.	
Unit No	Topics	
Unit I	Introduction to Industrial Bioprocess Fermentation - Bacterial, Fungal and Yeast, Biochemistry of fermentation. Traditional and Modern Biotechnology - A brief survey of organisms, processes, products. Basic concepts of Upstream and Downstream processing in Bioprocess, Process flow sheeting - block diagrams, pictorial representation.	
Unit II	Production of Primary Metabolites Primary Metabolites- Production of commercially important primary metabolites like organic acids, amino acids, alcohols and vitamins.	
Unit III	Production of Secondary Metabolites Secondary Metabolites- Production processes for various classes of secondary metabolites: Antibiotics and Steroids.	
Unit IV	Production of Enzymes And Other Bioproducts Production of Industrial Enzymes, Biopesticides, Biofertilizers, Biopreservatives, Biopolymers Biodiesel, Cheese, Beer, SCP & Mushroom culture. Bioremediation.	
Unit V	Production of Modern Biotechnology Products Production of recombinant proteins having therapeutic and diagnostic applications vaccines. Bioprocess strategies in Plant Cell and Animal Cell culture. IPR issues in Biotechnology	

Text Book :

1. Satyanarayana, U. "Biotechnology" Books & Allied (P) Ltd., 2005.

Reference Books

1. Dubey, R.C. "A Textbook of Biotechnology" S.Chand & Co. Ltd., 2006.
2. Prescott, S.C. and Cecil G. Dunn, "Industrial Microbiology", Agrobios (India), 2005.
3. Cruger, Wulf and Anneliese Crueger, "Biotechnology: A Textbook of Industrial Microbiology", 2nd Edition, Panima Publishing, 2000.

Code No	Subject	Semester No
Paper 4	MEDICAL BIOTECHNOLOGY	II
Objective:	To impart basic concepts in the field of medical biotechnology followed by advanced methodology in the molecular aspects of health care in various diseased condition	
Unit No	Topics	
Unit I	Tools of Medical Biotechnology Biotechnological revolutions- Genomics, combinatorial chemistry, insight into basic biology-Areas of application, Diagnosis and prediction of disorders ,Limits and approaches.	
Unit II	Role of biotechnology in healthcare Worldwide market and work in medical biotechnology. Vaccine production- New developments. Biosensors in clinical diagnosis, chiral technology, monoclonal antibodies for immunotherapy.	
Unit III	Advanced developments in medical biotechnology Pharming for human proteins and neutraceuticals .Tissue engineering and therapeutic cloning, Application of nanotechnology in biomedical sciences- Green nanaosubstances, gene delivery, drug delivery. Nanotechnology in replacing defective cells.	
Unit IV	Biotechnological Approach for Various diseases Diabetes mellitus; Alzheimer’s disease; Parkinsons disease, Hepatic disorders; Myasthenia gravis; Rheumatoid artyhritis; cancer; auto immune and genetic disorders.	
Unit V	Medical Biotechnology analysis Biochemical analysis of body fluids, Blood banking, Transplantation, AIDS, Lab safety, ELISA, RIA, FACS, PCR, Computers in biotechnology labs. Quality control	

Text Book :

1. Aparna Rajagopalan, “Fundamentals of medical biotechnology” Ukaaz publications.

Reference Books

1. S.N.Jogdand, “Medical biotechnology “ Himalaya publications.
2. Mackie and Mc Cartney, “Medical Microbiology”.
3. Andrew J.T. George (Editor), Catherine E. Urch (Editor) Publisher: Humana Press;edition (2000) “Diagnostic and Therapeutic Antibodies”.

Code No	Subject	Semester No
Paper 5	FOOD BIOTECHNOLOGY	II
Objective:	The objective of the course is to familiarize the students with advanced research area and basic concept in Food Biotechnology	
Unit No	Topics	
Unit I	Historical Background History of Microorganisms in food - Historical Developments – Taxonomy: role and significance of microorganisms in foods - Intrinsic and Extrinsic - Parameters of Foods that affect microbial growth.	
Unit II	Microorganisms in food Fresh meats and poultry - processed meats - seafood's - fermented and fermented dairy products and miscellaneous food products. Starter cultures: cheeses- beer, wine and distilled spirits - SCP- medical foods – probiotics and health benefits of fermented milk and foods products.	
Unit III	Brewing Malting – mashing – hops - primary & secondary fermentation - Biotechnological improvements - catabolic repression - High gravity brewing, B-glucan problem - getting rid of diacetyl – Beer - wine and distilled spirits. Nutritional boosts and flavor enhancers: Emerging processing and preservation technologies for milk and dairy products.	
Unit IV	Microbiological Examination and Food Preservation Surfaces - Air Sampling - Metabolically Injured Organisms, Enumeration and Detection of Food-borne Organisms - Bioassay and related Methods., Food Preservation Using Irradiation - Characteristics of Radiations of Interest in Food Preservation - Processing of Foods for Irradiation, Application of Radiation - Effect of Irradiation of Food constituents.	
Unit V	Storage Stability Food Preservation with Low Temperatures - Food Preservation with High Temperatures - Preservation of Foods by Drying - Indicator and Food-borne Pathogens - Other Proven and Suspected Food-borne Pathogens - Consumer perspective and future of food biotechnology.	

Text Book :

1. Frazier, "Food Microbiology"

Reference Books

1. James M. Jay., "Modern Food Micro-Biology", An Aspen Publication, Maryland, USA.
2. M.P. Doyle., L.R. Beuchat and Thoma J. Montville., "Food Microbiology: Fundamentals and frontiers", ASM press, USA.
3. G.F.G. Lopez & G.V.B. Canovas., "Food Science and Food Biotechnology", CRC Press, Florida, USA.

Code No	Subject	Semester No
Paper 6	ENVIRONMENTAL BIOTECHNOLOGY	II
Objective:	On successful completion of the subject the student should have understood ecosystem and its impact	
Unit No	Topics	
Unit I	Introduction to ecology Scope – Branches of ecology – Abiotic factors – soil – temperature. Biotic factors – Animal relationship – symbiosis – commensalisms – mutualism – Antagonism – Antibiosis – Parasitism.	
Unit II	Ecosystem Definition –structure – pond ecosystem – primary production –secondary production – food chain – food web – trophic levels – energy flow – pyramid of biomass– pyramid of energy. Biogeochemical cycle: Nitrogen and Phosphorous.	
Unit III	Pollution Types – sources – effects – Air - water – land – Noise – green house effect, ozone and its importance – global warming – Acid Rain.	
Unit IV	Sewage Treatment System Preliminary, Primary, secondary and tertiary treatment. Solid waste disposal and solid waste Management.	
Unit V	Biodiversity Types of Biodiversity, Hotspots, Values of Biodiversity, Methods of Conservation- insitu and exsitu conservation, Uses of bioresources	

Text Book

1. K. Arumugam , “Concepts of Ecology”

Reference Books

1. Odum, “Fundamentals of Ecology”
2. Rastogi, V.B. and M.S. Jayaraj, “Animal ecology and distribution of Animals”
3. Sharma, P.D, “Ecology and environment”

Code No	Subject	Semester No
Practical 1	PRACTICAL I: MICROBIOLOGY AND GENETICS LAB	I
Objective:	After successful completion of the course the students will be aware of various techniques in microbiology and genetics	
Unit No	Topics	
	<p>Microbiology</p> <ol style="list-style-type: none"> 1. Microscopy- care and use of microscope 2. Sterilization 3. Sample collection - clinical and Environmental samples 4. Culture media preparation 5. Pure culture techniques 6. Staining of Bacteria: simple, negative, differential, microchemical staining 7. Staining of fungi - Lacto phenol cotton blue 8. Isolation, purification and biochemical identification of bacteria <p>Genetics</p> <ol style="list-style-type: none"> 1. Drosophila – Morphology, Section culture and maintenance. 2. Identification of Mutants - Physical and Chemical Methods. 3. Experiments to determine Mendel’s law. 4. Monohybrid and dihybrid cross using plants. 5. Sex chromatin (buccal smear) 	

Reference Book :

1. Kanika Sharma, “Manual of Microbiology Tools and Techniques” Published by Ane Books, 2007.
2. Davis J.E. and Demain A.L, “Manual of industrial Microbiology and Biotechnology” Published by ASM publications, 1999. Edition: 2.
3. Sandhya Mitra, “Genetic Engineering Principles and Practice” Published by Macmillan India, 1996.

Code No	Subject	Semester No
Practical 2	PRACTICAL II: INDUSTRIAL BIOTECHNOLOGY LAB	I
Objective:	After successful completion of the course the students will be aware of various techniques in industrial biotechnology	
Unit No	Topics	
	<p>Industrial Biotechnology</p> <ol style="list-style-type: none"> 1. Screening and Isolation of Industrially important microorganisms and strain improvement by mutation. 2. Growth curve - measure of bacterial population by turbidimetry and studying the effect of temperature, pH, carbon and nitrogen source in the media. 3. Determination of thermal death point and thermal death time of microorganisms 4. Lab scale fermentation of antibiotics 5. Production of alcohol 6. Production of citric acid from <i>Aspergillus niger</i> 7. Production of extracellular lipase from <i>Bacillus</i> spp. 8. Immobilization of bacteria 9. Immobilization of enzymes 10. Lab scale production of Biofertilizer and biopesticide 	

Code No	Subject	Semester No
Practical 3	PRACTICAL III: ENVIRONMENTAL BIOTECHNOLOGY LAB	II
Objective:	After successful completion of the course the students will be aware of various techniques in environmental biotechnology	
Unit No	Topics	
	<p>Environmental Biotechnology</p> <ol style="list-style-type: none"> 1. Sampling techniques: Waste water analysis for physio - chemical characteristics such as pH, conductivity, TDS, DO, BOD, COD, CO₂, alkalinity, nutrients, chlorides, hardness, <i>settle ability</i> of solids 2. Isolation of microorganisms (Bacteria and Fungi) from polluted air 3. Isolation of microorganisms (Bacteria and Fungi) from polluted water 4. Isolation of microorganisms (Bacteria and Fungi) from polluted land 5. Microbial degradation of hydrocarbons 6. Removal of Heavy metals from industrial effluent 	

Reference Book :

1. Stanbury P F, Whittaker A and Hall S J, "Principles of fermentation Technology ", Aditya Books (P) Ltd., New Delhi. 1997.
2. Christon J. Hurst, "A Manual of Environmental Microbiology" Published by ASM Publications. 2001. Edition: 2.
3. James G. Cappuccino, & Natalie Sherman, "Microbiology: A laboratory Manual" Published by Benjamin/Cummings, 1996. Edition: 7.
4. Noel R. Rose, "Manual of Clinical Laboratory and Immunology" Published by ASM Publications, 2002, Edition: 6.

Code No	Subject	Semester No
Practical 4	PRACTICAL IV: MEDICAL AND FOOD BIOTECHNOLOGY LAB	II
Objective:	After successful completion of the course the students will be aware of various techniques in medical and food biotechnology	
Unit No	Topics	
	<p>Medical Biotechnology</p> <ol style="list-style-type: none"> 1. Clinical specimen collection and preservation 2. ABO Blood Grouping 3. WIDAL test 4. Immunodiagnosics using commercial kits <p>Food Biotechnology</p> <ol style="list-style-type: none"> 1. Determination of quality of milk by MRBT test 2. Detection of number of bacteria by SPC method 3. Microscopic determination of microbial flora from yoghurt and lactic acid determination 4. Microbial examination of food 5. Detection of pathogenic bacteria from food samples 6. Determination of milk clotting enzyme activity. 7. To check the food efficacy testing of chemical preservatives 8. Preparation of Bread 	