

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM & MARKING SCHEME

B.Sc. PART – II & III MICROBIOLOGY

SESSION : 2022-23



ESTD: 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A⁺, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

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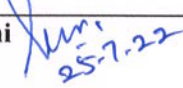
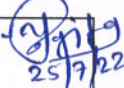



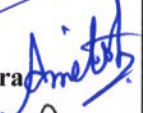
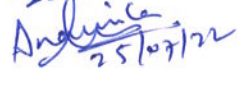
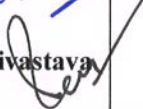
Syllabus Structure and Marking Scheme

B.Sc. Part II

Session 2022-23

Paper No.	Title of the Paper	Marks Allotted	
		Max.	Min.
I	Molecular Biology and Genetic Engineering	50	17
II	Bioinstrumentation and Biostatistics	50	17
III	Lab course	50	17
	Total	150	

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni 	Student Nominee – Ms. Yogita Lokhande 
Subject Expert - Dr. Anita Mahiswar	Departmental members
Subject Expert - Dr. Sonal Mishra 	4. Mrs. Rekha Gupta
VC Nominee – Dr. Prakash Saluja 	5. Mrs. Neetu Das 
Industrial Representative- Shri Amitesh Mishra 	6. Ms. Anamika Sharma 
Member of Other Department- Dr. Ranjana Shrivastava 	

Session 2022-23
B.Sc. – II
MICROBIOLOGY
PAPER – I

BMB 03 MOLECULAR BIOLOGY AND GENETIC ENGINEERING

Upon successful completion of the course students will be able –

- ❖ To be trained with the fundamentals of molecular biology and understand the central dogma of protein synthesis
- ❖ To study the alteration, repair and regulation of gene
- ❖ To gain knowledge of genetic database
- ❖ To get approach of genetic modifications and its detection

Unit – 1: Fundamentals of Biology

History and Scope of Molecular Biology, Concept and mechanism of heredity. DNA as genetic material- Experimental evidences. DNA replication mechanism, enzymes/ proteins involved in replication

Unit – 2: Central Dogma of Protein Synthesis

Transcription- initiation, elongation and termination. RNA polymerases and sigma factor. Transcription inhibitors (Antibiotics and Drugs). Translation- initiation, elongation and termination. Factors involved in translation. Genetic code.

Unit – 3: Mutation and DNA Repair Mechanism

Introduction and types of gene mutation- base substitution, frame shift mutation (insertion, deletion, miss-sense, nonsense mutation). Mutagens- physical, and chemical. Reverse mutation in bacteria. DNA repair mechanism (mismatch repair, photo-reactivation, excision and SOS repair). Beneficial and harmful effects of mutation.

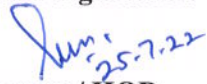

Unit – 4: Gene Regulation

Concept of gene- Cistron, Recon and Muton. Operon concept- lac Operon, tryptophan Operon, His Operon. Activator, Co-activator and Repressor. Introduction to Bioinformatics. Elementary gene database.

Unit – 5: Genetic Engineering

Basic concept of Genetic Engineering. DNA modifying enzymes, Restriction endonuclease, DNA ligase, terminal transferase. Vectors- pBR322, pUC19, BAC and YAC. Phage based vectors. Expressions of vectors. Transformation- physical and chemical methods. Bacterial host. Screening of recombinant vectors, Blue White screening. Colony Hybridization.

Name and Signatures:


Chairperson/ HOD

Industrial Representative

Subject Expert


Member of Other Department


Subject Expert


VC Nominee


Student Nominee

Departmental members:


25/7/22


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Recommended Books:

1. Gene Cloning; T.A. Brown
2. Molecular Biology of the Cell; Bruce Alberts et al. Garland Pub.
3. A Text Book of Microbiology; S.C. Dubey and D.K. maheshwari S. Chand And Company
4. Microbial Genetics; R.M. Stanley F. David and E.C. John

Session 2022-23
B.Sc. – II
MICROBIOLOGY
PAPER – II

BMB 04 BIOINSTRUMENTATION AND BIOSTATISTICS

Upon successful completion of the course students will be able –

- ❖ To be aware of different types of microscope and their applications
- ❖ To understand the instruments used for separation and analysis of bio-molecules
- ❖ To get an overview about the concept of biostatistics
- ❖ To know the methods of analysis of quantitative data

Unit – 1 Microscopy and Centrifugation

Simple and Compound light Microscope, Bright field, Dark field, Phase contrast, and Electron Microscope. Centrifugation- Principle and Types (Analytical and Preparatory), types of centrifugation (Differential and Rate zonal)

Unit – 2 pH metry and Chromatography

Principle of pH meter, Types of electrodes, factors affecting pH measurement, application of pH meter. Chromatography- principle, types- paper, TLC and column chromatography, HPLC

Unit – 3 Spectrophotometry

Electromagnetic spectrum, Beers-Lamberts law, Types of spectrophotometers (principle, working and applications)- colorimeter, UV-Vis spectrophotometry, Turbidometry and IR – Spectrophotometry.

Unit – 4 Electrophoresis and X-Ray Diffraction

Principle of electrophoresis, instrumentation and applications. Types (paper, Gel and Immuno-electrophoresis). X-Ray differection-Principle and applications.

Unit – 5 Biostatistics

Data types, characteristics, Presentation and distribution. Data analysis- Central Tendencies (Mean, Median and Mode). Deviation (Variance, SD and SE). Concept of Probability.

Name and Signatures:

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Chairperson/ HOD

Subject Expert

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Subject Expert

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VC Nominee

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Industrial Representative

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Member of Other Department

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25/7/22
Student Nominee

Departmental members:

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25/7/22

Sumi
25/7/22

Recommended Books

1. Biophysical Chemistry, Principles and Techniques – Upadhyay and Upadhyay, Himalaya Pub.
2. Introduction to Instrumental analysis, Robert Braun
3. Instrumental Analysis – Skoog and Haller
4. Analytical Chemistry – G. Chatwal and Anand, Himalaya Pub.
5. Biotechniques: Theory and Practice – S.V.S. Rana, Rastogi Pub.
6. Biostatistics; Sunder Rao
7. Statistical Methods; S.P. Gupta
8. Instrumental Methods of Chemical Analysis; B.K. Sharma

SESSION 2022-23
B.Sc. PART II
MICROBIOLOGY
BMBL 02 LIST OF PRACTICAL EXERCISES

Upon successful completion of the lab course students will be able –

- ❖ To understand the fundamental genetic properties of microorganisms and learn the genetic modification practices in microorganisms and their detection
- ❖ To perform the experiments based on analytical instruments
- ❖ To separate bio-molecules and study their properties
- ❖ To understand the behavior of genetic material under laboratory conditions

List of Exercises

1. Study of antibiotic sensitivity by Disc Diffusion Method
2. Isolation of Antibiotic Resistant bacteria from soil and water samples
3. Assaying of Microbial enzymes: Catalase, Protease, Peroxidase, Cellulase, Amylase, Diastase and Cellobioases
4. Demonstration of Transformation in Bacteria
5. Demonstration of Restriction Digestion of DNA
6. Testing and Confirmation of Beer's law and Determination of λ max of given coloured solution
7. Separation of suspended particles of pond water by Centrifugation
8. Separation of Ink components/ chlorophyll pigments/ Amino acids by Paper Chromatography
9. Separation of Amino acids by Thin Layer Chromatography
10. Demonstration of Gel Filtration Chromatography
11. Measurement of pH of water and soil samples and maintenance of required pH
12. Demonstration of SDS-PAGE and Submarine Gel Electrophoresis

Marking Scheme

Time: 04 hrs

Q. 1 Spectrophotometer / pH meter	Q. 2 Chromatography	Q. 3 Genetics	Spotting (1-5)	Viva	Sessional	Total
10	10	05	10	05	10	50

Name and Signatures:

Chairperson/ HOD

Industrial Representative

Subject Expert

Member of Other Department

Subject Expert

Student Nominee

VC Nominee

Departmental members:

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Syllabus Structure and Marking Scheme for

B.Sc. Part III

Session 2022-23

Paper No.	Title of the Paper	Marks Allotted	
		Max.	Min.
I	Medical Microbiology and Immunology	50	17
II	Environmental, Industrial and Agricultural Microbiology	50	17
III	Lab Course	50	17
	Total	150	

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni <i>Pragya</i> 25/7/22	Student Nominee – Ms. Yogita Lokhande <i>Yogita</i> 25/7/22
Subject Expert - Dr. Anita Mahiswar	Departmental members
Subject Expert - Dr. Sonal Mishra <i>Sonal</i>	7. Mrs. Rekha Gupta
VC Nominee – Dr. Prakash Saluja <i>Prakash</i>	8. Mrs. Neetu Das <i>Neetu</i> 25/7/22
Industrial Representative- Shri Amitesh Mishra <i>Amitesh</i>	9. Ms. Anamika Sharma <i>Anamika</i> 25/07/22
Member of Other Department- Dr. Ranjana Shrivastava <i>Ranjana</i>	

Session 2022-23
B.Sc. III
MICROBIOLOGY
PAPER – I
BMB 05 MEDICAL MICROBIOLOGY AND IMMUNOLOGY

Upon successful completion of the course students will be able –

- ❖ To study the air borne and water borne diseases
- ❖ To study the clinical diseases and their diagnosis
- ❖ To understand basic knowledge of immunity
- ❖ To learn about immunodiagnostic techniques

Unit 1 : Air Borne Diseases

Air borne diseases Types: Tuberculosis, Pertussis, Diphtheria, Influenza, Small and Chicken Pox, Mumps, Measles - Symptoms, Treatment and Preventions

Unit 2: Water Borne Diseases

Concept and cause of water borne diseases, Types: Hepatitis, Dysentery, Diarrhea, Cholera, Typhoid, Symptoms, Treatment, and Preventions

Unit 3 : Clinical Diseases and Diagnosis

Clinical Diseases: Diabetes, Asthma, Multiple Sclerosis, Rheumatoid Arthritis, Cancer, Symptoms, Treatment and Preventions

Unit 4 : Basic Concept Of Immunity

Immune System, Structure and Function of the cells, tissues and organs of immune system, Types of immunity, Humoral and Cell mediated, Innate, Acquired immunity, Antigen Antibody: types, properties, Hapten, Adjuvants, Immunoglobulins: Structure, types, Properties and their function, Theory of Antibody Production

Unit 5: Immuno Disease Diagnosis

Methods based on Ag- Ab interaction- Precipitation, Agglutination, ELISA, RIA, Immuno-electrophoresis, PCR based diagnosis method for infectious diseases.

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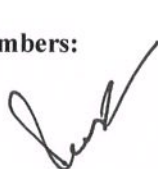

Chairperson/ HOD


Subject Expert

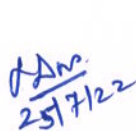

Subject Expert

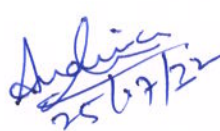

VC Nominee
~~External member~~

Departmental members:






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Recommended Books

1. Immunology: Kuby
2. General Microbiology by Powar and Dagainawala
3. Zinssers Microbiology by K.J. Wolfgang, McGraw- Hill Company
4. Medical Microbiology: N.C. Dey and T.K. Dey, Allied agency, Calcutta
5. Biotechnological Techniques by FJ Baker
6. A textbook of Microbiology: Dubey and Maheshwari; S. Chand & Sons
7. Scott's Diagnostic Microbiology by EJ Baron

Session 2022-23

B.Sc. III

MICROBIOLOGY

PAPER – II

BMB 06 ENVIRONMENTAL, INDUSTRIAL AND AGRICULTURAL MICROBIOLOGY

Upon successful completion of the course students will be able –

- ❖ To understand the basics of relation between environment and microorganisms
- ❖ To compare different habitats of microorganisms and recognize microbial interactions
- ❖ To know the industrial uses of microorganisms
- ❖ To be aware of the agricultural importance of microorganisms

Unit – 1: Air Microbiology

Basics of Aerobiology, Microbes in atmosphere, Source of microorganism in air, Droplet nuclei, Infectious dust, and Bio-aerosol, Factors affecting microbial survival in air, Sampling, Collection and Isolation of microbes from air.

Unit – 2: Water microbiology

Basic concept, Water zonation, Eutrophication, Microbial community in natural water. Determining the quality of water bacteriological evidence for fecal pollution, Indicator of fecal pollution. Water purification methods, Disinfection of potable water supply.

Unit – 3: Soil microbiology

Soil as an environmental culture medium, Microbes of soil. Brief account of Microbial Interaction- Symbiosis, Mutualism, Commensalism, Competition, Predation, Parasitism. Microbiological examination of soil. Rhizosphere- concept and role of microbes, Rhizosphere and non-rhizosphere micro-flora. Mycorrhiza.

Unit – 4: Industrial microbiology

Introduction and brief history and scope, Important microbes in various industries. Fermentation- definition, types- aerobic and anaerobic, Batch and SSF, Important products Bread, Cheese, Vinegar, Fermented dairy product and Oriental fermented food involving microbes. Microbial cells as food. SCP- Mushroom cultivation, Production of alcohol and fermented beverages, Beer and Wine.

Unit – 5: Agricultural microbiology

History of agricultural microbiology; Microbes and their importance in maintenance of soil, Biogeochemical cycles, Role of microbes in maintaining the fertility of soil. Biofertilizers- bacterial, azotobacter and vermiform compost. Soil micro-organism- association with vascular plants- Phyllosphere, Rhizobium, Rhizoplane associative nitrogen fixation. Bio-fertilizers- Cyanobacterial and Azolla

Text books recommended:

1. Environmental Microbiology, Banwarilal, CyberTech. Pub.
2. Introduction to Soil Microbiology, Alexander Martin, Wiley Eastern Press.
3. Agricultural Microbiology, Rangaswami G. and Bagyaraj D.J., Prentice Hall India Ltd.
4. A text book of Microbiology – P.Chakraborty, New central book agency(P) Ltd. Kolkata.
5. General Microbiology I & II - C.B. Powar and H. F. Dagainawala, Himalaya Publishing House
6. Bioremediation by KH baker and Ds herson.

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Industrial Representative


Member of Other Department


Student Nominee

Departmental members:


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SESSION 2022-23

B.Sc. PART III

MICROBIOLOGY

BMBL 03 LIST OF PRACTICAL EXERCISES

Upon successful completion of the lab course students will be able –

1. To understand the possible sources of microbial infections
2. To be familiar with the immunogenic reactions
3. To get insight of Microbial –Environmental interactions
4. To recognize agricultural and industrial importance of microorganisms

List of Exercises

1. Preliminary identification of enteric pathogens using Triple Sugar Iron Agar (TSIA) medium
2. Study of common air born and water born diseases
3. Demonstration of antigen Antibody interaction by slide agglutination reaction
4. Identification of cells of immune system
5. WIDAL test
6. Determination of BOD and COD of water samples
7. Isolation of Aeromycoflora by Petriplate Exposure Technique
8. Demonstration of centrifugal impact air sampler
9. Microbial assessment of water quality (Presumptive test and confirmative test)
10. Water Analysis for total bacterial population by SPC method
11. Isolation and enumeration of Rhizospheric and Non-rhizospheric fungi from soil and estimation of R:S ratio
12. Microscopic observation of root colonization by VAM Fungi
13. Isolation of Rhizobium from root nodules of leguminous plants
14. Study the industrial importance of microorganisms

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Departmental members:

Ans.
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