

# DEPARTMENT OF MICROBIOLOGY

## COURSE CURRICULUM & MARKING SCHEME

### M.Sc. MICROBIOLOGY

#### Semester - I

SESSION : 2023-24



ESTD: 1958

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

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

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

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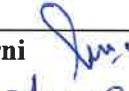
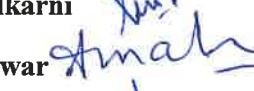


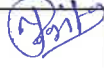


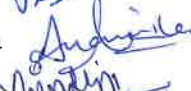


**DEPARTMENT OF MICROBIOLOGY**  
**GOVT. V. Y. T. P.G. AUTONOMOUS COLLEGE DURG**  
**SYALLABUS AND MARKING SCHEME**

**FIRST SEMESTER**

**Session: 2023-24**

Paper No.	Title of the Paper	Marks Allotted in Theory		Marks Allotted in Internal Assessment		Total	Credits
		Max	Min	Max.	Min.		
I	BACTERIOLOGY AND VIROLOGY	80	16	20	04	100	05
II	PHYCOLOGY AND MYCOLOGY	80	16	20	04	100	05
III	BIOCHEMISTRY	80	16	20	04	100	05
IV	FUNDAMENTALS OF IMMUNOLOGY	80	16	20	04	100	05
V	LAB COURSE I Based on Paper I and II	100	33	-	-	100	04
IV	LAB COURSE II Based on Paper III and IV	100	33	-	-	100	04
	Total	520	-	80	-	600	28

**Name and Signatures**

<p>Chairperson/ HOD- Dr. Pragya Kulkarni </p> <p>Subject Expert - Dr. Anita Mahiswar </p> <p>Subject Expert - Dr. Sonal Mishra </p> <p>VC Nominee – Dr. Prakash Saluja</p> <p>Industrial Representative- Shri Amitesh Mishra </p> <p>Member of Other Department- Dr. Ranjana Shrivastava</p>	<p>Student Nominee – Ms. Yogita Lokhande </p> <p>Departmental members</p> <ol style="list-style-type: none"> <li>Mrs. Rekha Gupta </li> <li>Mrs. Neetu Das </li> <li>Ms. Anamika Sharma </li> <li>Ms. Mrinalini Soni </li> <li>Ms. Neetu Bhargav </li> </ol> <p style="text-align: right;">15/08/23</p>
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**Session 2023-24**  
**M.Sc. – MICROBIOLOGY**  
**SEMESTER I**  
**PAPER – I**  
**MMB 101 BACTERIOLOGY AND VIROLOGY**

**Max. M. – 80; Min. M. – 16**

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

- ❖ **To understand the classification and diversity among bacteria and their respective forms**
- ❖ **To identify the nutritional requirements for cultivation of bacteria under laboratory conditions**
- ❖ **To acquire an initiative about the viruses, related agents and bacteriophages and their organizations**
- ❖ **To get an overview of viral diseases of plants and animals**

**Unit –I**

- Morphology and ultra-structure of bacteria: Morphological types, Archaeobacteria, Gram negative and positive Eubacteria, Actinomycetes and L-forms
- Cell wall: synthesis, antigenic properties; Capsule: types, composition and function Cell membranes: structure, composition and properties; Structure and functions of flagella, pili, gas vesicles, chromosomes, carboxysomes, magnetosomes Phycobolosomes, Endospore, Cell division
- Reserve food material, polyhydroxybutyrate, polyphosphate granules, oil droplets, cyanophycin granules and sulphur inclusions.

**Unit – II**

- Classification of microorganisms: Basis of microbial classification; Haeckel's three kingdoms concept, Whittacker's five kingdom concept, three domain concept of Carl Woese
- Salient feature of bacterial classification according to the Bergey's manual of determinative bacteriology
- Cultivation of bacteria: aerobic, anaerobic, shake & still cultures
- Nutritional types, culture media, Growth curve, Generation time, Growth kinetics, Asynchronous, synchronous, batch, continuous cultures, Measurement of growth, factors affecting growth, Control of bacteria and preservation methods.

**Unit – III**

- Brief outline on discovery of viruses, Classification and nomenclature of viruses
- Distinctive properties of viruses, morphology and ultra structure, capsids and their arrangements, types of envelopes and their composition, Viral genome, their types and structures
- Virus related agents (viroids, prions).
- Bacteriophages: structural organization, life cycle; (one step growth curve, eclipse phase, phage production, burst size), lysogenic cycle; Brief details on life cycle of MI3, Mu, T3, T4, and Lamda P1
- Genetic mapping of phage T4 , genetic organization  $\lambda$  phage

**Unit – IV**

- Cultivation of viruses: embryonated eggs, experimental animals; Cell culture: primary and secondary cell cultures, suspension cell cultures and monolayer cell cultures and transgenic system
- Assay of viruses: physical and chemical methods (protein, nucleic acid, radioactive tracers, electron microscopy), infectivity assay (plaque Method, end point method), bacteriophage typing
- Structural organization, life cycle, pathogenicity, symptoms of: Plant Viruses (TMV, CMV, and PVX) and Animal Viruses (Pox, Herpes, HIV, Influenza, Polio), control of vector

**Name and Signatures:**

**Chairperson/ HOD**

**Subject Expert**

**Subject Expert**

**VC Nominee**

**Industrial Representative**

**Member of Other Department**

**Student Nominee**

**Departmental members:**

**Recommended Books:**

1. A Text book of Microbiology – P.Chakraborty , New central book agency(P) Ltd. Kolkata.
2. General Microbiology I &II - C.B. Powar and H. F. Dagainawala , HimalayaPublishing House Bombay.
3. Microbiology – B.D. Davis, R. Dulbecco, H.N. Eisen and H.S. Ginsberg, Harper and Row Publishers Philadelphia.
5. A Text book of Microbiology – R.C. Dubey and D.K. Maheshwari, S. Chand and Company Ltd., New Delhi.
6. Microbiology: Fundamentals and Applications – S.S. Purohit, Students Edition, Jodhpur.
7. Biology of Microorganisms – T.D. Brock and M.T. Madigan, Prentice Hall Int. Inc
8. Fundamental Principles of Bacteriology – A.J. Salle
9. General Microbiology – R.Y. Stainer, J.L. Wheelis and P.R. Painter, Macmillan Educational Ltd. London.
10. Modern Microbiology – E.A. Brige, W.M.C. Brown, Oxford, England
11. Text book on Principles of Bacteriology, Virology and Immunology – Topley and Wilson, Edward Arnold, London
13. An Introduction to Viruses – S.B.Biswas and Amita Biswas, Vikas Publishing house Pvt.Ltd.
14. Virology: Principles and Applications – John Carter and Venetia Saunders, John Wiley and Sons Ltd.

**Session 2023-24**  
**M.Sc. – MICROBIOLOGY**  
**SEMESTER I**  
**PAPER – II**  
**MMB 102 PHYCOLOGY AND MYCOLOGY**

**Max. M. – 80; Min. M. - 16**

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

- ❖ **To Know the diversity and life cycle of Eukaryotic Microorganisms, Algae and Fungi**
- ❖ **To be able to relate the knowledge of evolutionary relationship among fungal groups**
- ❖ **To get insight into useful fungal activities and their importance**
- ❖ **To analyze the information regarding representative members of Algae and Fungi**

**Unit – I**

- Algae – Distribution, classification, thallus range and nutrition, Pigmentation
- Blue Green Algae: classification, properties, economic importance; Diatoms
- Algal Reproduction
- Algal Ecology
- Algal Biotechnology
- Lichens – General account, classification, structure, reproduction and economic importance.

**Unit – II**

- General Features of fungi: Structure and cell differentiation, Classification, Reproduction
- Salient features of Division Myxomycotina, Mastigomycotina and Zygomycotina. Life cycle and economic importance of representative members
- Salient features of Division Ascomycotina – Hemiascomycetes, Plectomycetes, Pyrenomycetes, Discomycetes, Labelbeniomycetes, Loculoascomycetes. Life cycle and economic importance of representative members

**Unit – III**

- Salient features of Division Basidiomycotina–Teliomycetes, Hymenomycetes. Life cycle and economic importance of representative members
- Salient features of Division Deuteromycetes –Hypomycetes, Coelomycetes, Blastomycetes. Life cycle and economic importance of representative members
- Evolutionary tendencies in lower fungi and higher fungi.

**Unit – IV**

- Fungi and Ecosystem –Nutritional strategies , Fungi as insect symbiont, Fungi and bioremediation, Effect of Environment on fungal growth, Prevention of fungal growth, Mycorrhiza – Ectomycorrhiza, Endomycorrhiza, Vesicular Arbuscular Mycorrhiza
- Industrial importance of Fungi
- Heterothallism in fungi
- Sex hormones in fungi

**Name and Signatures:**

 <b>Chairperson/ HOD</b>	 <b>Subject Expert</b>	 <b>Subject Expert</b>	<b>VC Nominee</b>
<b>Industrial Representative</b>	 <b>Member of Other Department</b>	<b>Student Nominee</b>	
<b>Departmental members:</b>			
			

**Recommended Books:**

1. An Introduction to Mycology – R.S. Mehrotra, and K.R. Aneja 1990, New Age International publishers.
- 2: Introduction to Mycology (3<sup>rd</sup> Ed.) –Alexopoulos, C.J. and C.W. Mims 1979. Wiley Eastern Ltd.,
3. Fundamentals of Mycology – J.H. BurnettmPublisher : Edward , Arnold Crane russak.
4. The Fungi – M.Charlile& S.C. Watkinson, Publisher:Academic Press.
5. Fundamentals of Fungi – E. Moore-Landeekeer, Publisher: Prentice Hall.
6. The Algae: Structure and Reproduction, Vol I and II – F.E. Fritsch, Vikas Publishing house Pvt. Ltd.
7. A text book of Algae – A.V.S.S. Sambamurthy, I.K. International Pub.

**Session 2023-24**  
**M.Sc. – MICROBIOLOGY**  
**SEMESTER I**  
**PAPER – III**  
**MMB 103 BIOCHEMISTRY**

**Max. M. – 80; Min. M. - 16**

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

- ❖ **To learn the characters and classes of basic building blocks and their biological significance**
- ❖ **To be familiar the students with bio-molecular derivatives and their importance**
- ❖ **To Study the structure, properties and biological importance of DNA and RNA**
- ❖ **To understand conceptual knowledge of properties, structure, function of enzymes, enzyme kinetics and their regulation**

**Unit – I**

- **Carbohydrates: Characters and classification; Monosaccharide -classification, structure and physico-chemical properties, glycosides; Derivatives of monosaccharide – aminosugars, sugar acids and phosphorylated sugars**
- **Disaccharides- sucrose, lactose and maltose**
- **Structure, occurrence and biological significance of polysaccharides (starch, cellulose, chitin, glycogen and peptidoglycan)**

**Unit – II**

- **Amino acids: Standard amino acids, nonstandard amino acids, D-amino acids, beta- and gamma-amino acids, Classification of amino acids, Analysis of mixtures of amino acids, Derivatives of amino acids**
- **Proteins : Classification, organization and specificity of proteins, assemblies of proteins, purification**
- **Vitamins: Classification- water and fat soluble vitamins, structure and their biochemical properties**
- **Hormones : Basic mechanism of hormones action , hormones and diseases**

**Unit – III**

- **Lipids:Classification of lipids; fatty acids: physico - chemical properties, separation,distribution in nature, characterization and saponification**
- **Nomenclature, outline structure, properties and functions of glycerides, neutral lipids(waxes, fats and oils) Membrane lipids: phospholipids, spingophospholipids and glycolipids**
- **Steroids, Plant sterols, Ergosterol, Stigmasterol and Cholesterol**
- **Structure of purine and pyrimidine bases, nucleosides and nucleotides and their nomenclature, Types of RNA and DNA and their structures**

**Unit – IV**

- **Enzymes:Nomenclature, classification**
- **Enzyme kinetics, factors affecting enzyme activity: Effect of pH, substrate concentration, temperature and inhibitors**
- **Mechanism of enzyme action,Competitive and non-competitive inhibition, Regulation of enzyme activity,allosteric enzymes and feedback mechanisms**
- **Enzyme assay: General considerations and different methods**

**Name and Signatures:**

  
**Chairperson/ HOD**

  
**Subject Expert**

  
**Subject Expert**

**VC Nominee**

**Industrial Representative**

  
**Member of Other Department**

  
**Student Nominee**

**Departmental members:**











**Recommended Books:**

1. Principles of Biochemistry- Albert L. Lehninger ,CBSPublishers And Distributors
2. Fundamentals of Biochemistry – Dr. J.L.Jain , Dr. Sanjay Jain, S.Chand Publication
3. Biochemistry- U.Satyanarayana, U.Chakrapani ,Books and Allied (p) Ltd.
4. Color Atlas of Biochemistry- J.Koolman And K.H. Roehm , Thieme Stuttgart, New York
5. Biochemistry- Power AndChattwal, Himalaya Publishing House
6. Biochemistry- Christopher K. Mathews, K.E.VanHolde, Kevin G. Ahern, Pearson Education
7. Practical Biochemistry- Principles And Techniques- Keith Wilson And John Walker
8. Biochemistry – Donald Voet and Judith G. Voet



**Session 2023-24**  
**M.Sc. – MICROBIOLOGY**  
**SEMESTER I**  
**PAPER – IV**  
**MMB 104 FUNDAMENTALS OF IMMUNOLOGY**

**Max. .M. – 80; Min. M. – 16**

Upon successful completion of the course students will be able –

- ❖ To know the concept of immune system and immunity and learn the methods of immunogenic reactions
- ❖ To understand variety of operation related to immune response
- ❖ To conceptualize the origin of lymphocytic clones
- ❖ To know the theory of immunization and immune therapy

**Unit –I**

- Immune System and Immunity: History of Immunology
- Structures, composition and functions of cells and organs involved in immune system
- Immune responses: Innate immunity and Acquired immunity
- Antigens: Structure and Properties, types, Iso and allo, haptens, adjuvants, antigen specificity
- Immunoglobulin: structure, heterogeneity, types and subtypes, properties (physico Chemical and biological)

**Unit –II**

- Complement: structure, components, properties and functions
- In vitro Methods: agglutination, precipitation, complement fixation, immune fluorescence, ELISA, Radio Immunoassays
- In vivo Method: Skin tests & immune complex tissue demonstrations, applications of these methods in diagnosis of microbial diseases
- Immunohaematology: blood groups, blood transfusion and Rh incompatibilities

**Unit – III**

- Structure and functions of MHC
- Gene regulation and Ir-genes; HL-A and tissue transplantation, Tissue typing methods for organ and tissue transplantations in humans; graft versus host reaction and rejection
- Autoimmunity: Theories, mechanism and diseases with their diagnosis

**Unit –IV**

- Tumor immunology: Tumor specific antigens, Immune response to tumors, immune diagnosis of tumors, detection of tumor markers, alphafoetal proteins, carcino embryonic antigen
- Hypersensitivity Reactions: Antibody mediated, Type I(Anaphylaxis), TypeII(Antibody dependent cell cytotoxicity), Type III (Immune complex mediated reactions), Type IV (Cell mediated hypersensitivity reaction)
- Cytokines: Properties, classification, biological functions, cytokine receptors and cytokine related diseases

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**Subject Expert**

  
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**Industrial Representative**

  
**Member of Other Department**

  
**Student Nominee**

**Departmental members:**









**Recommended Books:**

1. Essentials of Immunology – I.M. Roitt, ELBS, Blackwell Scientific publishers, London.
2. Kubey Immunology II-Edition – J. Kube, W.H. Freeman and company. New York.
3. Immunology. Understanding of Immune System – Klaus D. Elgert Wiley – Liss. NY.
4. Text book on Principles of Bacteriology, Virology and Immunology (IX Ed) – Topley & Wilson's (5 volumes) Edward Arnold, London.
5. Immunology – S.S. Lal and Sanjeev Kumar, Rastoogi Pub. Meerut India.
6. Immunology at a glance – J.H.L. Playfair
7. The chain of Immunology – G. Feinberg and M.A. Jackson
8. Lecture notes on immunology – I.R. Todd, Blackwell scientific Publications, Oxford.
9. Fundamental Immunology – W.E. Paul, Raven Press, New York
10. Fundamentals of Immunology – R.M Coleman, M.F. Lombord and R.E. Sicard, 2<sup>nd</sup> Ed. Brown Publishers

**Session 2023-24**  
**M.Sc. MICROBIOLOGY**  
**SEMESTER –I**  
**LAB COURSE I**  
**MMBL 01 BACTERIOLOGY & VIROLOGY AND PHYCOLOGY & MYCOLOGY**  
**List of Practical Exercises**

**M.M. – 100**

**I – Bacteriology and Virology**

1. Isolation of bacteria from following sources and study their cultural characteristics.  
Air, Water and Soil.
2. Identification of isolated bacteria by Gram staining, Negative staining, Acid fast staining and Flagella staining.
3. Identification of isolated bacteria on the basis of biochemical properties.
  - IMVic test
  - TSIA test
  - H<sub>2</sub>S production test
  - Catalase production test
  - Amylase production test
4. Determination of bacterial growth by Turbidity measurement (Spectrophotometric method).
5. Isolation and examination of Actinomycetes from soil and study their cultural characteristics.
6. Phage titration and determination of Viral load in given sample.
7. Symptomatological study of Viral Diseases (plants and animals).

**II – Phycology & Mycology**

1. Isolation of Green Algae and Cyanobacteria from soil and water samples.
2. Study the special features of selected Green Algae, Cyanobacteria and Diatoms.
3. Study the special features of Lichens.
4. Isolation and examination of Rhizospheric fungi by Warcup's method.
5. Isolation and examination of Keratinophilic fungi from soil by Keratin Bait technique.
6. Isolation and examination of Coprophilous fungi from dung by Moist Chamber method.
7. Isolation and examination of Storage fungi from food grains by Blotter technique.
8. Isolation and examination of Zoosporic fungi from water by Seed Bait technique.
9. Isolation and examination of Aeromycoflora by Petri plate exposure.
10. Study of Endomycorrhiza colonization and calculation of percent root infection.
11. Study the special features of selected fungal isolated.
12. Micrometry and camera Lucida studies of some microbial structures.

**Name and Signatures:**

  
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**Student Nominee**

**Departmental members:**









**Session 2023-24**  
**M.Sc. MICROBIOLOGY**  
**SEMESTER -I**  
**LAB COURSE II**  
**MMBL 02 BIOCHEMISTRY AND IMMUNOLOGY**  
**List of Practical Exercises**

**M.M. - 100**

**I Biochemistry**

1. Preparation of buffer and determination of pH.
2. Extraction and determination of total sugars in the sample by Dubois method.
3. Determination of reducing sugar in the sample by Benedict's reagent.
4. Distinguish between aldose and ketose sugar by Seliwanoff's test.
5. Determination of starch by Iodine test.
6. Detection of free amino acid in the sample by Ninhydrin test.
7. Extraction of protein and estimation by Folin-Lowry and Biuret method.
8. Detection of presence of lipid by Saponification.
9. Isolation of genomic DNA from bacterial cell and estimation by DPA method (Diphenylamine method).
10. Isolation and estimation of RNA from yeast.
11. Enzyme production test by microorganisms (Amylase/Lipase/Gelatinase/Pectinase/ Protease).

**II Immunology**

1. Study of agglutination reaction with blood grouping and Blood examination for Rh factor.
2. Characterization of Lymphocytes from blood.
3. Antigen antibody reaction by Double Diffusion technique.
4. Separation of Immunogen by immuno electrophoresis technique.
5. Dot ELISA.
6. Determination of concentration of given antigen by RID technique.
7. Antigen/Antibody capture ELISA

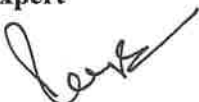
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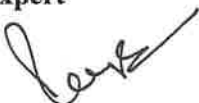
  
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Subject Expert

  
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Industrial Representative

  
Member of Other Department

  
Student Nominee

**Departmental members:**







