

DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM & MARKING SCHEME

B.Sc. VII, VIII Semester

MICROBIOLOGY

(Based on Choice Based Credit System)

SESSION : 2025-26



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)

Phone : 0788-2212030

Website - www.govtsciencecollegedurg.ac.in, Email – autonomousdurg2013@gmail.com

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2025-26

PART – A: INTRODUCTION

Program: B.Sc.		Semester - VII		Session: 2025-26
1	Course Code	BMB-701		
2	Course Title	Bacteriology and Virology		
3	Course Type	DSC		
4	Course Learning Outcomes (CLO)	This Course will enable the students to – CO 1 To understand the classification and diversity among bacteria and their respective forms CO 2 To identify the nutritional requirements for cultivation of bacteria under laboratory conditions CO 3 To acquire an initiative about the viruses, related agents and bacteriophages and their organizations CO 4 To get an overview of viral diseases of plants and animals		
5	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation	
6	Total Marks	Max. Marks: 75		Minimum Passing marks: 30

PART – B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Periods
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, Phycobolismes, Endospore, Cell division, Reserve food material, polyhydroxybutyrate, polyphosphate granules, oil droplets, cyanophycin granules and sulphur inclusions.	11
II	Classification of microorganisms: Basis of microbial classification; Haeckel's three kingdoms concept, Whittaker's five kingdom concept, three domain concepts of Carl Woese Salient feature of bacterial classification according to the Bergey's manual of determinative bacteriology. Special Groups of Bacteria: Archaeobacteria, Actinomycetes, Mycoplasmas, Rickettsia, Chlamydiae and Spirochetes. Brief outline on discovery of viruses, Classification and nomenclature of viruses.	11
III	Distinctive properties of viruses, morphology and ultrastructure, capsids and their arrangements, types of envelopes and their composition, Viral genome, their types and structures. Plant Viruses: Structural organization, life cycle, pathogenicity, symptoms (TMV and CMV); Animal Viruses (Pox, Herpes, Influenza) Bacteriophages: structural organization, life cycle; (one step growth curve, eclipse phase, phage production, burst size), lysogenic cycle; Brief details on life cycle of M13, T4 Phage. Virus related agents (viroids, prions).	11
IV	Cultivation of viruses: embryonated eggs, experimental animals; Cell culture: primary and secondary cell cultures, suspension cell cultures and monolayer cell cultures. Assay of viruses: physical and chemical methods, infectivity assay (plaque Method, end point method) Cultivation of bacteria: aerobic, anaerobic methods, Nutritional types, culture media, Growth curve (batch culture), synchronous, continuous cultures. Generation time, Growth kinetics, Measurement of growth, factors affecting microbial growth.	12

Name and Signatures

Chairperson/ HOD

Subject Expert

Subject Expert

VC Nominee

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

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, Himalaya Publishing 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

Reference Books:

1. Fundamental Principles of Bacteriology – A.J. Salle
2. General Microbiology – R.Y. Stainer, J.L. Wheelis and P.R. Painter, Macmillan Educational Ltd. London.
3. Modern Microbiology – E.A. Brige, W.M.C. Brown, Oxford, England
4. Text book on Principles of Bacteriology, Virology and Immunology – Topley and Wilson, Edward Arnold, London
5. An Introduction to Viruses – S.B. Biswas and Amita Biswas, Vikas Publishing house Pvt. Ltd.
6. Virology: Principles and Applications – John Carter and Venetia Saunders, John Wiley and Sons Ltd.

Online Resources – e-Resources/ e-Books and e- learning portals

- <https://pmc.ncbi.nlm.nih.gov/articles/PMC8435829/>
- <https://www.ncbi.nlm.nih.gov/books/NBK26917/>
- <https://pmc.ncbi.nlm.nih.gov/articles/PMC5002265/>

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 75 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 60 Marks

Internal Assessment:

Continuous Comprehensive Evaluation (CCE)

Internal Test of 15 Marks and Assignment of 15 Marks

Semester
End Exam
(SEE)

Pattern -FOUR Questions (A, B, C, D) from each Unit

Question - A & B: (Compulsory) Very short answer type (01 each) 02 x 5 = 10 Marks

Question - C: Short answer type question 03 x 5 = 15 Marks

Question - D: Long answer type question 07 x 5 = 35 Marks

Total = 60 Marks

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni

Subject Expert - Dr. Anita Mahiswar

Subject Expert - Dr. Sonal Mishra

VC Nominee – Dr. Prakash Saluja

Member of Other Department- Dr. G.S. Thakur

Industrial Representative- Shri Amitesh Mishra

Student Nominee – Ms. Yogita Lokhande

Departmental members

1. Mrs. Rekha Gupta

2. Mrs. Neetu Das

3. Ms. Mrinalini Soni

4. Ms. K.K. Yashoda

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
LAB COURSE

PART – A: INTRODUCTION

Program: B.Sc.		Semester - VII	Session: 2025-26
1	Course Code	BMBL-701	
2	Course Title	Lab. Course	
3	Course Type	Laboratory Course	
4.	Course Learning Outcomes (CLO)	This Course will enable the students to: CO 1 To understand isolation methods of bacterial and fungal colonies and their morphological characterization, CO 2 To understand the different staining and Biochemical identification methods, CO 3 To study the principles of assay techniques, CO 4 To study the symptoms of viral diseases.	
5.	Credit Value	1 Credit	1 Credit = 30 Hours Learning and Observation
6.	Total Marks	Maximum Marks :25	Minimum Passing Marks:10

PART – B: CONTENT OF THE COURSE

S.No.	List of Experiments
1.	Isolation of bacteria from following sources and study their cultural characteristics.
2.	Air, Water and Soil.
3.	Identification of isolated bacteria by Gram staining, Negative staining, Acid fast staining and Flagella staining.
4.	Identification of isolated bacteria on the basis of biochemical properties: IMVic test, TSIA test, H ₂ S production test, Catalase production test, Amylase production test
5.	Determination of bacterial growth by Turbidity measurement (Spectrophotometric method).
6.	Isolation and examination of Actinomycetes from soil and study their cultural characteristics.
7.	Phage titration and determination of Viral load in given sample.
8.	Symptomatological study of Viral Diseases (plants and animals).

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Practical Microbiology by Dr. R.C. Dubey and Dr. D.K. Maheshwari, S. Chand and Company LTD.
2. Society for general Microbiology, Basic Practical Microbiology by John Grainger, Hurst, Darrel Burdass.

Online Resources:

<https://www.researchgate.net/publication/312196295> Practical Bacteriology
<https://www.researchgate.net/publication/234167107> Practical Microbiology - A Laboratory Manual
<https://www.researchgate.net/publication/24821604> Virology A Practical Approach
<https://www.researchgate.net/publication/51261148> Practical Procedures for the Purification of Bacterial Viruses
<https://microbiologyvsociety.org/static/uploaded/23cbf9c5-f8c8-4f91-b092a4ad819e6357.pdf>

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:

25 Marks

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)
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Name and Signatures







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DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2025-26

PART – A: INTRODUCTION			
	Program: B.Sc.	Semester - VII	Session: 2025-26
1	Course Code	BMB-702	
2	Course Title	Structure and Functions of Biomolecules	
3	Course Type	DSE I	
4	Course Learning Outcomes (CLO)	This Course will enable the students to – CO 1 To learn the characters and classes of basic building blocks and their biological significance CO 2 To be familiar the students with bio-molecular derivatives and their importance CO 3 To Study the structure, properties and biological importance of DNA and RNA CO 4 To understand conceptual knowledge of properties, structure, function of enzymes, enzyme kinetics and their regulation	
5	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation
6	Total Marks	Max. Marks: 75	Minimum Passing marks: 30

PART – B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Periods
I	Carbohydrates: Structure and physico-chemical properties and classification; Monosaccharide - Derivatives of monosaccharide- aminosugars, sugar acids and phosphorylated sugars, glycosides; Disaccharides- sucrose, lactose and maltose Polysaccharides- Structure, occurrence and biological significance of (starch, cellulose, chitin, glycogen and peptidoglycan)	11
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	11
III	Nucleosides and Nucleotides- Structure of purine and pyrimidine bases, and their nomenclature, Types of RNA and DNA and their structures Lipids: Classification of lipids; fatty acids- physico - chemical properties, separation, distribution in nature, characterization and saponification Nomenclature, outline structure, properties and functions of glycerides and neutral lipids(waxes, fats and oils); Steroids- Plant sterols, Ergosterol and Cholesterol	11
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	12

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni	Industrial Representative- Shri Amitesh Mishra
Subject Expert - Dr. Anita Mahiswar	Student Nominee – Ms. Yogita Lokhande
Subject Expert - Dr. Sonal Mishra	Departmental members
VC Nominee – Dr. Prakash Saluja	1. Mrs. Rekha Gupta
Member of Other Department- Dr. G.S. Thakur	2. Mrs. Neetu Das
	3. Ms. Mrinalini Soni
	4. Ms. K.K. Yashoda

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Principles of Biochemistry- Albert L. Lehninger ,CBS Publisers 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 And Chattwal, 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

Reference Books:

1. Wilson & Walker. Principles and Techniques in Practical Biochemistry. 5th Edition Cambridge University Press (2000).
2. D.T Plummer. An Introduction to practical Biochemistry. McGraw Hill Publication 1987.
3. Beckner, W.M., Kleinsmith L.J. and Hardin J. The world of cell. IV edition Benjamin/Cummings (2000).
4. Berg, J. M., Tymoczko, J. L., Gatto, G. J., & Stryer, L. (2019). Biochemistry (9th ed.). W. H. Freeman.
5. Voet, D., & Voet, J. G. (2016). Biochemistry (4th ed.). Wiley.
6. Rodwell, V. W., Bender, D. A., Botham, K. M., Kennelly, P. J., & Weil, P. A. (2021). Harper's illustrated biochemistry (31st ed.). McGraw-Hill.

Online Resources – e-Resources/ e-Books and e- learning portals

- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=MNhNzp1RQIU+6LM40KjY1Q==>
- <https://egvankosh.ac.in/bitstream/123456789/73094/1/Unit-2.pdf>
- <https://egvankosh.ac.in/bitstream/123456789/80290/3/Unit-11.pdf>

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	75 Marks
Continuous Internal Assessment (CIA):	15 Marks
End Semester Exam (ESE):	60 Marks

Internal Assessment:

Continuous Comprehensive Evaluation (CCE)

Internal Test of 15 Marks and Assignment of 15 Marks

Semester
End Exam
(SEE)

Pattern -FOUR Questions (A, B, C, D) from each Unit

Question - A & B: (Compulsory) Very short answer type (01 each)	02 x 5 = 10 Marks
Question - C: Short answer type question	03 x 5 = 15 Marks
Question - D: Long answer type question	07 x 5 = 35 Marks
Total	= 60 Marks

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni

Subject Expert - Dr. Anita Mahiswar

Subject Expert - Dr. Sonal Mishra

VC Nominee – Dr. Prakash Saluja

Member of Other Department- Dr. G.S. Thakur

Industrial Representative- Shri Amitesh Mishra

Student Nominee – Ms. Yogita Lokhande

Departmental members

1. Mrs. Rekha Gupta
2. Mrs. Neetu Das
3. Ms. Mrinalini Soni
4. Ms. K.K. Yashoda

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FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
LAB COURSE

PART – A: INTRODUCTION			
Program: B.Sc.		Semester - VII	
Session: 2025-26			
1.	Course Code	BMBL-702	
2.	Course Title	Lab. Course	
3.	Course Type	Laboratory Course	
4.	Course Learning Outcomes (CLO)	This Course will enable the students to: CO 1 To understand structural organization, and classification of biomolecules CO 2 To determine the relationship between the structure and function of biomolecules CO 3 To understand principles of enzyme kinetics, enzyme inhibition, and mechanisms of enzyme action CO 4 To learn role of vitamins and hormones in metabolic processes	
5.	Credit Value	1 Credit	1 Credit = 30 Hours Learning and Observation
6.	Total Marks	Maximum Marks :25	Minimum Passing Marks:10

PART – B: CONTENT OF THE COURSE

S.No.	List of Experiments
1.	Preparation of buffer and determination of pH.
2.	Determination of total sugars in the sample by Dubois method.
3.	Determination of reducing sugar in the sample by Benedict's reagent.
4.	Determination of starch by Iodine test
5.	Detection of free amino acid in the sample by Ninhydrin test.
6.	Extraction of protein and estimation by Folin-Lowry/ Biuret method
7.	Detection of presence of lipid by Saponification
8.	Enzyme production test by microorganisms (Amylase/Lipase/Gelatinase/Pectinase/ Protease).

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. An introduction to practical biochemistry , 3rd edition by David T. Plummer, Indian Edition, McGraw Hill Education
2. Saras, Principles and techniques of biophysics by N. Arumugam,V.Kumaresan

Online Resources:

- <https://tk.elte.hu/dstore/document/871/book.pdf>
- <https://www.vet-ebooks.com/experiments-in-biochemistry-a-hands-on-approach/>
- <https://www.e-booksdirectory.com/listing.php?category=8>

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 25 Marks

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)
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Name and Signatures Chairperson/ HOD- Dr. Pragya Kulkarni

Subject Expert - Dr. Anita Mahiswar

Subject Expert - Dr. Sonal Mishra

VC Nominee – Dr. Prakash Saluja

Member of Other Department- Dr. G.S. Thakur

Industrial Representative- Shri Amitesh Mishra

Student Nominee – Ms. Yogita Lokhande

Departmental members

Mrs. Rekha Gupta

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DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2025-26

PART – A: INTRODUCTION			
Program: B.Sc.		Semester - VII	Session: 2025-26
1	Course Code	BMB-703	
2	Course Title	Phycology and Mycology	
3	Course Type	DSE II	
4	Course Learning Outcomes (CLO)	This Course will enable the students to – CO 1 To Know the diversity and life cycle of Eukaryotic Microorganisms, Algae and Fungi CO 2 To be able to relate the knowledge of evolutionary relationship among fungal groups CO 3 To get insight into useful fungal activities and their importance CO 4 To analyze the information regarding representative members of Algae and Fungi	
5	Credit Value	04 Credits	Credit = 15 Hours - Learning & Observation
6	Total Marks	Max. Marks: 100	Minimum Passing marks: 40

PART – B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Periods
I	Algae – Distribution, classification, thallus range and nutrition, Pigmentation Blue Green Algae: classification, properties, economic importance; Diatoms Algal Reproduction, Algal Ecology and Algal Biotechnology. Lichens – General account, classification, structure, reproduction and economic importance.	12
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.	11
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.	11
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.	11

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni	Industrial Representative- Shri Amitesh Mishra
Subject Expert - Dr. Anita Mahiswar	Student Nominee – Ms. Yogita Lokhande
Subject Expert - Dr. Sonal Mishra	Departmental members
VC Nominee – Dr. Prakash Saluja	1. Mrs. Rekha Gupta
Member of Other Department- Dr. G.S. Thakur	2. Mrs. Neetu Das
	3. Ms. Mrinalini Soni
	4. Ms. K.K. Yashoda

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. An Introduction to Mycology – R.S. Mehrotra, and K.R. Aneja 1990, New Age International publishers.
2. Introduction to Mycology (3rd Ed.) –Alexopoulos, C.J. and C.W. Mims 1979. Wiley Eastern Ltd.,
3. Fundamentals of Mycology – J.H. Burnett Publisher : Edward , Arnold Crane russak.
4. The Algae: Structure and Reproduction, Vol I and II – F.E. Fritsch, Vikas Publishing house Pvt. Ltd.
5. A text book of Algae – A.V.S.S. Sambamurthy, I.K. International Pub.

Reference Books:

1. The Fungi – M.Charlile & S.C. Watkinson, Publisher: Academic Press.
2. Fundamentals of Fungi – E. Moore-Landeecker, Publisher: Prentice Hall.

Online Resources – e-Resources/ e-Books and e- learning portals

- <https://veastwonderfulworld.files.wordpress.com/2016/10/fungal-biology.pdf>
- <http://www.deskuervis.nic.in/pdf/WEBSTER30521807395.pdf>
- <https://www.rvskvv.net/images/I-Year-II-Sem Principles Plantpathology ANGRAU 20.04.2020.pdf>

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 20 Marks

End Semester Exam (ESE): 80 Marks

Internal Assessment:

Continuous Comprehensive Evaluation (CCE)

Internal Test of 20 Marks and Assignment of 20 Marks

Semester
End Exam
(SEE)

Pattern -FOUR Questions (A, B, C, D) from each Unit

Question - A & B: (Compulsory) Very short answer type (02 each) 04 x 4 = 16 Marks
Question - C: Short answer type question 06 x 4 = 24 Marks
Question - D: Long answer type question 10 x 4 = 40 Marks
Total = 80 Marks

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni

Subject Expert - Dr. Anita Mahiswar

Subject Expert - Dr. Sonal Mishra

VC Nominee – Dr. Prakash Saluja

Member of Other Department- Dr. G.S. Thakur

Industrial Representative- Shri Amitesh Mishra

Student Nominee – Ms. Yogita Lokhande

Departmental members

1. Mrs. Rekha Gupta
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DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2025-26

PART – A: INTRODUCTION			
Program: B.Sc.		Semester - VII	Session: 2025-26
1	Course Code	BMB-704	
2	Course Title	Advanced Immunology	
3	Course Type	DSE III	
4	Course Learning Outcomes (CLO)	This Course will enable the students to – CO 1 To know the concept of immune system and immunity and learn the methods of immunogenic reactions CO 2 To understand variety of operation related to immune response CO 3 To conceptualize the origin of lymphocytic clones CO 4 To know the theory of immunization and immune therapy	
5	Credit Value	04 Credits	Credit = 15 Hours - Learning & Observation
6	Total Marks	Max. Marks: 100	Minimum Passing marks: 40

PART – B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Periods
I	Immune system: Innate and Acquired immunity, Haematopoiesis, Structures, composition and functions of cells and Organs involved in immune system, Immune responses; Antigens: Structure and Properties, types, Iso and allo, haptens, adjuvants, antigen specificity, Immunoglobulin: structure, heterogeneity, types and subtypes, properties (physico-chemical and biological); Cytokines: Properties, Classification, Biological functions, cytokine receptors	12
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, Immuno-haematology: Blood groups, Blood transfusion and Rh incompatibilities, Flow cytometry, Microarray technique, Structure and functions of Class I, II MHC, Gene regulation and Ir (immune response) genes; HLA and Tissue transplantation, Tissue typing methods for organ and tissue transplantations in humans; Graft versus Host Reaction and Rejection	12
III	Tumor immunology: Tumor specific antigens, Immune response to tumors, Immune diagnosis of tumors, Detection of tumor markers, Alphafoetal proteins, Carcino embryonic antigen, Immune therapy in cancer, Checkpoint therapy, Autoimmunity: Mechanism and Diseases with their diagnosis.	11
IV	Hypersensitivity Reactions: Antibody mediated, Type I (Anaphylaxis), Type II (Antibody dependent cell cytotoxicity), Type III (Immune complex mediated reactions), Type IV (Cell mediated hypersensitivity reaction), Cytokine related diseases	10

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni	Industrial Representative- Shri Amitesh Mishra
Subject Expert - Dr. Anita Mahiswar	Student Nominee – Ms. Yogita Lokhande
Subject Expert - Dr. Sonal Mishra	Departmental members
VC Nominee – Dr. Prakash Saluja	1. Mrs. Rekha Gupta
Member of Other Department- Dr. G.S. Thakur	2. Mrs. Neetu Das
	3. Ms. Mrinalini Soni
	4. Ms. K.K. Yashoda

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Essentials of Immunology – I.M. Roitt, ELBS, Blackwell Scientific publishers, London.
2. Text book on Principles of Bacteriology, Virology and Immunology (IX Edi)–Topley & Wilson's (5 volumes) Edward Arnold, London.
3. Immunology – S.S. Lal and Sanjeev Kumar, Rastogi Pub. Meerut India.

Reference Books:

1. Kubey Immunology II-Edition– J. Kubey, W.H. Freeman and company. New York
2. Immunology. Understanding of Immune System –Klaus D. Elgert Wiley– Liss. NY.
3. Immunology at a glance – J.H.L. Playfair
4. The chain of Immunology – G. Feinberg and M.A. Jackson
5. Lecture notes on immunology – I.R. Todd, Blackwell scientific Publications, Oxford.
6. Fundamental Immunology – W.E. Paul, Raven Press, New York
7. Fundamentals of Immunology – R.M Coleman, M.F. Lombord and R.E. Sicard, 2nd Ed. Brown Publishers

Online Resources – e-Resources/ e-Books and e- learning portals

- <https://www.ncbi.nlm.nih.gov/books/NBK459455/>
- https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content
- https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000002BI/
- https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000035ZO/P001308/

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 20 Marks

End Semester Exam (ESE): 80 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)		Internal Test of 20 Marks and Assignment of 20 Marks	
Semester End Exam (SEE)	Pattern -FOUR Questions (A, B, C, D) from each Unit		
	Question - A & B: (Compulsory) Very short answer type (02 each)	04 x 4 = 16 Marks	
	Question - C: Short answer type question	06 x 4 = 24 Marks	
	Question - D: Long answer type question	10 x 4 = 40 Marks	
		Total	= 80 Marks

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni	Industrial Representative- Shri Amitesh Mishra
Subject Expert - Dr. Anita Mahiswar	Student Nominee – Ms. Yogita Lokhande
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VC Nominee – Dr. Prakash Saluja	1. Mrs. Rekha Gupta
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FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2025-26

PART – A: INTRODUCTION			
Program: B.Sc.		Semester - VII	Session: 2025-26
1	Course Code	BMB-705	
2	Course Title	Fermentation Technology	
3	Course Type	DSE IV	
4	Course Learning Outcomes (CLO)	This Course will enable the students to – CO 1 classify the microorganisms for fermentation CO 2 illustrate the basic concept of fermenter design CO 3 explain the raw materials used in fermentation technology CO 4 examine the methods of food preservation and assess quality	
5	Credit Value	04 Credits	Credit = 15 Hours - Learning & Observation
6	Total Marks	Max. Marks: 100	Minimum Passing marks: 40

PART – B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Periods
I	Microbial growth and Design of fermenters: Microbial culture selection for fermentation, Media formulation and optimization, inoculums development, strain improvement, microbial growth kinetics and yield kinetics. Design and operation of Fermenters, Basic concepts for selection of a reactor.	12
II	Processes involved in fermentation: Scale-up process and scale down process: Stages of fermentation-laboratory scale, pilot plant scale and production scale: Criteria of scale-up for critical parameters – aeration, agitation and sterilization; Scale down- Cell disruption; Filtration; Centrifugation; Chromatography; Lyophilization.	12
III	Quality control & quality assurance test: Principles of validation for pharmaceutical industry; QA Tests of finished product-Sterility testing, pyrogen testing, Ame's test toxicity testing, shelf-life testing.	11
IV	Food preservation methods and Fermentation products: High temperature, drying, food additives and radiation, preservation of milk, meat, fish, fruits and vegetables; food hygiene maintenance, large scale fermentation of Beer, Wine, Riboflavin, Streptomycin, Citric acid, Glutamic acid.	10

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni Subject Expert - Dr. Anita Mahiswar Subject Expert - Dr. Sonal Mishra VC Nominee – Dr. Prakash Saluja Member of Other Department- Dr. G.S. Thakur	Industrial Representative- Shri Amitesh Mishra Student Nominee – Ms. Yogita Lokhande Departmental members 1. Mrs. Rekha Gupta 2. Mrs. Neetu Das 3. Ms. Mrinalini Soni 4. Ms. K.K. Yashoda
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Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. A Text Book of Microbiology: Dr. R.C. Dubey & Dr. D.K. Maheshwari
2. Industrial Microbiology, Casida, L. E. 1984, Wiley, Easterns, New Delhi.
3. Industrial Microbiology. A. H. Patel 2nd Edition.

Reference Books:

4. Fermentation Microbiology and Biotechnology by M. El-Mansi and C. Bryce
5. Principles of Fermentation Technology Stanbury P.F., Whitaker A, and Hall S.J. (1997) Aditya Books Pvt. Ltd, N. Delhi.
6. Food Microbiology. 3rd edition. Frazier WC and Westhoff DC. (1992). Tata McGraw-Hill Publishing Company Ltd, New Delhi, India
7. Microbial Technology Vol. I and II by H.J. Pepler and D. Perlman. Academic Press INC.

Online Resources – e-Resources/ e-Books and e- learning portals

- http://nsi.gov.in/study-materials/DIIPA_Lecture-2_Role_of_microorganism_and_other_conditions_07042020.pdf
- <https://www.technologytimes.pk/2019/03/13/food-preservation-methods/>
- <https://www.classcentral.com/course/swayam-food-microbiology-and-food-safety-17609>

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 20 Marks

End Semester Exam (ESE): 80 Marks

Internal Assessment:

Continuous Comprehensive Evaluation (CCE)

Internal Test of 20 Marks and Assignment of 20 Marks

Semester
End Exam
(SEE)

Pattern -FOUR Questions (A, B, C, D) from each Unit

Question - A & B: (Compulsory) Very short answer type (02 each) 02 x 5 = 20 Marks

Question - C: Short answer type question 04 x 5 = 20 Marks

Question - D: Long answer type question 10 x 4 = 40 Marks

Total = 80 Marks

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni

Subject Expert - Dr. Anita Mahiswar

Subject Expert - Dr. Sonal Mishra

VC Nominee – Dr. Prakash Saluja

Member of Other Department- Dr. G.S. Thakur

Industrial Representative- Shri Amitesh Mishra

Student Nominee – Ms. Yogita Lokhande

Departmental members

1. Mrs. Rekha Gupta

2. Mrs. Nectu Das

3. Ms. Mrinalini Soni

4. Ms. K.K. Yashoda

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2025-26

PART – A: INTRODUCTION

Program: B.Sc.		Semester - VIII	Session: 2025-26
1	Course Code	BMB-801	
2	Course Title	Microbial Physiology and Metabolism	
3	Course Type	DSC	
4	Course Learning Outcomes (CLO)	This Course will enable the students to – CO 1 To learn the basic aspects of physiology CO 2 To be familiar the students with Metabolic pathways and their importance CO 3 To connect link between biomolecules and metabolic pathways. CO 4 To understand conceptual knowledge of Cellular Respiration and Phototrophy	
5	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation
6	Total Marks	Max. Marks: 75	Minimum Passing marks: 30

PART – B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

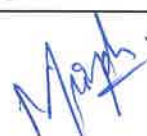
Unit	Topics (Course contents)	No. of Periods
I	Basic aspects of bioenergetics: entropy, enthalpy. Oxidation-reduction reaction: Electron donors and acceptors, Redox potentials, artificial electron donors. Electrons carrier: Nicotinamide Adenine Dinucleotide, Flavoproteins, Cytochromes, Quinones. High Energy compounds, ATP cycle, Nutrient Uptake and Transport: Passive and facilitated diffusion Primary and secondary active transport, concept of uniport, symport and antiport.	12
II	Brief account of photosynthetic and accessory pigments: chlorophyll, bacteriochlorophyll, rhodopsin, carotenoids, phycobiliproteins Autotrophic generation of ATP: Photosynthetic apparatus and reaction Centers, Oxygenic and an-oxygenic photosynthesis. Fixation of CO ₂ in microorganisms: Calvin cycles, Reverse TCA cycle. Chemolithotrophism, Sulphur, iron, hydrogen, Methanogenesis, Bio-Luminescence.	10
III	Carbohydrate anabolism: Gluconeogenesis, Glycogenesis Respiratory metabolism: Embden Mayer Hoff Parnas pathway, Pentose Phosphate Pathway, Entner-Doudroff pathway, Tricarboxylic Acid Cycle, Oxidative and substrate level phosphorylation, inhibitors, uncouplers Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways), concept of linear and branched fermentation pathways.	12
IV	Nitrogen metabolism, structure of nitrogenase enzyme, genome structure, nitrogen fixation Synthesis of major amino acids: polyamines Synthesis of polysaccharides: peptidoglycan, biopolymers as cell components. Global regulatory responses: Heat shocks response, stringent response and regulation by small molecules such as ppGpp and cAMP, signal hypothesis	11

Name and Signatures











Part – C: Learning Resources

Text Books, Reference Books and Others

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 , Himalaya Publishing House Bombay.
3. Microbiology – B.D. Davis, R. Dulbecco, H.N. Eisen and H.S. Ginsberg, Harper and Row, Publishers Philadelphia.
4. Biology of Microorganisms – T.D. Brock and M.T. Madigan, Prentice Hall Int. Inc
5. General Microbiology – R.Y. Stainer, J.L. Wheelis and P.R. Painter, Macmillan Educational Ltd. London.
6. Modern Microbiology – E.A. Brige, W.M.C. Brown, Oxford, England
7. Microbial Physiology and Metabolism – D.R. Coldwell, Brown Publisher
8. Microbial Physiology – A.G. Moat and J.W. Foster, Wiley Pub.
9. Principles of Biochemistry- Albert L. Lehninger , CBS Publisers And Distributors
10. Biochemistry – Donald Voet and Judith G. Voet

Reference Books:

1. Moat AG and Foster JW. (2002). Microbial Physiology. 4th edition. John Wiley & Sons
2. Reddy SR and Reddy SM. (2005). Microbial Physiology. Scientific Publishers India
3. Gottschalk G. (1986). Bacterial Metabolism. 2nd edition. Springer Verlag
4. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. (1987). General Microbiology. 5th edition, McMillan Press.

Online Resources – e-Resources/ e-Books and e- learning portals

- https://onlinecourses.swayam2.ac.in/cec20_bt14/preview
- <https://www.sciencedirect.com/bookseries/advances-in-microbial-physiology>
- https://www.researchgate.net/publication/358954750_microbial_physiology_and_metabolism_1

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 75 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 60 Marks

Internal Assessment: Continuous Comprehensive Evaluation (CCE)		Internal Test of 15 Marks and Assignment of 15 Marks	
Semester End Exam (SEE)	Pattern -FOUR Questions (A, B, C, D) from each Unit		
	Question - A & B: (Compulsory) Very short answer type (01 each)	02 x 5 = 10 Marks	
	Question - C: Short answer type question	03 x 5 = 15 Marks	
	Question - D: Long answer type question	07 x 5 = 35 Marks	
	Total		= 60 Marks

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni

Subject Expert - Dr. Anita Mahiswar

Subject Expert - Dr. Sonal Mishra

VC Nominee – Dr. Prakash Saluja

Member of Other Department- Dr. G.S. Thakur

Industrial Representative- Shri Amitesh Mishra

Student Nominee – Ms. Yogita Lokhande

Departmental members

Mrs. Rekha Gupta

Mrs. Neetu Das

Ms. Mrinalini Soni

Ms. K.K. Yashoda

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
LAB COURSE

PART – A: INTRODUCTION			
Program: B.Sc.		Semester - VII	
Session: 2025-26			
1	Course Code	BMBL-801	
2	Course Title	Lab. Course	
3	Course Type	Laboratory Course	
4.	Course Learning Outcomes (CLO)	This Course will enable the students to: CO 1 To understand the effect of various environmental factors on microbial growth CO 2 To determine the mode of nutrition of a microbe CO 3 To understand the principles of Fermentation CO 4 To learn role of environmental factors on various biosynthetic pathways	
5.	Credit Value	1 Credit	1 Credit = 30 Hours Learning and Observation
6.	Total Marks	Maximum Marks :25	Minimum Passing Marks:10
PART – B: CONTENT OF THE COURSE			
S.No.	List of Experiments		
1.	Effect of light on growth and sporulation of fungi.		
2.	Effect of temperature on growth of bacteria and determination TDP & TDT.		
3.	Effect of pH on growth of microorganism.		
4.	Study the fermentation of carbohydrates (glucose, sucrose & lactose).		
5.	Effect of salt concentration on growth of microorganism.		
6.	Effect of molecular oxygen on growth of microorganism.		
7.	Effect of heavy metal on growth of microorganism.		
PART – C: LEARNING RESOURCES			
Text Books, Reference Books and Others			
Text Books Recommended:			
1. An introduction to practical biochemistry , 3 rd edition by David T. Plummer, Indian Edition, McGraw Hill Education 2. Saras, Principles and techniques of biophysics by N. Arumugam, V.Kumaresan			
Online Resources:			
• https://academic.oup.com/book/54529 • https://pmc.ncbi.nlm.nih.gov/articles/PMC7685786/			
PART – D: ASSESSMENT AND EVALUATION			
Suggested Continuous Evaluation Methods:			
Maximum Marks:		25 Marks	
(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)			
Semester End Exam (SEE)		Laboratory performance: As per Dept. (LOCF)	

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni Subject Expert - Dr. Anita Mahiswar Subject Expert - Dr. Sonal Mishra VC Nominee – Dr. Prakash Saluja Member of Other Department- Dr. G.S. Thakur	Industrial Representative- Shri Amitesh Mishra Student Nominee – Ms. Yogita Lokhande Departmental members 1. Mrs. Rekha Gupta 2. Mrs. Neetu Das 3. Ms. Mrinalini Soni 4. Ms. K.K. Yashoda
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GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2025-26

PART – A: INTRODUCTION

Program: B.Sc.		Semester - VIII	Session: 2025-26
1	Course Code	BMB-802	
2	Course Title	Biostatistics and Computer Application	
3	Course Type	DSE I	
4	Course Learning Outcomes (CLO)	This Course will enable the students to – CO 1 To get the concept of biostatistics in microbiology and learn the basic measures to compile, analyze and make inference from observations CO 2 To understand the correlation of obtained data and able to explain the significance in results during scientific experiments CO 3 To design an experiment and to visualize the controlling factors CO 4 To understand and practice the tools of computers	
5	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation
6	Total Marks	Max. Marks: 75	Minimum Passing marks: 30

PART – B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Periods
I	Introduction: Definition, Basic concepts, The sample and population, Measurement scales, Statistical inference and parameters Classification of Data: Objective of Classification, Types of data Presentation of data: Tabulation, Frequency distribution, Graphical presentation of data and interpretation Measures of central tendencies (mean, mode, median)	11
II	Measures of dispersion (range, mean deviation, standard deviation and error) Probability: Basic Concepts, Types, Applications Correlation: Types and Methods, Correlation coefficient and its significance Regression analysis: linear regression, regression coefficient, uses of regression analysis, difference between correlation and regression.	12
III	Tests of significance: Chi-Square, characteristics, applications Student's t Test: Properties and Applications Variance – Ratio test 'F' test Analysis of Variance (ANOVA): Introduction, procedure, multiple comparisons Experimental designs: Basic concepts and principles, types, significance. Statistical quality control: Introduction, types, advantages.	12
IV	Introduction to MS-Office Software: MS Word, MS-Excel, MS Power point, Publisher Basics of Internet and its applications, emailing Search engines: Google Scholar, Web of Science, Pub med, Scopus Plagiarism: types and examples, techniques to avoid plagiarism	10

Name and Signatures

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Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Biostatistics, A foundation for analysis in the health science, Wayne W. Daniel, Wiley India Edition
2. A text book of Biostatistics, B. Annadurai
3. Research Methodology, Methods and Techniques, C.R. Kothari, New Age International Pub.
4. Biostatistical analysis – J.H. Zar
5. Introduction to Biostatistics – R.R. Sokal and F.J. Rohaf
6. Fundamentals of Biostatistics – Khan and Khanum, Ukaaz Pub. Hyderabad.

Reference Books:

1. Microbiological Assay – W. Hewitt, Academic Press, New York.
2. Hand Biostatistics – P. Ramakrishnan, SarasPbu. Kanyakumari.
3. Statistics in Biology – C.I.K. Bliss, Vol.1, McGraw Hill, New York
4. Statistics for Biologists – R.C. Campbell, Cambridge Uni. Press, Cambridge.
5. Dawson, B., & Trapp, R. G. (2004). *Basic & clinical biostatistics* (4th ed.). McGraw-Hill Medical.
6. Sinha, P. K. (2007). *Computer fundamentals* (6th ed.). BPB Publications.
7. Goel, A. (2010). *Computer fundamentals* (1st ed.). Pearson Education India.
8. Leon, A., & Leon, M. (2008). *Introduction to computers* (1st ed.). Vikas Publishing House
9. Norton, P. (2005). *Introduction to computers* (6th ed.). McGraw-Hill Education.

Online Resources – e-Resources/ e-Books and e- learning portals

- <https://www.uou.ac.in/sites/default/files/slm/MSCBOT-606.pdf>
- https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/bioinformatics/02._basic_biostatistics_introduction_to_statistics_and_bio_statistics/et/5227_et_04_et.pdf
- https://sim.edu.in/wp-content/uploads/2019/01/INFORMATION_AND_COMMUNICATION_TECHONOLGY_I.pdf

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 75 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 60 Marks

Internal Assessment:

Continuous Comprehensive Evaluation (CCE)

Internal Test of 15 Marks and Assignment of 15 Marks

Semester
End Exam
(SEE)

Pattern -FOUR Questions (A, B, C, D) from each Unit

Question - A & B: (Compulsory) Very short answer type (01 each) 02 x 5 = 10 Marks

Question - C: Short answer type question 03 x 5 = 15 Marks

Question - D: Long answer type question 07 x 5 = 35 Marks

Total = 60 Marks

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni

Subject Expert - Dr. Anita Mahiswar

Subject Expert - Dr. Sonal Mishra

VC Nominee – Dr. Prakash Saluja

Member of Other Department- Dr. G.S. Thakur

Industrial Representative- Shri Amitesh Mishra

Student Nominee – Ms. Yogita Lokhande

Departmental members

1. Mrs. Rekha Gupta

2. Mrs. Neetu Das

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4. Ms. K.K. Yashoda

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
LAB COURSE

PART – A: INTRODUCTION					
Program: B.Sc.		Semester - VIII		Session: 2025-26	
1	Course Code	BMBL-802			
2	Course Title	Lab. Course			
3	Course Type	Laboratory Course			
4.	Course Learning Outcomes (CLO)	This Course will enable the students to: CO 1 To get the concept of biostatistics in microbiology and learn the basic measures to compile, analyze and make inference from observations CO 2 To understand the correlation of obtained data and able to explain the significance in results during scientific experiments CO 3 To design an experiment and to visualize the controlling factors CO 4 To understand and practice the tools of computers			
5.	Credit Value	1 Credit	1 Credit = 30 Hours Learning and Observation		
6.	Total Marks	Maximum Marks :25		Minimum Passing Marks:10	
PART – B: CONTENT OF THE COURSE					
S.No.	List of Experiments				
1.	Construction of frequency tables by given sample data using MS word				
2.	Construction of Bar diagram, Pie chart and Histograms by given sample data using MS word and MS Excel				
3.	Compare the measures of central tendency from a common data table.				
4.	Calculate the standard deviation of the given data mean with MS Excel				
5.	Compare the sample mean with the population mean by t Test.				
6.	Determine whether the observed frequencies are similar to expected frequencies by χ^2 test.				
7.	Estimate and test the given hypothesis about population mean by ANOVA.				
8.	Computation of correlation coefficient.				
9.	Prepare a Pauer Point Presentation by applying formatting tools				
PART – C: LEARNING RESOURCES					
Text Books, Reference Books and Others					
Text Books Recommended:					
1. Practical Statistics for experimental Biologists –A.C. Wardlaw, John wiley and Sons, New York.					
2. Book for experimental immunology – D.M. Weir, (W. Lutz), Blackwell Pub.Ltd. Oxford.					
3. Research methodology: Methods and techniques (2nd ed.). New Age International Publishers. Kothari, C. R. (2004).					
PART – D: ASSESSMENT AND EVALUATION					
Suggested Continuous Evaluation Methods:					
Maximum Marks:		25 Marks			
(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)					
Semester End Exam (SEE)		Laboratory performance: As per Dept. (LOCF)			

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni Subject Expert - Dr. Anita Mahiswar Subject Expert - Dr. Sonal Mishra VC Nominee – Dr. Prakash Saluja Member of Other Department- Dr. G.S. Thakur	Industrial Representative- Shri Amitesh Mishra Student Nominee – Ms. Yogita Lokhande Departmental members 1. Mrs. Rekha Gupta 2. Mrs. Neetu Das 3. Ms. Mrinalini Soni 4. Ms. K.K. Yashoda
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GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2025-26

PART – A: INTRODUCTION			
	Program: B.Sc.	Semester - VIII	Session: 2025-26
1	Course Code	BMB-803	
2	Course Title	Cell and Molecular Biology	
3	Course Type	DSE II	
4	Course Learning Outcomes (CLO)	This Course will enable the students to – CO 1 To get an in depth understanding of DNA replication and inhibitors of DNA replication CO 2 To understand the significance of central dogma of gene action and understand the molecular mechanisms involved in transcription and processing of RNA CO 3 To gain knowledge of genetic code and molecular mechanisms in Protein synthesis CO 4 To study and compare the regulation of gene expression in both prokaryotes and eukaryotes	
5	Credit Value	04 Credits	Credit = 15 Hours - Learning & Observation
6	Total Marks	Max. Marks: 100	Minimum Passing marks: 40

PART – B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Periods
I	DNA replication: General principles in Prokaryotic and Eukaryotic organisms, various modes of replication, Rolling Circle mode of replication, Types and properties of DNA polymerases, Proof reading, Continuous and discontinuous synthesis, Exonuclease activity in eukaryotic DNA polymerases, Superhelicity in DNA, Linking number, Topological properties, Mechanism of action of topoisomerases Retroviruses and their unique modes of DNA synthesis	11
II	Transcription: General principles in Prokaryotic and Eukaryotic organisms, basic apparatus, steps (initiation, elongation and termination), Types of RNA polymerases Polycistronic and monocistronic RNAs, Maturation and processing of RNA: Methylation, Cutting and trimming of rRNA, Capping, Polyadenylation and splicing of mRNA; Basic features of genetic code Protein synthesis: Steps of initiation, elongation, termination, roles of various factors in above steps	12
III	Inhibitors of DNA replication: Blocking precursor synthesis, nucleotides polymerization, altering DNA structures Cell Cycle; Relationship between replication and cell cycle; Cell cycle regulation, Apoptosis, Inhibitors of RNA synthesis Inhibitors of proteins synthesis	10
IV	Regulation of genes expression: Operon concept, catabolite repression instability of bacterial RNA, Gene regulation: Inducers and co repressors, Negative regulation (E. coli lac operon), Positive regulation (E. coli) DNA binding proteins, enhancer sequences and controls of transcription by interaction between RNA polymerases and promoter regions, Use of alternate sigma factors, protein binding sites on DNA	12

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni Subject Expert - Dr. Anita Mahiswar Subject Expert - Dr. Sonal Mishra VC Nominee – Dr. Prakash Saluja Member of Other Department- Dr. G.S. Thakur	Industrial Representative- Shri Amitesh Mishra Student Nominee – Ms. Yogita Lokhande Departmental members 1. Mrs. Rekha Gupta 2. Mrs. Neetu Das 3. Ms. Mrinalini Soni 4. Ms. K.K. Yashoda
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Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Molecular biology of gene, Watson, Baker, Bell, Gann, Levine, Personal Education LPE
2. Principles and Techniques of Biochemistry and Molecular Biology, K. Wilson and J. Walker, Cambridge low price Edition.
3. Mol Bio- Fundamentals of Molecular Biology, A. Upadhyay, Himalaya Pub.
4. Molecular Biology, A.V.S.S. Sambamurthy, Narosa Pub.
5. Biochemistry, C.B. Powar and Chatwal, Himalaya Pub.

Reference Books:

1. Essentials of Molecular Biology, Malacinski, M. George and David Freidfelder, Narosa Pub.
2. Karp, G. (2019). Cell and molecular biology: Concepts and experiments (8th ed.). Wiley.
3. Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A., & Martin, K. C. (2021). Molecular cell biology (9th ed.). W.H. Freeman & Company.
4. Watson, J. D., Baker, T. A., Bell, S. P., Gann, A., Levine, M., & Losick, R. (2017). Molecular biology of the gene (7th ed.). Pearson.
5. Cooper, G. M., & Hausman, R. E. (2022). The cell: A molecular approach (9th ed.). Oxford University Press.

Online Resources – e-Resources/ e-Books and e- learning portals

- https://molbiomadecasy.wordpress.com/wp-content/uploads/2013/09/fundamental_molecular_biology.pdf
- https://pages.jh.edu/rschleil/Random_stuff/publications/molbiogene.pdf

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 20 Marks

End Semester Exam (ESE): 80 Marks

Internal Assessment:

Continuous Comprehensive Evaluation (CCE)

Internal Test of 20 Marks and Assignment of 20 Marks

Semester
End Exam
(SEE)

Pattern -FOUR Questions (A, B, C, D) from each Unit

Question - A & B: (Compulsory) Very short answer type (02 each) 04 x 4 = 16 Marks

Question - C: Short answer type question 06 x 4 = 24 Marks

Question - D: Long answer type question 10 x 4 = 40 Marks

Total = 80 Marks

Name and Signatures

Chairperson/ HOD- Dr. Pragma Kulkarni

Subject Expert - Dr. Anita Mahiswar

Subject Expert - Dr. Sonal Mishra

VC Nominee – Dr. Prakash Saluja

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GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2025-26

PART – A: INTRODUCTION			
	Program: B.Sc.	Semester - VIII	Session: 2025-26
1	Course Code	BMB-804	
2	Course Title	Microbial Genetics	
3	Course Type	DSE III	
4	Course Learning Outcomes (CLO)	This Course will enable the students to – CO 1 To understand the mechanism of damage and repair of DNA in living system CO 2 To gain the knowledge of causes and consequences of modifications in DNA structures CO 3 To study the different ways of gene transfer in microorganisms CO 4 To get an idea about the tools used in genetic construction and analysis	
5	Credit Value	04 Credits	Credit = 15 Hours - Learning & Observation
6	Total Marks	Max. Marks: 100	Minimum Passing marks: 40

PART – B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Periods
I	DNA damages: Biological indications of damage to DNA, Types of DNA damage: deamination, oxidative damage, alkylation, pyrimidine dimers Repair pathways (Direct repair, Methyl Directed Mismatch Repair, very short patch repairs, Nucleotide Excision Repairs, Base Excision Repairs, Recombination Repairs, and SOS repair system)	11
II	Gene as a unit of Mutation, Biochemical basis of Mutation, Types of mutations and their origin: Spontaneous mutation, Induced Mutation, Types of chemical mutagens Effect of Mutation: Forward mutation, Reversion mutation, Suppression mutation (intragenic and extragenic), silent, missense, nonsense mutation, frame shift mutation Gene as a unit of recombination, Molecular nature of Recombination	11
III	Gene transfer mechanism: Transformation, Transduction, Conjugation, Transfection Lysogeny and their applications, Genetic analysis of Bacteria by genetic mapping Plasmids, types and their uses in genetic analysis, plasmid as vector for gene cloning, Replication of selected plasmids, plasmid incompatibility and compatibility; Transposons and their uses in genetic analysis.	11
IV	Detection and Isolation of Mutants: mutant detection by Replica plating technique, Selection of Auxotrophs by reversion mutation Construction of bacterial strains: methods; Molecular methods for detection of Mutations; Genotyping of Bacteria and Viruses, DNA sequencing: Sanger's method, Maxam and Gilbert method, Genetic Markers: SNP, AFLP, RFLP and RAPD methods.	12

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni	Industrial Representative- Shri Amitesh Mishra
Subject Expert - Dr. Anita Mahiswar	Student Nominee – Ms. Yogita Lokhande
Subject Expert - Dr. Sonal Mishra	Departmental members
VC Nominee – Dr. Prakash Saluja	1. Mrs. Rekha Gupta
Member of Other Department- Dr. G.S. Thakur	2. Mrs. Neetu Das
	3. Ms. Mrinalini Soni
	4. Ms. K.K. Yashoda

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. A Text Book of Microbiology; Dubey & Maheshwari.
2. A Text Book of Microbiology; R.P. Singh.
3. Genetics – P.K. Gupta, Rastogi Pub
4. Microbial Genetics – C.B. Powar, Vol I&II, Himalaya Pub
5. Fundamentals of Genetics – B.D. Singh, Kalyani Pub.

Reference Books:

1. Microbial Genetics – Maloy et al. 1994, Jones and Bartlett publishers.
2. Modern microbial genetics – Streips and Yasbin, 1991, Niley Ltd.
3. Microbial genetics -S.R. Maloy, J.E. Cronan, and David Freifelder, 2nd edition 2006, Narosa publishing house, New Delhi.
4. Biotechnology and Genetics – R. Shetty
5. Genetics – W. Monroe
6. N.W. Strickberger 3rd edition
7. Prescott, Harley, Klein's Microbiology–Wiley, Sherwood, Woolverton, 7th edition. McGraw-Hill International Edition

Online Resources – e-Resources/ e-Books and e- learning portals

- <https://wou.edu/chemistry/courses/online-chemistry-textbooks/ch450-and-ch451-biochemistry-defining-life-at-the-molecular-level/chapter-12-dna-damage-repair>
- <https://microbenotes.com/horizontal-gene-transfer-prokaryotes-eukaryotes/>
- <https://www.colss.net/sample-chapters/c03/E6-53-01-03.pdf>
- <https://pmc.ncbi.nlm.nih.gov/articles/PMC3883366/#F0004>
- <https://www.sciencevision.org/storage/journal-articles/February2019/EhvLNVl8OrhwvQQjLk6I.pdf>

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 20 Marks

End Semester Exam (ESE): 80 Marks

Internal Assessment:

Continuous Comprehensive Evaluation (CCE)

Internal Test of 20 Marks and Assignment of 20 Marks

Semester
End Exam
(SEE)

Pattern -FOUR Questions (A, B, C, D) from each Unit

Question - A & B: (Compulsory) Very short answer type (02 each) 04 x 4 = 16 Marks

Question - C: Short answer type question 06 x 4 = 24 Marks

Question - D: Long answer type question 10 x 4 = 40 Marks

Total = 80 Marks

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni

Subject Expert - Dr. Anita Mahiswar

Subject Expert - Dr. Sonal Mishra

VC Nominee – Dr. Prakash Saluja

Member of Other Department- Dr. G.S. Thakur

Industrial Representative- Shri Amitesh Mishra

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Departmental members

1. Mrs. Rekha Gupta

2. Mrs. Necti Das

3. Ms. Mrinalini Soni

4. Ms. K.K. Yashoda

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2025-26

PART – A: INTRODUCTION			
	Program: B.Sc.	Semester - VIII	Session: 2025-26
1	Course Code	BMB-805	
2	Course Title	Metagenomics and Bioinformatics	
3	Course Type	DSE IV	
4	Course Learning Outcomes (CLO)	This Course will enable the students to – CO 1 explain the concept and importance of metagenomics CO 2 observe the perception of Microbiome CO 3 develop an understanding of host-microbe interactions Co 4 examine resources and tools of Bioinformatics	
5	Credit Value	04 Credits	Credit = 15 Hours - Learning & Observation
6	Total Marks	Max. Marks: 100	Minimum Passing marks: 40
PART – B: CONTENT OF THE COURSE			
Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Periods
I	Metagenomics: Brief history and development of metagenomics, understanding bacterial diversity using metagenomics approach, Prospecting genes of biotechnological importance using Metagenomics, Basic knowledge of viral metagenome, meta transcriptomics, metaproteomics and metabolomics.		12
II	Microbiomes: Importance of microbial communities, VBNC (viable but not culturable bacteria). Modern methods of rapid identification of microbes (PCR, mass spectrometry, fluorescence techniques). CRISPR-Cas system		11
III	Molecular Basis of Host-Microbe Interaction: Hypersensitive response (HR) to plant pathogens and its mechanism, Type three secretion systems (TTSS) of plant and animal pathogens.		10
IV	Concept of Bioinformatics: Aim and branches, Applications, Basic biomolecular concepts: Protein, Amino acids, DNA, RNA sequences, structure and functions, Forms of biological information, Bioinformatics resources: NCBI, EBI, ExPASy, RCSB, DDBJ, available tools, Open access bibliographic resources and literature data bases: PubMed, BioMed Central, Public Library of Science (PloS), CiteXplore.		12

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni Subject Expert - Dr. Anita Mahiswar Subject Expert - Dr. Sonal Mishra VC Nominee – Dr. Prakash Saluja Member of Other Department- Dr. G.S. Thakur	Industrial Representative- Shri Amitesh Mishra Student Nominee – Ms. Yogita Lokhande Departmental members 1. Mrs. Rekha Gupta 2. Mrs. Neetu Das 3. Ms. Mrinalini Soni 4. Ms. K.K. Yashoda
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Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Fundamentals of Gene, Genomics and Genetic Engineering, Irfan Khan and Atiya Khanum, Ukaaz Publications Hyderabad.
2. Basic Bioinformatics, C.R. Hemlata
3. Bioinformatics, R. Sundaralingam, Saras Publications.
4. Bioinformatics and Computational Biology, Dr. Chittaranjan Baruah.
5. Computer Basics, G. Manjunath, Vasan Publications

Reference Books:

1. Introduction to Bioinformatics; Teresa K. Attwood, David J. Parry-Smith, Pearson Education. (1999).
 2. Introduction to bioinformatics; Arthur M. Lesk. Oxford University Press (2004)
 3. Fundamental Concepts of Bioinformatics; Dan E. Krane and Michael L. Raymer (2002)
 4. Gene VII; Benjamin Lewin, Oxford University Press, (2000).
 5. Molecular Biology of Gene; Watson. J. D, Baker. T. A, Bell S. P, Gann A. Levine. M. Losick R, 5th Edition.
 6. Molecular biology and Microbial genetics; David Frifielder, Stanely R. Maloy, 2nd Edition, Jones and Barlett Publishers. (1994).
- Molecular Biotechnology; Glick B. R. and Pasternak J.J., 2nd Ed. ASM press. (2003).

Online Resources – e-Resources/ e-Books and e- learning portals

- https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/files/BI0505%20LAB%20MANUAL.pdf
- <https://www.polygwaliar.ac.in/file/20181204071417842813.pdf>
- <https://handelsmanlab.discovery.wisc.edu/wp-content/uploads/2018/01/Metagenomics-genomic-analysis.pdf>
- <https://handelsmanlab.discovery.wisc.edu/wp-content/uploads/2018/01/Sabree-Rondon-Handelsman-Metagenomics.pdf>
- https://ashishmodi.weebly.com/uploads/1/8/9/7/18970467/computer_fundamental.pdf

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