DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM & MARKING SCHEME

B.Sc. III, IV, V, VI Semester

MICROBIOLOGY

(Based on Choice Based Credit System)

SESSION : 2024-25

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 (Chhattisgarh)

(Erstwhile: Govt. Arts & Science College, Durg)

Proposed Scheme For 4Yr UG Program in Microbiology

Semester	Core Course (DSC)	Discipline Specific Elective	Generic Elective Course	Ability Enhancement Course	Skill Enhancement Course	Internship/ Project	Value Added Courses	Total Credits
1	CC1 Microbiology (4) CC1 Botany (4) CC1 Chemistry (4)		Choose one from a pool of courses GE 1 (4)	Choose one from a pool of courses AEC (2)	Choose one from a pool of courses SEC (2)		Choose one from a pool of courses VAC (2)	22
2	CC2 Microbiology (4) CC2 Botany (4) CC2 Chemistry (4)		Choose one from a pool of courses GE 2 (4)	Choose one from a pool of courses AEC (2)	Choose one from a pool of courses SEC (2)		Choose one from a pool of courses VAC (2)	22
Students on exit shall be awarded undergraduate certificate (in the field of Multidisciplinary Study) after securing the requisite 44 credits in Semester 1 and 2								
3	CC3 Microbiology (4) CC3 Botany (4) CC3 Chemistry (4)	Choose one from a pool of courses DSE A/B/C (4) Or Choose one from a pool of courses GE 3 (4)		Choose one from a pool of courses AEC (2)	Choose one from a pool of courses SEC (2)		Choose one from a pool of courses VAC (2)	22
4	CC4 Microbiology (4) CC4 Botany (4) CC4 Chemistry (4)	Choose one from a pool of courses DSE A/B/C (4) Or Choose one from a pool of courses GE 4 (4)		Choose one from a pool of courses AEC (2)	Choose one from a pool of courses SEC (2)		Choose one from a pool of courses VAC (2)	22
Students on exit shall be awarded undergraduate Diploma (in the field of Multidisciplinary Study) after securing the requisite 88 credits in Semester IV								
5	CC5 Microbiology (4) CC5 Botany (4)	Choose two from a pool of courses DSE A/B/C (4)	Choose one from a pool of courses GE 4 (4)		Choose one from a pool of courses SEC (2) Or			22

	CC5 Chemistry (4)				Internship/Project/ Community outreach activity (2)		
6	CC6 Microbiology (4) CC6 Botany (4) CC6 Chemistry (4)	Choose ~~two~~ from a pool of courses DSE A/B/C (4)	Choose one from a pool of courses GE 4 (4)		Choose one from a pool of courses SEC (2) Or Internship/Project/ Community outreach activity (2)		22
Students on exit shall be awarded Bachelor of (in the field of Multidisciplinary Study) after securing the requisite 132 credits in Semester VI							
7	DSC A/B/C (4)	Choose 3 DSE course from a pool (3x4) **Or** Choose 2 DSE course from a pool and one GE course **Or** One DSE course and 02 GE course from a pool (Total 12)			Dissertation (6)		22
8	DSC A/B/C (4)	Choose 3 DSE course from a pool (3x4) **Or** Choose 2 DSE course from a pool and one GE course **Or** One DSE course and 02 GE course from a pool (Total 12)			Dissertation (6)		22
Students on exit shall be awarded Bachelor of (in the field of Multidisciplinary Study) (Honours or Honours with Academic projects/Entrepreneurship) after securing the requisite 176 credits in Semester VIII						**Total**	**176**

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni 27.6.24 **Subject Expert - Dr. Anita Mahiswar** **Subject Expert - Dr. Sonal Mishra** **VC Nominee – Dr. Prakash Saluja** **Member of Other Department- Dr. Ranjana Shrivastava**	**Industrial Representative- Shri Amitesh Mishra** **Student Nominee – Ms. Yogita Lokhande** **Departmental members** **1. Mrs. Rekha Gupta** 27/06/24 **2. Mrs. Neetu Das** 27.06.2024

1. In 1st semester Hindi Language, 2nd semester English Language and Environmental studies in 3rd and 4th Semester will be offered as AEC.
2. Students are required to take Generic Specific courses (courses from other than A/B/C Disciplines)
3. DSC-1 to DSC-7 shall be core courses of either Discipline A or B or C.
4. If a student wishes to Major in Discipline A, then he/she should earn at least 60 credits from DSCs and DSEs, Research Methodology of Discipline A and dissertation writtenon a topic of Discipline A.
5. Minor in a Discipline will be awarded to a student if he/she earns 24 credits from GEs (other than B and C) along with major in A.
6. Completion of core courses from host institute is mandatory.
7. Students may take up SEC, GEC and DSEC of equivalent credits from any other institute/ online platforms/MOOC/ ODL from UGC recognized organizations.

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni	**Industrial Representative- Shri Amitesh Mishra**
Subject Expert - Dr. Anita Mahiswar 27.6.24	**Student Nominee – Ms. Yogita Lokhande**
Subject Expert - Dr. Sonal Mishra	**Departmental members**
VC Nominee – Dr. Prakash Saluja	**1. Mrs. Rekha Gupta** 27/06/24
Member of Other Department- Dr. Ranjana Shrivastava	**2. Mrs. Neetu Das** 27.06.2024

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2024-25

DSC			DSE			GE		
Sem.	**Code**	**Title**	**Sem.**	**Code**	**Title**	**Sem.**	**Code**	**Title**
I	MBSC-01	Introductory Microbiology and Microbial techniques	-	-	-	I	MBGE-01	Introductory Microbiology and Microbial techniques
II	MBSC-02	Bacteriology, Virology and Protozoology	-	-	-	II	MBGE-02	Bacteriology, Virology and Protozoology
III	BMB-301	Microbial Techniques and Instrumentation	III	BMB-302	Immunology	-	-	-
IV	BMB-401	Environmental Microbiology and Microbial Ecology	IV	BMB-402	Mycology and Plant Pathology	-	-	-
V	BMB-501	Food and Dairy Microbiology	V	BMB-502	Agriculture Microbiology	V	BMB-501	Food and Dairy Microbiology
			V	BMB 503	Mycology and Plant Pathology			
VI	BMB-601	Medical and Veterinary Microbiology	VI	BMB-602	Clinical Microbiology	VI	BMB-601	Medical and Veterinary Microbiology
			VI	BMB 603	Immunology			
VII	BMB-701	Industrial Microbiology	VII	BMB-702	Microbial Enzyme Technology	**SEC**		
			VII	BMB-703	Fermentation Technology	I/II/III	MBSEC -01	Mushroom Cultivation
			VII	BMB-704	Biosafety and Intellectual Property Rights		BMBSC -02	Microbial Products – Biofertilizers and biopesticides
VIII	BMB-801	Microbial Biotechnology	VIII	BMB-802	Microbial Genetics			
			VIII	BMB-803	Advanced Microbiology	**VAC**		
			VIII	BMB-804	Basic Computer, Biostatics and Bioinformatics		MBVAC-01	Microbes and Human Health

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. Ranjana Shrivastava

Industrial Representative- Shri Amitesh Mishra

Student Nominee – Ms. Yogita Lokhande

Departmental members

1. **Mrs. Rekha Gupta**
2. **Mrs. Neetu Das**

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2024-25

PART – A: INTRODUCTION				
Program: B.Sc.		**Semester - III**		**Session: 2024-25**
1	**Course Code**	**BMB-301**		
2	**Course Title**	**Microbial Techniques and Instrumentation**		
3	**Course Type**	**DSC**		
4	**Course Learning Outcomes (CLO)**	**This Course will enable the students to-** CO 1 learn principles of sterilization for microbiological work CO 2 relate analytical instruments and performing laboratory manipulations CO 3 explain application of microscope CO 4 examine separation techniques to work with microorganisms CO 5 identify biomolecules quantitatively		
5	**Credit Value**	**03 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 techniques:** Maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria, and accessing non-cultivable bacteria; Buffers in culture medium; Cultivation of fungi, actinomycetes, yeast and cyanobacteria. Cultivation of anaerobes. Types and applications of Antiseptic, Germicide, Sanitizer, Fungicide, Virucide, Bacteriostatic and Bactericidal agent. Chemical disinfectants.	9
II	**Microscopy:** Principle, Mechanism and application of photo optical instruments (different types of microscopes), Bright field, Dark field, phase contrast microscope, Fluorescence microscopy, Confocal microscopy, Scanning and Transmission Electron Microscopy (SEM & TEM).	9
III	**Principle of pH meter**, Types of electrodes, factors affecting pH measurement, application of pH meter. **Centrifugation**: Principle and types (Analytical and Preparatory, differential and Rate zonal), ultracentrifugation techniques and its applications.	9
IV	**Chromatography**: Principle and techniques with applications (Partition, adsorption, ion-exchange, exclusion and affinity chromatography). Electrophoretic technique (agarose and polyacrylamide gel) its Components, working and applications.	9
V	**Spectrophotometric techniques**: Electromagnetic spectrum, Basic principles & Law of absorption and radiation; principle, mechanism and applications of instruments (UV and Visible spectrophotometer). **Radiobiological techniques:** Characters of radioisotopes, autoradiography, Radioisotope dilution technique and pulse chase experiments.	9

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PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Biophysical Chemistry, Principles and Techniques by Upadhyay, Upadhyay and Nath, Himalaya Publicating House.
2. Biological instrumentation and Methodology by Dr. P.K. Bajpai, S Chand and Co. Ltd.
3. Biophysics, Principles and technologies by M. A. Subramaniann
4. Fundamentals of Bioanalytical techniques and Instrumentation; Sabri Ghosal and Anupama Sharma

Reference Books:

1. Wilson & Walker. Principles and Techniques in Practical Biochemistry. 5th Edition Cambridge University Press (2000).
2. Murphy D.B. Fundamental of light Microscopy & Electron Imaging. 1st Edition. Wiley-Liss. (2001).
3. K L Ghatak. Techniques and methods in biology PHI publication (2011).
4. Pranav Kumar. Fundamentals and techniques of biophysics and molecular biology (2016)
5. Aurora Blair. Laboratory techniques & Experiments in biology. Intelliz Press.
6. D.T Plummer. An Introduction to practical Biochemistry. McGraw Hill Publication 1987.
7. Beckner, W.M., Kleinsmith L.J. and Hardin J. The world of cell. IV edition Benjamin/Cummings (2000).

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

- https://www.sathyabama.ac.in/sites/default/files/course-material/2020-10/SCY2.pdf
- https://faculty.ksu.edu.sa/sites/default/files/instrumental_chemical_analysis.pdf
- https://www.academia.edu/31125635/Biotechniques_Theory_and_Practice_eBook
- https://cbpbu.ac.in/userfiles/file/2020/STUDY_MAT/ZOO/PK%20(2).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 10 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 5 = 20 Marks
	Question - C: Short answer type question	05 x 5 = 25 Marks
	Question - D: Long answer type question	07 x 5 = 35 Marks
	Total	**= 80 Marks**

Name and Signatures

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Subject Expert - Dr. Anita Mahiswar	**Student Nominee – Ms. Yogita Lokhande**
Subject Expert - Dr. Sonal Mishra	**Departmental members** 27/06/24
VC Nominee – Dr. Prakash Saluja	1. **Mrs. Rekha Gupta**
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GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
LAB COURSE

PART – A: INTRODUCTION				
Program: B.Sc.		**Semester - III**		**Session: 2024-25**
1	**Course Code**	**BMBL-301**		
2	**Course Title**	**Lab. Course**		
3	**Course Type**	**Laboratory Course**		
4.	**Course Learning Outcomes (CLO)**	**This Course will enable the students to:** CO1 familiar with common laboratory instruments/equipment of microbiology CO2 the methods of obtaining microorganisms under lab conditions CO3 differentiate microorganisms on the basis of microscopic features CO 4 study common microscopic organisms		
5.	**Credit Value**	**1 Credit**	**1 Credit = 30 Hours Learning and Observation**	
6.	**Total Marks**	**Maximum Marks: 50**		**Minimum Passing Marks: 20**

PART B: CONTENT OF THE COURSE	
S.No.	**List of Experiments**
1.	Study of fluorescent micrographs to visualize bacterial cells.
2.	Ray diagrams of phase contrast microscopy and electron microscopy.
3.	Separation of mixtures by paper/ thin layer chromatography.
4.	Demonstration of column packing in any form of column chromatography.
5.	Separation of protein mixture by any form of chromatography.
6.	Separation of protein mixture by Polyacrylamide Gel Electrophoresis(PAGE).
7.	Determination of absorption max of unknown sample and calculation of extinction coefficient.
8.	Separation of components of a given mixture using a laboratory scale centrifuge.
9.	Understanding density gradient centrifugation with the help of pictures.

PART – C: LEARNING RESOURCES

Text Books Recommended:

1. K L Ghatak. Techniques and methods in biology PHI publication (2011).
2. D.T Plummer. An Introduction to practical Biochemistry. McGraw Hill Publication 1987.
3. An Introduction to practical Biochemistry; McGraw Hill Publication 1987. D.T Plummer.
4. Principles and Techniques in Practical Biochemistry; Wilson & Walker.
5. Biotechniques: Theory and Practice; S.V.S. Rana, Rastogi Pub.
6. Statistical Methods; S.P. Gupta

Online Resources:

- https://books.google.co.in/books?id=Wh9OTbjcsfUC&printsec= age&q&f=false
- https://www.academia.edu/31125635/Biotechniques_Theory_and_Practice_eBook

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:
Maximum Marks: 50 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

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FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2024-25

PART – A: INTRODUCTION				
Program: B.Sc.		**Semester - III**		**Session: 2024-25**
1	**Course Code**	**BMB-302**		
2	**Course Title**	**Immunology**		
3	**Course Type**	**Discipline Specific Elective (DSE)**		
4	**Prerequisite (If Any)**	**As per Program**		
5	**Course Learning Outcomes (CLO)**	**At the end of this course, students will be able to –** CO 1 define the functions of the immune system CO 2 distinguish innate immunity and acquired immunity CO 3 relate the structure and function immune cells and organs CO 4 discuss cell mediated and antibody-mediated immunity CO 5 explain immunological techniques		
6	**Credit Value**	**03 Credits**	**Credit = 15 Hours - Learning & Observation**	
7	**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 Period
I	**Immunity and Immune system** – History: Contribution of G.P. Talwar, M.C. Vaidya and Indira Nath; Concept of Innate and acquired immunity, Host defense mechanism- First, second and third line of host defense.	9
II	**Haematopoiesis** - Definition, types and process, structure, functions and properties of Immune Cells; Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; Organs of Immune; Bone Marrow, Thymus, Lymph Node, Spleen.	9
III	**Antigens and Antibodies-** Characteristics of an antigen (Foreignness, Molecular size and Heterogeneity); Epitopes, Haptens, Adjuvants. Structure, Types, Functions and Properties of Immunoglobulins (Antibody); Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic).	9
IV	**Immune Response** - Primary and Secondary Immune Response; Generation of Humoral Immune Response; Generation of Cell Mediated Immune Response; Killing Mechanisms by CTL (Cytotoxic T lymphocytes) and NK cells. Structure and Functions of MHC I & II molecules, Components and biological activities of Complement.	9
V	**Antigen and Antibody Reactions and Immunological Techniques-** Principles of Agglutination, precipitation, Complement Fixation test, Immunodiffusion, Immuno electrophoresis, Hemagglutination, Immunofluorescence, ELISA, RIA, Coombs test.	9

Name and Signatures

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PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Text book of Microbiology; R. Anantharayanan, C.K. Jayaram Panikar, Orient Longman.
2. Medical microbiology; Chrakraborthy P.
3. A text book of Microbiology; Dubey & Maheshwari.
4. Immunology, A Textbook; C.V. Rao.
5. Immunology; J. Kuby.

Reference Books:

1. Fundamental Immunology; W.E. Paul.
2. Essentials of Immunology; Roitt, I.M.

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

- https://repository.stikesbcm.ac.id/id/eprint/168/1/books_5453_0.pdf
- https://www.mbbcollege.in/db/notes/474.pdf
- http://www.helmberg.at/immunology.pdf
- https://www.utep.edu/eerael/immunology.htm
- https://conursing.uobaghdad.edu.iq/wp-content/uploads/sites/20/2019/09/Microbiology-L10-Immunity-and-immune-system.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 5 = 20 Marks
	Question - C: Short answer type question	05 x 5 = 25 Marks
	Question - D: Long answer type question	07 x 5 = 35 Marks
	Total	**= 80 Marks**

Name and Signatures

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

PART A: INTRODUCTION			
Program: B.Sc.		**Semester III**	**Session: 2024-25**
1	**Course Code**	**BMBL-302**	
2	**Course Title**	**Lab. Course**	
3	**Course Type**	**Laboratory Course**	
4	**Prerequisite (If Any)**	**As per Program**	
5	**Course Learning Outcomes (CLO)**	**This Course will enable the students to-** CO 1 identify blood group and estimate of haemoglobin CO 2 perform Gel Diffusion assays used to examine antigen-antibody reactions CO 3 perform DOT ELISA test CO 4 understand the Flocculation and Agglutination reaction	
6	**Credit Value**	**1 Credit**	**Credit = 30 Hours. - Learning & Observation**
7	**Total Marks**	**Max. Marks: 50**	**Min. Passing marks: 20**

PART B: CONTENT OF THE COURSE	
Total No. of learning-Training/ Performance Periods: 30 Periods (30 Hours)	
S. No.	**List of Exercises**
1	Identification of human blood groups.
2	Estimation of haemoglobin.
3	Perform Total Leukocyte Count of the given blood sample.
4	Separate serum from the blood sample.
5	Flocculation reactions - VDRL Agglutination, Widal test, Blood Grouping.
6	Immuno-diffusion techniques- ODD and RID.
7	To Perform DOT ELISA.
8	Examination of skin microflora.

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Practical Immunology, Frank C. Hay, Olwyn M.R. Westwood & Paul N. Nelson. 4th Edition, 1 January
2. Handbook of Practical and Clinical Immunology, 2e, Vol. II 2nd Edition, Kindle Edition
3. Immunological Techniques Interpretations Validation and Safety Measures; Ankita Joshi & R S Chauhan

Online Resources:

- https://doi.org/10.1002/9780470757475.index
- http://www.lucp.net/books-pdf/Lab%20Manual%20Dr.%20Idris%20Adewale%20Ahmed/15.%20BASIC%20IMMUNOLOGY.pdf
- https://webstor.srmist.edu.in/web_assets/downloads/2021/18BTC106J-lab-manual.pdf

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 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 27.6.24	**Industrial Representative- Shri Amitesh Mishra**
Subject Expert - Dr. Anita Mahiswar	**Student Nominee – Ms. Yogita Lokhande**
Subject Expert - Dr. Sonal Mishra Sonal	**Departmental members**
VC Nominee – Dr. Prakash Saluja	1. **Mrs. Rekha Gupta** 27/06/24
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COURSE CURRICULUM 2024-25

PART – A: INTRODUCTION			
Program: B.Sc.		**Semester - IV**	**Session: 2024-25**
1	**Course Code**	**BMB-401**	
2	**Course Title**	**Environmental Microbiology and Microbial Ecology**	
3	**Course Type**	**DSC**	
4	**Course Learning Outcomes (CLO)**	**This Course will enable the students to –** CO 1 develop knowledge of different types of environments and habitats of microorganisms CO 2 identify the role microorganisms in maintaining healthy environment CO 3 signify importance of BOD/COD for assessing quality of water CO 4 examine biodegradation methods CO 5 explain microbial interactions	
5	**Credit Value**	**03 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	**Microorganisms of different habitats:** Terrestrial Environment - Soil profile and soil microflora; Aquatic Environment - Microflora of fresh water and marine habitats; Air Atmosphere - Aeromicroflora and dispersal of microbes; Animal Environment - Microbes in/on human body (microbiomics) & animal (ruminants) body; Extreme Habitats - Extremophiles, Microbes thriving at high & low temperatures, pH, high hydrostatic & osmotic pressures, salinity and low nutrient levels.	9
II	**Waste management:** Sources and types of solid waste, Methods of solid waste disposal (Composting and sanitary landfill). Composition of Liquid waste, strength of sewage (BOD and COD), Primary, secondary (oxidation ponds, trickling filter, activated sludge process and septic tank) and tertiary sewage treatment	9
III	**Biodegredation:** Principles and degradation of common pesticides, organic (hydrocarbons, oil spills) and inorganic (metals) matter, biosurfactants. **Microbiology of Water:** Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests for faecal coliforms (b) Membrane filter technique.	9
IV	**Ecosystems:** Structure, types and roll of microorganisms in ecosystems. Contributions of Beijerinck, Winogradsky, Martin Alexander and Selman A. Waksman. **Biological Interaction:** Microbe–Microbe Interactions: Mutualism, Synergism, Commensalism, Competition, Amensalism, Parasitism, Predation; Biocontrol agents; Microbe–Plant Interactions: Roots, Aerial Plant surfaces.	9
V	**Biogeochemical Cycles:** Carbon cycle - Microbial degradation of cellulose, hemicelluloses, lignin and chitin; Nitrogen cycle - Biological Nitrogen fixation (symbiotic/nonsymbiotic), ammonification, nitrification, denitrification and nitrate reduction; Phosphorus cycle - Phosphate immobilization and solubilisation; Sulphur cycle - Microbes involved in sulphur cycle.	9

Name and Signatures

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Subject Expert - Dr. Anita Mahiswar	**Student Nominee – Ms. Yogita Lokhande**
Subject Expert - Dr. Sonal Mishra Sonal	**Departmental members**
VC Nominee – Dr. Prakash Saluja	**1. Mrs. Rekha Gupta** 27/06/24
Member of Other Department- Dr. Ranjana Shrivastava	**2. Mrs. Neetu Das** 27.06.2024

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Text book of Microbiology; R.P. Singh, Kalyani publication.
2. General microbiology; Vol. I and Vol. II, Power and Daginawala, Himalaya Publication.
3. Microbiology; Pelczar, MJ Chan ECS and Krieg NR, McGraw-Hill.

Reference Books:

1. Prescott's Microbiology. Wiley J M, Sherwood L M and Woolverton C J.
2. Microbiology; Tortora, Funke, Case. Pearson Benjamin Cummings.
3. Microbial Ecology; Alexander, M John. Wiley & Sons, Inc., New York.

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

- https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMB2101.pdf
- https://kamarajcollege.ac.in/wp-content/uploads/Core-IX-Environmental-Microbiology.pdf
- https://nou.edu.ng/coursewarecontent/BIO320_0.pdf
- https://content.e-bookshelf.de/media/reading/L-12090079-7c15e330d2.pdf
- https://booksite.elsevier.com/samplechapters/9780123705198/Sample_Chapters/01~Front_Matter.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 5 = 20 Marks
	Question - C: Short answer type question	05 x 5 = 25 Marks
	Question - D: Long answer type question	07 x 5 = 35 Marks
	Total	**= 80 Marks**

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni 27.6.24	**Industrial Representative- Shri Amitesh Mishra**
Subject Expert - Dr. Anita Mahiswar	**Student Nominee – Ms. Yogita Lokhande**
Subject Expert - Dr. Sonal Mishra	**Departmental members** 27/06/24
VC Nominee – Dr. Prakash Saluja	1. **Mrs. Rekha Gupta**
Member of Other Department- Dr. Ranjana Shrivastava	2. **Mrs. Neetu Das** 27.06.2024

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

PART – A: INTRODUCTION				
Program: B.Sc.		**Semester - IV**		**Session: 2024-25**
1	**Course Code**	**BMBL-401**		
2	**Course Title**	**Lab. Course**		
3	**Course Type**	**Laboratory Course**		
4.	**Course Learning Outcomes (CLO)**	**This Course will enable the students to:** CO 1 define ecological factors affecting microbial growth CO 2 compare diversity of microorganisms in different habitats CO 3 explain microbiological quality of water CO 4 identify microbial interactions		
5.	**Credit Value**	**1 Credit**	**1 Credit = 30 Hours Learning and Observation**	
6.	**Total Marks**	**Maximum Marks: 50**	**Minimum Passing Marks: 20**	

PART B: CONTENT OF THE COURSE	
S.No.	**List of Experiments**
1.	Analysis of soil for pH, moisture content
2.	Isolation of microbes (bacteria & fungi) from rhizosphere and rhizoplane
3.	Assessment of microbiological quality of water by presumptive test/MPN test
4.	Confirmed and Completed tests for faecal coliforms
5.	Determination of BOD of wastewater sample
6.	Study of biological interactions (Competition, Parasitism)
7.	Isolation of Rhizobium from root nodules.
8.	Study the Effect of salt concentration/ pH on growth of microbes
9.	Demonstration of Winogradsky's Column Preparation

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Practical Microbiology: Dubey and Maheshwari. D.K., S. Chand & Company, Pvt. Ltd., New Delhi.
2. Laboratory experiments in Microbiology: Gopal Reddy
3. Microbiology Laboratory Manual: Cappuccino, Sherman, Pearson Education.

Online Resources:

- http://www.onlinelabs.in
- http://www.vlab.co.in
- http://www.vlab.amrita.edu

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 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 27.6.24	**Industrial Representative- Shri Amitesh Mishra**
Subject Expert - Dr. Anita Mahiswar	**Student Nominee – Ms. Yogita Lokhande**
Subject Expert - Dr. Sonal Mishra	**Departmental members** 27/06/24
VC Nominee – Dr. Prakash Saluja	1. **Mrs. Rekha Gupta**
Member of Other Department- Dr. Ranjana Shrivastava	2. **Mrs. Neetu Das** 27.06.2024

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2024-25

PART – A: INTRODUCTION				
Program: B.Sc.		**Semester - IV**		**Session: 2024-25**
1	**Course Code**	**BMB-402**		
2	**Course Title**	**Mycology and Plant Pathology**		
3	**Course Type**	**Discipline Specific Elective (DSE)**		
4.	**Course Learning Outcomes (CLO)**	**This Course will enable the students to -** CO 1 classify and distinguish different types of fungi CO 2 relate some special phenomenon in fungi CO 3 examine the important genera of fungi CO 4 determine applied aspects of fungi CO 5 explain basic concepts of plants diseases and their management		
5.	**Credit Value**	**03 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: 45Hours/ 45 Periods

Unit	Topics (Course contents)	No. of Period
I	**Mycology:** Characteristics, cellular and thallus organization in fungi, Classification, general features, structure and reproduction in Phycomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes; Heterothallism and Para sexuality, Physiological specialization, Sex hormones in fungi	9
II	**Important Fungal Genera:** General features, taxonomic status and economic importance of *Mucor, Aspergillus, Penicillium, Saccharomyces, Neurospora, Agaricus, Fusarium, Alternaria, Curvularia, Cladosporium*; General account and importance of Lichens.	9
III	**Fungal Biotechnology:** Role of fungi in biotechnology, Applications of fungi in food industry (Flavor, texture, fermentation, organic acids, enzymes, Mycoproteins) fungal secondary metabolites, Fungal biofertilizers, Mycotoxins, Mushroom cultivation.	9
IV	**Concept of plant disease:** Contributions of eminent Indian plant pathologists. Definition of disease, symptoms associated with plant disease, Koch's postulates, Methods of infection and dissemination of pathogens, forecasting of plant diseases and its relevance in Indian context, Defence Mechanisms in Plant, Principles and practices involved in the management of plant diseases.	9
V	**Insect Vectors of Plant Viruses and other pathogen** History of developments in the area of insects as vectors of plant pathogens. Important insect vectors and their characteristics; mouth parts and feeding processes of important insect vectors. Efficiency of transmission. Transmission of plant viruses and fungal pathogens. Relation between viruses and their vectors.	9

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni 27.6.24	**Industrial Representative- Shri Amitesh Mishra**
Subject Expert - Dr. Anita Mahiswar	**Student Nominee – Ms. Yogita Lokhande**
Subject Expert - Dr. Sonal Mishra Sonal	**Departmental members**
VC Nominee – Dr. Prakash Saluja	**1. Mrs. Rekha Gupta** 27/06/24
Member of Other Department- Dr. Ranjana Shrivastava	**2. Mrs. Neetu Das** 27.06.24

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Introductory Mycology; Alexopoulus, C.J., Mims,C.W. and Blackwel, M,. John Wiley, New York.
2. An Introduction to Mycology; Mehrotra, R.S. and K.R.Aneja. New Age International
3. Plant Pathology; Mehrotra R S and Ashok Agrawal. Tata Mc Graw Hill ,6th reprint (2006).

Reference Books:

1. Introduction to fungi; Webster, J. Cambridge University Press. Cambridge, U.K. (1985).
2. Morphology and Taxonomy of fungi; Bessey E.A. Vikas Publishing House Pvt. Ltd., New Delhi.

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

- Text Book of Modern Plant Pathology
- https://yeastwonderfulworld.files.wordpress.com/2016/10/fungal-biology.pdf
- http://www.deskuenvis.nic.in/pdf/WEBSTER30521807395.pdf
- https://www.rvskvv.net/images/I-Year-II-Sem_Principles_Plantpathology_ANGRAU_20.04.2020.pdf
- https://agri-bsc.kkwagh.edu.in/uploads/department_course/PATH-121_FUNDAMENTALS_OF_PLANT_PATHOLOGY.pdf

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Comprehensive Evaluation (CCE):	**20 Marks**
Semester End Exam (SEE):	**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 5 = 20 Marks
	Question - C: Short answer type question	05 x 5 = 25 Marks
	Question - D: Long answer type question	07 x 5 = 35 Marks
	Total	**= 80 Marks**

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni 27.6.24	**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** 27/06/24
Member of Other Department- Dr. Ranjana Shrivastava	2. **Mrs. Neetu Das** 27.06.24

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

PART A: INTRODUCTION			
	Program: B.Sc.	**Semester -IV**	**Session: 2024-25**
1	**Course Code**	**BMBL-402**	
2	**Course Title**	**Lab. Course**	
3	**Course Type**	**Laboratory Course**	
4.	**Course Learning Outcomes (CLO)**	**This Course will enable the students to -** CO 1 distinguish pathogenic and non-pathogenic fungi CO 2 demonstrate fungal preservation under laboratory conditions CO 3 identify the life cycle of disease-causing fungi CO 4 examine plant disease symptoms in the laboratory	
5.	**Credit Value**	**1 Credit**	**1 credit =30 Hours – Learning and Observation**
6.	**Total Marks**	**Maximum Marks :50**	**Minimum Passing Marks:20**

PART: B CONTENT OF THE COURSE	
S.No.	**List of Experiments**
1.	Isolation of fungi from different sources
2.	Preservation of pure cultures of common fungi.
3.	Study of the vegetative and reproductive structures through temporary and permanent slides: *Mucor, Rhizopus, Saccharomyces, Aspergillus, Penicillium, Erysiphe, Agaricus, Fusarium, Cercospora, Colletotrichum, Cladosporium and Alternaria*
4.	Study of common plant diseases on the basis of causal agent, symptoms, epidemiology and control; White rust of crucifers; Downy mildew; Late blight of potato; Powdery mildew, Ergot of rye; Black stem rust of wheat; Loose smut of wheat; Wilt of tomato

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Laboratory Manual of Microbiology and Biotechnology; K. R Aneja
2. Practical Microbiology; R. C. Dubey and D. K. Maheshwari.
3. Laboratory Manual in Microbiology; P. Gunasekaran.
4. Experiments in Microbiology, Plant Pathology and Biotechnology; K.R. Aneja. New Age Pub. 2017

Online Resources:

- https://nikolaussucher.github.io/bio-two/fungi.html
- Practical manual of Plant pathology
- Plant Pathology_Concepts and Laboratory Exercises_240131_100459.pdf (tnau.ac.in)

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:
Maximum Marks: 50 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 27.6.24	**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** 27/06/24
Member of Other Department- Dr. Ranjana Shrivastava	2. **Mrs. Neetu Das** 27-06-24

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2024-25

PART – A: Introduction			
Program: B.Sc.		**Semester - IV**	**Session: 2024-25**
1	**Course Code**	**BMBSC-02**	
2	**Course Title**	**Microbial Products – Biofertilizers and Biopesticides**	
3	**Course Type**	**Skill Enhancement Course (SEC)**	
4	**Prerequisite (If Any)**	**As per Program**	
5	**Course Learning Outcomes (CLO)**	**At the end of this course, the students will be able to –** ➢ acquire very good understanding of microorganisms used as biofertilizers/ Biopesticides ➢ familiar with the types of biofertilization ➢ discuss the advantages of biofertilizers/ biopesticides ➢ acquainted with the methods of the production of Biofertilizers/ bio pesticides/bioinsecticides ➢ compare the field application results	
6	**Credit Value**	**02 Credits (1C + 1C)**	***Credit = 15 Hrs. Theoretical Learning and = 30 Hrs. Laboratory or field learning/ Training***
7	**Total Marks**	**Max. Marks: 50**	**Minimum Passing marks: 20**

PART – B: Content of the Course

Total No. of Teaching-Learning Periods:
Theory – 15 Periods (15 Hrs.) and Lab. or Field Learning / Training 30 Periods (30 Hours)

Module	Topics (Course Contents)	No. of Period
Theory Contents	**Bio fertilizers:** General account of the microbes used as bio fertilizers for various crop plants and their advantages over chemical fertilizers. **Symbiotic N2 fixers:** *Rhizobium* - Characteristics, inoculum production and field application, *Frankia* - Characteristics, *Cyanobacteria* - Characteristics, mass multiplication and field application. **Non - Symbiotic Nitrogen Fixers:** *Azospirillum* and *Azotobacter*- characteristics, mass production and field application. **Phosphate Solubilizers:** Characteristics, mass Inoculum production, field application. PGPR – Characteristics, mass production and application. **Mycorrhizal Bio-fertilizers:** Types of mycorrhizae, Mass inoculum production of VAM, field applications. **Biopesticides:** General account of microbes used as biopesticides and their advantages over synthetic pesticides, mass production and Field applications.	**15**
Lab./Field Training Contents	1. To know about important scientists in the field of biofertilizer and biopesticides 2. To isolate different microorganisms used as biofertilizer and study the characteristics 3. To study of terminology used in the field of biopesticides (entomopathogens, infectivity, pathogenicity, virulence, symptoms and syndrome, course of infection, incubation period) 4. To isolate entomopathogenic fungi/ bacteria and study pesticidal effects 5. To practice mass production of biofertilizers and biopesticides and check the biological efficiency of the products. 6. To identify important companies and units for production of biofertilizers and biopesticides.	**30**

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Mehrotra R S and Ashok Agrawal. Plant Pathology. Tata Mc Graw Hill ,6th reprint (2006).
2. K.S. Bilgrami, H. C. Dube A textbook of modern pathology. 6thEdition, Vani Educational Books, a division of Vikas, (1984).
3. Shalini Suri. Biofertilizer and Biopesticide APH PublishingCorporation (2011)

Reference Books:

1. Eldor A. Paul. Soil Microbiology.
2. Eugene L. Madsen. Environmental Microbiology: From Genomesto Biogeochemistry. I Edition, Wiley-Blackwell Publishing. (2008).
3. Agrios, G.N. Plant pathology. Harcourt Asia Pvt. Ltd. (2000).

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

- https://www.manage.gov.in/nf/pptspdfs/Biofertilizers%20and%20Biopesticides-Balaraju.pdf
- https://www.slideshare.net/slideshow/final-practical-manual-elec-230convertedpdf/251597918
- https://www.tnu.in/wp-content/uploads/2021/09/biofertilizer-and-biocontrol.pdf
- https://rafflesuniversity.edu.in/pdf/2023/TLP/SOAS/TLP-AET-T-302-5-sem-Biopesticide%20and%20Biofertilizers.pdf
- https://eternaluniversity.edu.in/docs/ProductionTechnologyforBioagentsandBiofertilizers.pdf

PART: D ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:
Maximum Marks: 50 Marks
Continuous Internal Assessment (CIA): 15 Marks
End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal Test/ Quiz – (2): 10 & 10** **Assignment/ Seminar + Attendance: 05** **Total Marks: 15**	Better Marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against **15** Marks

End Semester Exam (ESE):	**Laboratory/ Field Skill Performance: On spot Assessment** **A. Performed the Task based on lab. work – 20 Marks** **B. Spotting based on tools & technology (written) - 10 Marks** **C. Viva-voce (based on principle/ technology) – 05 Marks**	**Managed by Coordinator as per skilling**

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2024-25

PART – A: INTRODUCTION				
	Program: B.Sc.	**Semester - V**		**Session: 2024-25**
1	**Course Code**	**BMB-501**		
2	**Course Title**	**Food and Dairy Microbiology**		
3	**Course Type**	**DSC**		
4	**Course Learning Outcomes (CLO)**	**This Course will enable the students to –** CO 1 define the significance and activities of microorganisms in food CO 2 relate the principles in traditional food preservation techniques CO 3 identify the starter cultures of different microbial food products CO 4 explain the types of food intoxications CO 5 examine the food born infections		
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 to food and dairy Microbiology:** Importance of studying food and dairy microbiology, Traditional and ayurvedic foods of Indian origin, Classification of food in relation to shelf life.	9
II	**Microbial spoilage:** principles, Intrinsic and extrinsic factors that affect growth and survival of microbes in foods, natural flora and source of contamination of foods in general.	9
III	**Principles and methods of food preservation:** Physical methods of food preservation: temperature, Pasteurization, canning, drying, High pressure and Irradiation; chemical methods of food preservation: salt, sugar, organic acids, SO2 and antibiotics.	9
IV	**Microbiology of fermented milk and fermented food:** Starter lactic cultures, fermented milk products- yogurt, butter and cheese, other fermented foods- idly, bread. Microorganisms as food- Mushroom. **Prebiotics and Probiotics-** definition and uses.	9
V	**Food borne diseases:** food poisoning, food infections and intoxications. Causative agents, symptoms and preventive measures. Food intoxications: Clostridium botulinum and mycotoxins; Food infections: *Bacillus cereus, Escherichia coli, Shigella, Listeria monocytogenes.*	9

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni 29.6.24	**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** 27/06/24
Member of Other Department- Dr. Ranjana Shrivastava	**2. Mrs. Neetu Das**

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Biochemistry of milk products: Andrews AT, Varley J. (1994). Royal Society of Chemistry.
2. Food microbiology: Banwart GJ. (1989)
3. A textbook of Microbiology: R. C. Dubey and Maheshwari, S Chand publications.
4. Food Microbiology, 5th Edition; William C. Frazier, Dennis C. Westhoff and N.M. Vanitha

Reference Books:

1. Basic food microbiology: Chapman & Hall, New York.
2. Modern Food Microbiology: Jay JM, Loessner MJ and Golden DA. (2005).7th edition, CBS Publishers and Distributors, Delhi
3. Food Microbiology: Adams MR and Moss MO. (1995)., Cambridge.

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

- https://bookarchive.net/pdf/industrial-microbiology-by-i-e-casida-jr/
- http://foodhaccp.com/foodsafetymicro/onlineindex.html
- https://sist.sathyyabama@ac.in/sist_coursematerial/uploads/SMB2203.pdf
- http://www.cpe.rutgers.ed/courses/current/If0401wa.html
- https://www.classcentral.com/course/swayam-food-microbiology-and-food-safety-17609

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 27.6.24	**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** 27/06/24
Member of Other Department- Dr. Ranjana Shrivastava	2. **Mrs. Neetu Das**

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

PART – A: INTRODUCTION				
Program: B.Sc.		**Semester - V**		**Session: 2024-25**
1	**Course Code**	**BMBL-501**		
2	**Course Title**	**Lab. Course**		
3	**Course Type**	**Laboratory Course**		
4.	**Course Learning Outcomes (CLO)**	**This Course will enable the students to:** CO 1 illustrate the methods for isolation, detection and identification of microorganisms from food samples CO 2 outline the spoilage microorganisms of food CO 3 compare the effect of temperature on the spoilage of food products CO 4 relate the parts of mushrooms		
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 spoilage microorganisms from bread
2.	MBRT of milk samples and their standard plate count
3.	Isolation of bacteria and fungi from food products
4.	Microbiological examination of canned foods
5.	Isolation of spoilage bacteria from fruits and vegetables
6.	Effect of temperature on the spoilage of food products
7.	Microbiological examination of mushrooms
8.	Microbiological examination of packaged food

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Practical Microbiology: Dubey and Maheshwari. D.K., S. Chand & Company, Pvt. Ltd., New Delhi.
2. Laboratory experiments in Microbiology: Gopal Reddy
3. Microbiology Laboratory Manual: Cappuccino, Sherman, Pearson Education.

Online Resources:

- http://www.onlinelabs.in
- http://www.vlab.co.in
- http://www.vlab.amrita.edu

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 27.6.24	**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** 27/06/24 2. **Mrs. Neetu Das**
Member of Other Department- Dr. Ranjana Shrivastava	

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2024-25

PART A: INTRODUCTION				
Program: B.Sc.		**Semester - V**		**Session: 2024-25**
1	**Course Code**	**BMB-502**		
2	**Course Title**	**Agriculture Microbiology**		
3	**Course Type**	**Discipline Specific Elective (DSE)**		
4	**Prerequisite (If Any)**	**As per Program**		
5	**Course Learning Outcomes (CLO)**	**This Course will enable the students to-** CO 1 find the multifarious roles of microorganisms in agriculture CO 2 illustrate microbial damages to plants CO 3 explain harmful effects fungal toxins on human CO 4 examine biological control measures of plant diseases CO 5 relate animal diseases due to microorganisms		
6	**Credit Value**	**03 Credits**	**Credit = 15 Hours - Learning & Observation**	
7	**Total Marks**	**Max. Marks: 75**		**Minimum Passing marks: 30**

PART B: CONTENT OF THE COURSE

Total No. of Teaching-Learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Agricultural Microbiology**: History of agricultural microbiology; Microbial groups in soil; Bacteria, Actinomycetes, Fungi, Cyanobacteria, Algae, Role of microbes in soil fertility and crop production, Contributions of Subba Rao, Dr. M. Swaminathan in Indian agriculture.	9
II	**Bio fertilizers:** classification of biofertilizers, Nitrogen fixers, Rhizoplane associative nitrogen fixation, Phosphate solubilizers, PGPR, Phyllosphere microflora, vermiform compost, Cyanobacterial and Azolla Biofertilizers.	9
III	**Plant Diseases:** Fungal diseases of plants: Rusts of wheat, late blight of potato, red rot of sugarcane; Bacterial diseases of plants: Citrus canker, blight of rice; Viral diseases of plants: Leaf curl of Papaya, vein clearing of lady's finger.	9
IV	**Storage fungi:** Categories of storage fungi, conditions during storage in relation to damage of seeds, harmful effects. **Mycotoxins:** Effect on human, Role of toxins in plant pathogenesis, Microbial Enzymes and their significance in agriculture. **Agro-wastes**: Types and management of Agriculture waste.	9
V	**Biological Control of plant diseases**: Bacterial control of insect pests: Bacillus thuringiensis as bacterial insecticide; Viral control of insect pests: Nuclear polyhedrosis visuses (NPV) and cytoplasmic polyhedrosis viruses (CPV); Fungal control of insect pests: Entomopathogenic fungi*: Beauveria bassiana, Verticillium lecani.*	9

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni 27.6.24	**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** 27/06/24
Member of Other Department- Dr. Ranjana Shrivastava	**2. Mrs. Neetu Das**

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Microbial Ecology: Fundamentals & Applications. 4th edition Atlas RM and Bartha R. (2000). Benjamin/Cummings Science Publishing, USA
2. Hand Book of Microbial Biofertilizers, Mahendra K. Rai (2005)., The Haworth Press, Inc. New York.
3. Bioinoculants for Sustainable Agriculture and Forestry, Reddy, S.M. et. al. (2002)., Scientific Publishers.

Reference Books:

1. Soil Microbiology: An Exploratory Approach, Coyne MS. (2001). Delmar Thomson Learning.
2. Agriculture Biotechnology; Altman A (1998)., Ist edition, Marcel decker Inc.
3. Development of Bioinsecticide, Saleem F and Shakoori AR (2012), Lap Lambert Academic Publishing GmbH KG

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

- http://www.jnkvv.org/PDF/02042020180252Yogranjan_Lecture%20notes_Agricultural%20Microbiology.pdf
- https://hpuniv.ac.in/upload/syllabus/5f0d8da1ed0a4B.Sc.HonsMicrobiologyFinal.pdf

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**75 Marks**
Continuous Internal Assessment (CIA):	**15 Marks**
End Semester Exam (SEE):	**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 27.6.24	**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** 27/06/24
Member of Other Department- Dr. Ranjana Shrivastava	2. **Mrs. Neetu Das**

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

PART – A: Introduction				
Program: B.Sc.		**Semester -V**		**Session: 2024-25**
1	**Course Code**	**BMBL-502**		
2	**Course Title**	**Lab. Course**		
3	**Course Type**	**Laboratory Course**		
4	**Prerequisite (If Any)**	**As per Program**		
5	**Course Learning Outcomes (CLO)**	**This Course will enable the students to-** CO1 examine microbial population of soil and their role CO 2 demonstrate role of microorganisms for plant growth CO 3 identify specific plant diseases CO 4 identify specific animal diseases		
6	**Credit Value**	**1 Credit**	**1 Credit = 30 Hours Learning and Observation**	
7	**Total Marks**	**Maximum Marks: 25**		**Minimum Passing Marks: 10**

PART: B CONTENT OF THE COURSE

S. No.	**List of Exercises**
1	Enumeration of microbial population in soil- bacteria, fungi, actinomycetes.
2	Isolation of *Rhizobium* from legume root nodule and seed treatment studies.
3	Isolation of *Azotobacter/ Azospirillum* and study their effects.
4	Isolation of BGA from water/soil and its mass cultivation.
5	Isolation of PGPR from soil.
6	Study of storage fungi.
7	Symptomatic study of plant diseases and causal organism.

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Laboratory Manual of Microbiology and Biotechnology; Aneja K. R
2. Practical Microbiology, R. C. Dubey and D. K. Maheshwari.
3. Laboratory Manual in Microbiology. By P. Gunasekaran.

Online Resources:

- https://nishat2013.files.wordpress.com/2013/11/laboratory-exercises-in-microbiology-book.pdf
- https://books.google.co.in/books?id=Wh9OTbjcsfUC&printsec= age&q&f=false

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 27.6.24	**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** 27/06/24
Member of Other Department- Dr. Ranjana Shrivastava	2. **Mrs. Neetu Das**

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2024-25

PART – A: INTRODUCTION				
Program: B.Sc.		**Semester - V**		**Session: 2024-25**
1	**Course Code**	**BMB-503**		
2	**Course Title**	**Mycology and Plant Pathology**		
3	**Course Type**	**Discipline Specific Elective (DSE)**		
4.	**Course Learning Outcomes (CLO)**	**This Course will enable the students to -** CO 1 classify and distinguish different types of fungi CO 2 relate some special phenomenon in fungi CO 3 examine the important genera of fungi CO 4 determine applied aspects of fungi CO 5 explain basic concepts of plants diseases and their management		
5.	**Credit Value**	**03 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: 45Hours/ 45 Periods

Unit	**Topics (Course contents)**	**No. of Period**
I	**Mycology:** Characteristics, cellular and thallus organization in fungi, Classification, general features, structure and reproduction in Phycomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes; Heterothallism and Para sexuality, Physiological specialization, Sex hormones in fungi	**9**
II	**Important Fungal Genera:** General features, taxonomic status and economic importance of *Mucor, Aspergillus, Penicillium, Saccharomyces, Neurospora, Agaricus, Fusarium, Alternaria, Curvularia, Cladosporium*; General account and importance of Lichens.	**9**
III	**Fungal Biotechnology:** Role of fungi in biotechnology, Applications of fungi in food industry (Flavor, texture, fermentation, organic acids, enzymes, Mycoproteins) fungal secondary metabolites, Fungal biofertilizers, Mycotoxins, Mushroom cultivation.	**9**
IV	**Concept of plant disease:** Contributions of eminent Indian plant pathologists. Definition of disease, symptoms associated with plant disease, Koch's postulates, Methods of infection and dissemination of pathogens, forecasting of plant diseases and its relevance in Indian context, Defence Mechanisms in Plant, Principles and practices involved in the management of plant diseases.	**9**
V	**Insect Vectors of Plant Viruses and other pathogen** History of developments in the area of insects as vectors of plant pathogens. Important insect vectors and their characteristics; mouth parts and feeding processes of important insect vectors. Efficiency of transmission. Transmission of plant viruses and fungal pathogens. Relation between viruses and their vectors.	**9**

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** **2. Mrs. Neetu Das**
Member of Other Department- Dr. Ranjana Shrivastava	

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Introductory Mycology; Alexopoulus, C.J., Mims,C.W. and Blackwel, M,. John Wiley, New York.
2. An Introduction to Mycology; Mehrotra, R.S. and K.R.Aneja. New Age International
3. Plant Pathology; Mehrotra R S and Ashok Agrawal. Tata Mc Graw Hill ,6th reprint (2006).

Reference Books:

1. Introduction to fungi; Webster, J. Cambridge University Press. Cambridge, U.K. (1985).
2. Morphology and Taxonomy of fungi; Bessey E.A. Vikas Publishing House Pvt. Ltd., New Delhi.

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

- Text Book of Modern Plant Pathology
- https://yeastwonderfulworld.files.wordpress.com/2016/10/fungal-biology.pdf
- http://www.deskuenvis.nic.in/pdf/WEBSTER30521807395.pdf
- https://www.rvskvv.net/images/I-Year-II-Sem_Principles_Plantpathology_ANGRAU_20.04.2020.pdf
- https://agri-bsc.kkwagh.edu.in/uploads/department_course/PATH-121_FUNDAMENTALS_OF_PLANT_PATHOLOGY.pdf

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Comprehensive Evaluation (CCE):	**20 Marks**
Semester End Exam (SEE):	**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 5 = 20 Marks
	Question - C: Short answer type question	05 x 5 = 25 Marks
	Question - D: Long answer type question	07 x 5 = 35 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**
Subject Expert - Dr. Sonal Mishra	**Departmental members**
VC Nominee – Dr. Prakash Saluja	1. **Mrs. Rekha Gupta**
Member of Other Department- Dr. Ranjana Shrivastava	2. **Mrs. Neetu Das**

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

PART A: INTRODUCTION				
	Program: B.Sc.	**Semester - V**		**Session: 2024-25**
1	**Course Code**	**BMBL-503**		
2	**Course Title**	**Lab. Course**		
3	**Course Type**	**Laboratory Course**		
4.	**Course Learning Outcomes (CLO)**	**This Course will enable the students to -** CO 1 distinguish pathogenic and non-pathogenic fungi CO 2 demonstrate fungal preservation under laboratory conditions CO 3 identify the life cycle of disease-causing fungi CO 4 examine plant disease symptoms in the laboratory		
5.	**Credit Value**	**1 Credit**	**1 credit =30 Hours – Learning and Observation**	
6.	**Total Marks**	**Maximum Marks :50**		**Minimum Passing Marks:20**

PART: B CONTENT OF THE COURSE	
S.No.	**List of Experiments**
1.	Isolation of fungi from different sources
2.	Preservation of pure cultures of common fungi.
3.	Study of the vegetative and reproductive structures through temporary and permanent slides: *Mucor, Rhizopus, Saccharomyces, Aspergillus, Penicillium, Erysiphe, Agaricus, Fusarium, Cercospora, Colletotrichum, Cladosporium and Alternaria*
4.	Study of common plant diseases on the basis of causal agent, symptoms, epidemiology and control; White rust of crucifers; Downy mildew; Late blight of potato; Powdery mildew, Ergot of rye; Black stem rust of wheat; Loose smut of wheat; Wilt of tomato

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Laboratory Manual of Microbiology and Biotechnology; K. R Aneja
2. Practical Microbiology; R. C. Dubey and D. K. Maheshwari.
3. Laboratory Manual in Microbiology; P. Gunasekaran.
4. Experiments in Microbiology, Plant Pathology and Biotechnology; K.R. Aneja. New Age Pub. 2017

Online Resources:

- https://nikolaussucher.github.io/bio-two/fungi.html
- Practical manual of Plant pathology
- Plant Pathology_Concepts and Laboratory Exercises_240131_100459.pdf (tnau.ac.in)

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:
Maximum Marks: 50 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	**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** 2. **Mrs. Neetu Das**
Member of Other Department- Dr. Ranjana Shrivastava	

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM (2024-25)

PART – A: INTRODUCTION				
Program: B.Sc.		**Semester - VI**		**Session: 2024-25**
1	**Course Code**	**BMB-601**		
2	**Course Title**	**Medical and Veterinary Microbiology**		
3	**Course Type**	**DSC**		
4	**Course Learning Outcomes (CLO)**	**This Course will enable the students to -** CO 1 define the history of medical microbiology CO 2 identify medically important microorganisms CO 3 explain the mechanism of infection CO 4 examine bacterial diseases CO 5 examine fungal diseases		
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 (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Introduction of medical microbiology and concept of infection:** Historical development, Koch & River's postulates, role of microbiology in medicine of medically important microbes; microbial flora of human body.	9
II	**Pathogenesis:** Microbial infection-types, stages and process. Mechanism of bacterial adhesion, colonization and invasion of mucous membranes of respiratory, enteric and urogenital tracts. Role of agresins, depolymerizing enzymes, organotropism, variation and virulence.	9
III	**Bacterial Pathogenesis:** Pathogenic bacteria- morphological characteristics, epidemiology, pathogenesis, laboratory diagnosis and treatment of pathogenic bacteria; *Staphylococcus aureus, group A Streptococcus, Pneumococci, E. coli, Salmonella, Corynebacterium Mycobacterium* and drug resistance.	9
IV	**Clinical Mycology:** Superficial, subcutaneous, cutaneous and systemic mycoses. General description of mycotic pathogens, the diagnosis and prevention. Pathogenic fungi: *Microsporium, Trichophyton, Histoplasma capsulatum, Blastomyces dermatitidis, Candida albicans, Cryptococcus neoformans.*	9
V	**Veterinary Microbiology:** Introduction, history and scope, Sources and routes of infection, Zoonoses, Study of following animal diseases with respect to etiology, symptoms, mode of transmission, prophylaxis and control: FMD, swine flu, bird flu, Rabies, bovine tuberculosis, Marek's, Ranikhet disease, brucellosis, distemper, transgenic animals.	9

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni 27.6.24	**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** 27/06/24
Member of Other Department- Dr. Ranjana Shrivastava	**2. Mrs. Neetu Das**

PART – C: LEARNING RESOURCES		
Text Books, Reference Books and Others		
Text Books Recommended: 1. Text book of Microbiology; R. Anantharayanan, C. K. Jayaram Panikar, Orient Longman, Mumbai. 2. Medical microbiology; P. Chrakrborthy 3. A Text Book of Microbiology: R. C. Dubey & D. K. Maheshwari **Reference Books:** 1. Medical Microbiology; N. C. Dey and T. K. Dey, Allied agency, Calcutta. 2. Microbiology; Davis, Dulbecco, Eisen Harper and Row Maryland.		
Online Resources – e-Resources/ e-Books and e- learning portals • https://microbiologysociety.org/static/uploaded/23cbf9c5-f8c8-4f91-b092a4ad819e6357.pdf • https://books.google.co.in/books?id=RLpEDwAAQBAJ&pg=PA46&source=gbs_toc_r&cad=2#v=onepage&q&f=false • https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMB3101.pdf • https://repository.poltekkes-kaltim.ac.id/1153/1/medical%20microbiology.pdf		
PART – D: ASSESSMENT AND EVALUATION		
Suggested Continuous Evaluation Methods: **Maximum Marks:** **75 Marks** **Continuous Comprehensive Evaluation (CCE):** **15 Marks** **Semester End Exam (SEE):** **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) Question - C: Short answer type question Question - D: Long answer type question **Total**	 02 x 5 = 10 Marks 03 x 5 = 15 Marks 07 x 5 = 35 Marks **= 60 Marks**

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni 27.6.24 **Subject Expert - Dr. Anita Mahiswar** **Subject Expert - Dr. Sonal Mishra** **VC Nominee – Dr. Prakash Saluja** **Member of Other Department- Dr. Ranjana Shrivastava**	**Industrial Representative- Shri Amitesh Mishra** **Student Nominee – Ms. Yogita Lokhande** **Departmental members** 1. **Mrs. Rekha Gupta** 27/06/24 2. **Mrs. Neetu Das**

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

LAB COURSE 2024-25

PART – A: INTRODUCTION				
Program: B.Sc.		**Semester -VI**		**Session: 2024-25**
1	**Course Code**	**BMBL-601**		
2	**Course Title**	**Lab. Course**		
3	**Course Type**	**Laboratory Course**		
4.	**Course Learning Outcomes (CLO)**	**This Course will enable the students to –** ➢ prepare culture media and examine of different pathological samples ➢ compare various staining techniques ➢ relate serological tests for disease diagnosis ➢ justify antibiotic sensitivity tests		
5.	**Credit Value**	**1 Credit**	**1 Credit = 30 Hours Learning and Observation**	
6.	**Total Marks**	**Max. Marks: 25**		**Min. Passing marks: 10**

PART: B CONTENT OF THE COURSE	
S.No.	**List of Exercises**
1.	Preparation of culture media: Blood agar, Chocolate agar, MacConkey agar
2.	Isolation of bacteria from tooth crevices
3.	Staining techniques: Gram staining, Acid fast staining, metachromatic granule staining
4.	Demonstration of hemolysis on blood agar
5.	Perform microscopic examination of urine
6.	Isolation and identification of bacteria from pathological samples
7.	Perform serological tests: WIDAL, VDRL.
8.	Perform antibiotic sensitivity test by disc diffusion method.

PART – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Laboratory Manual of Microbiology and Biotechnology: Aneja K. R
2. Practical Microbiology: R. C. Dubey and D. K. Maheshwari.
3. Laboratory Manual in Microbiology: P. Gunasekaran.

Online Resources:

- https://books.google.co.in/books?id=Wh9OTbjcsfUC&printsec= age&q&f=false
- https://microbiologysociety.org/static/uploaded/23cbf9c5-f8c8-4f91-b092a4ad819e6357.pdf
- https://books.google.co.in/books?id=RLpEDwAAQBAJ&pg=PA46&source=gbs_toc_r&cad=2#v=onepage&q&f=false

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 27.6.24

Subject Expert - Dr. Anita Mahiswar

Subject Expert - Dr. Sonal Mishra

VC Nominee – Dr. Prakash Saluja

Member of Other Department- Dr. Ranjana Shrivastava

Industrial Representative- Shri Amitesh Mishra

Student Nominee – Ms. Yogita Lokhande

Departmental members

1. **Mrs. Rekha Gupta** 27/06/24
2. **Mrs. Neetu Das**

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2024-25

PART – A: INTRODUCTION				
Program: B.Sc.		**Semester - VI**		**Session: 2024-25**
1	**Course Code**	**BMB-602**		
2	**Course Title**	**Clinical Microbiology**		
3	**Course Type**	**Discipline Specific Elective (DSE)**		
4.	**Course Learning Outcomes (CLO)**	**This Course will enable the students to –** CO 1 develop a clear vision about various aspects of infectious diseases CO 2 explain the portal of entry of pathogens CO 3 identify the method of collection of clinical samples and their processing CO 4 distinguish different types of infectious diseases CO 5 explain diagnostic procedures of infectious diseases		
5.	**Credit Value**	**03 Credits**	**Credit = 15 Hours - Learning & Observation**	
6.	**Total Marks**	**Max. Marks: 75**		**Minimum Passing marks: 30**
Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)				

PART – B: CONTENT OF THE COURSE

Unit	Topics (Course contents)	No. of Period
I	**Basic concepts in Clinical Microbiology** - Sterilization & disinfection, minimum inhibitory concentration, Classification of disease – infectious, communicable, contagious, nosocomial, iatrogenic& zoonotic diseases.	9
II	**Chain of infection** -Portal of entry and exit of pathogen. Collection of clinical samples and Laboratory diagnosis: precautions required for sample collection (oral cavity, throat, skin, blood, urine, faeces).	9
III	**Viral Infections and Diseases** - Study of disease; causative agent, infectious dose, portal of entry, virulence, epidemiology, laboratory diagnosis, prophylaxis and treatment of AIDS, Polio, Rabies, Hepatitis. Newly emerging diseases: Dengue and Ebolla, COVID.	9
IV	**Bacterial Infections and Diseases** - Study of disease; causative agent, infectious dose, portal of entry, virulence, epidemiology, laboratory diagnosis, prophylaxis and treatment of Tuberculosis, Typhoid, Cholera, Tetanus, Syphilis, Gastroenteritis caused by E. coli.	9
V	**Fungal and Protozoal Diseases** - Study of disease; Causative agent, portal of entry, pathogenicity, laboratory diagnosis and treatment of Dermatophytosis, Malaria, Amoebic dysentery.	9

Name and Signatures

Chairperson/ HOD- Dr. Pragya Kulkarni 27.6.24	**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** 27/06/24
Member of Other Department- Dr. Ranjana Shrivastava	**2. Mrs. Neetu Das**

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Textbook of Microbiology; Ed 8th, Anantnarayan P. and Paniker, C. K. J., (2009), Universities press, Hyderabad.
2. A text book of Microbiology; Chakraborty P (2013) New Central Book Agency, Delhi.
3. Medical Bacteriology and Microbiology; 16th Ed, Dey, N. C. and Dey, T. K., (1999) Allied Agency, Calcutta.

Reference Books:

1. Microorganisms in our world; Atlas, R. M. (1995), Mosby Year Book Inc.
2. Microbiology; 4th Ed., Davis, B. D., Dulbecco, R, Eisen, H. N., Ginsberg, R. S., (1990), Harper and Row Publishers, Singapore.
3. Microbiology; 2nd Ed., Prescott, L. M., Hartley, J. P. and Klein, D. A., (1993), W. M. C. Brown Publ, England.
4. Microbiology; 8th Ed., Tortora, G. J., Funke, B. R. and Case, C. L., (2004), Person Education (Low Price edition), Delhi

Online Resources:

- https://www.routledge.com/Clinical-Microbiology/Struthers/p/book/9781498786898
- https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMB3101.pdf
- https://repository.poltekkes-kaltim.ac.id/1153/1/medical%20microbiology.pdf
- https://pubmed.ncbi.nlm.nih.gov/21413252/ Medical Microbiology - PubMed (nih.gov)

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**75 Marks**
Continuous Comprehensive Evaluation (CCE):	**15 Marks**
Semester End Exam (SEE):	**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 27.6.24	**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** 27/06/24
Member of Other Department- Dr. Ranjana Shrivastava	2. **Mrs. Neetu Das**

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

PART – A: INTRODUCTION				
Program: B.Sc.		**Semester -VI**		**Session: 2024-25**
1	**Course Code**	**BMBL- 602**		
2	**Course Title**	**Lab. Course**		
3	**Course Type**	**Laboratory Course**		
4.	**Course Learning Outcomes (CLO)**	**This Course will enable the students to –** CO 1 find the methods of collection and transport of clinical samples CO 2 explain the principles of clinical phenomena for diagnosis of diseases CO 3 experiment with isolation and identification of disease-causing organisms CO 4 relate antibiotic responses of pathogenic microorganisms		
5.	**Credit Value**	**1 Credit**	**1 Credit = 30 Hours Learning and Observation**	
6.	**Total Marks**	**Max. Marks: 25**		**Min. Passing marks: 10**

PART: B CONTENT OF THE COURSE	
S.No.	**List of Exercises**
1.	Collection & transport of clinical specimens.
2.	Serological tests-WIDAL, VDRL, ELISA
3.	Demonstration Chick Embryo techniques-inoculation and harvesting
4.	Study of growth characters of isolated pathogens on following media: MacConkey agar, EMB agar, Mannitol salt agar, Salmonella Shigella agar, TSI agar
5.	Physical, Chemical and Microscopic examination of Clinical samples –urine, pus
6.	Isolation, identification of pathogens from clinical samples: *E. coli, Salmonella spp., Pseudomonas spp., Proteus spp., Klebsiella spp., Shigella spp., Staphylococcus spp, Streptococcus spp*
7.	Isolation and observation of fungal pathogens using Lactophenol cotton blue stain.
8.	Direct examination of faces for ova and cysts
9.	Antibiotic sensitivity testing of the isolates

PART – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Laboratory Manual of Microbiology and Biotechnology; Aneja K. R
2. Practical Microbiology; R.C. Dubey and D. K. Maheshwari.
3. Laboratory Manual in Microbiology; P. Gunasekaran.

Online Resources:

- https://books.google.co.in/books?id=Wh9OTbjcsfUC&printsec=frontcover&source=gbs
- https://microbiologysociety.org/static/uploaded/23cbf9c5-f8c8-4f91-b092a4ad819e6357.pdf
- https://books.google.co.in/books?id=RLpEDwAAQBAJ&pg=PA46&source=gbs_toc_r&cad=2#v=onepage&q&f=false

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 22-6-24

Subject Expert - Dr. Anita Mahiswar

Subject Expert - Dr. Sonal Mishra

VC Nominee – Dr. Prakash Saluja

Member of Other Department- Dr. Ranjana Shrivastava

Industrial Representative- Shri Amitesh Mishra

Student Nominee – Ms. Yogita Lokhande

Departmental members

1. **Mrs. Rekha Gupta** 27/06/24
2. **Mrs. Neetu Das**

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM 2024-25

PART – A: INTRODUCTION			
Program: B.Sc.		**Semester - VI**	**Session: 2024-25**
1	**Course Code**	**BMB-603**	
2	**Course Title**	**Immunology**	
3	**Course Type**	**Discipline Specific Elective (DSE)**	
4	**Prerequisite (If Any)**	**As per Program**	
5	**Course Learning Outcomes (CLO)**	**At the end of this course, students will be able to –** CO 1 define the functions of the immune system CO 2 distinguish innate immunity and acquired immunity CO 3 relate the structure and function immune cells and organs CO 4 discuss cell mediated and antibody-mediated immunity CO 5 explain immunological techniques	
6	**Credit Value**	**03 Credits**	**Credit = 15 Hours - Learning & Observation**
7	**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 Period
I	**Immunity and Immune system** – History: Contribution of G.P. Talwar, M.C. Vaidya and Indira Nath; Concept of Innate and acquired immunity, Host defense mechanism- First, second and third line of host defense.	9
II	**Haematopoiesis** - Definition, types and process, structure, functions and properties of Immune Cells; Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; Organs of Immune; Bone Marrow, Thymus, Lymph Node, Spleen.	9
III	**Antigens and Antibodies**- Characteristics of an antigen (Foreignness, Molecular size and Heterogeneity); Epitopes, Haptens, Adjuvants. Structure, Types, Functions and Properties of Immunoglobulins (Antibody); Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic).	9
IV	**Immune Response** - Primary and Secondary Immune Response; Generation of Humoral Immune Response; Generation of Cell Mediated Immune Response; Killing Mechanisms by CTL (Cytotoxic T lymphocytes) and NK cells. Structure and Functions of MHC I & II molecules, Components and biological activities of Complement.	9
V	**Antigen and Antibody Reactions and Immunological Techniques**- Principles of Agglutination, precipitation, Complement Fixation test, Immunodiffusion, Immuno electrophoresis, Hemagglutination, Immunofluorescence, ELISA, RIA, Coombs test.	9

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. Ranjana Shrivastava	**2. Mrs. Neetu Das**

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Text book of Microbiology; R. Anantharayanan, C.K. Jayaram Panikar, Orient Longman.
2. Medical microbiology; Chrakraborthy P.
3. A text book of Microbiology; Dubey & Maheshwari.
4. Immunology, A Textbook; C.V. Rao.
5. Immunology; J. Kuby.

Reference Books:

1. Fundamental Immunology; W.E. Paul.
2. Essentials of Immunology; Roitt, I.M.

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

- https://repository.stikesbcm.ac.id/id/eprint/168/1/books_5453_0.pdf
- https://www.mbbcollege.in/db/notes/474.pdf
- http://www.helmberg.at/immunology.pdf
- https://www.utep.edu/eerael/immunology.htm
- https://conursing.uobaghdad.edu.iq/wp-content/uploads/sites/20/2019/09/Microbiology-L10-Immunity-and-immune-system.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 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 (02 each)	04 x 5 = 20 Marks
	Question - C: Short answer type question	05 x 5 = 25 Marks
	Question - D: Long answer type question	07 x 5 = 35 Marks
	Total	**= 80 Marks**

Name and Signatures

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Subject Expert - Dr. Sonal Mishra	**Departmental members**
VC Nominee – Dr. Prakash Saluja	1. **Mrs. Rekha Gupta**
Member of Other Department- Dr. Ranjana Shrivastava	2. **Mrs. Neetu Das**

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

PART A: INTRODUCTION			
Program: B.Sc.		**Semester VI**	**Session: 2024-25**
1	**Course Code**	**BMBL- 603**	
2	**Course Title**	**Lab. Course**	
3	**Course Type**	**Laboratory Course**	
4	**Prerequisite (If Any)**	**As per Program**	
5	**Course Learning Outcomes (CLO)**	**This Course will enable the students to-** CO 1 identify blood group and estimate of haemoglobin CO 2 perform Gel Diffusion assays used to examine antigen-antibody reactions CO 3 perform DOT ELISA test CO 4 understand the Flocculation and Agglutination reaction	
6	**Credit Value**	**1 Credit**	**Credit = 30 Hours. - Learning & Observation**
7	**Total Marks**	**Max. Marks: 50**	**Min. Passing marks: 20**

PART B: CONTENT OF THE COURSE

Total No. of learning-Training/ Performance Periods: 30 Periods (30 Hours)

S. No.	**List of Exercises**
1	Identification of human blood groups.
2	Estimation of haemoglobin.
3	Perform Total Leukocyte Count of the given blood sample.
4	Separate serum from the blood sample.
5	Flocculation reactions - VDRL Agglutination, Widal test, Blood Grouping.
6	Immuno-diffusion techniques- ODD and RID.
7	To Perform DOT ELISA.
8	Examination of skin microflora.

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended:

1. Practical Immunology, Frank C. Hay, Olwyn M.R. Westwood & Paul N. Nelson. 4th Edition, 1 January
2. Handbook of Practical and Clinical Immunology, 2e, Vol. II 2nd Edition, Kindle Edition
3. Immunological Techniques Interpretations Validation and Safety Measures; Ankita Joshi & R S Chauhan

Online Resources:

- https://doi.org/10.1002/9780470757475.index
- http://www.lucp.net/books-pdf/Lab%20Manual%20Dr.%20Idris%20Adewale%20Ahmed/15.%20BASIC%20IMMUNOLOGY.pdf
- https://webstor.srmist.edu.in/web_assets/downloads/2021/18BTC106J-lab-manual.pdf

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:
Maximum Marks: 50 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

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Subject Expert - Dr. Anita Mahiswar	**Student Nominee – Ms. Yogita Lokhande**
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