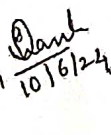
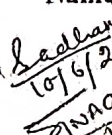
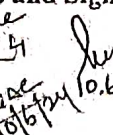
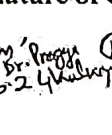
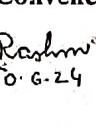
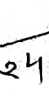


FOUR YEAR UNDERGRADUATE PROGRAM (NEP 2020)
PROGRAM: BACHELOR OF SCIENCE (2024-28)
DISCIPLINE: MICROBIOLOGY
Session: 2024-25

DSC- 01 to 08		DSE- 01 to 12		DGE- 01 to 02	
MBSC- 01 T	Introductory Microbiology and Microbial Techniques	MBSE- 01 T	Microbial Enzyme Technology	MBGE- 01 T	Introductory Microbiology and Microbial Techniques
MBSC- 01 P	Lab Course	MBSE- 01 P	Lab Course	MBGE- 01 P	Lab Course
MBSC- 02 T	Bacteriology, Virology and Protozoology	MBSE- 02 T	Industrial Microbiology	MBGE- 02	Bacteriology, Virology and Protozoology
MBSC- 02 P	Lab Course	MBSE- 02 P	Lab Course	MBGE- 02 P	Lab Course
MBSC- 03 T	Cell Biology and Biochemistry	MBSE- 03 T	Food and Dairy Microbiology		
MBSC- 03 P	Lab Course	MBSE- 03 P	Lab Course		
MBSC- 04 T	Bioinstrumentation and Biostatistics	MBSE- 04 T	Microbial Biotechnology		
MBSC- 04 P	Lab Course	MBSE- 04 P	Lab Course		
MBSC- 05 T	Microbial Physiology and Metabolism	MBSE- 05 T	Medical Microbiology	SEC	
MBSC- 05 P	Lab Course	MBSE- 05 P	Lab Course		
MBSC- 06 T	Molecular Biology and Microbial Genetics	MBSE- 06 T	Mycology and Plant Pathology	MBSEC- 01	Mushroom Cultivation
MBSC- 06 P	Lab Course	MBSE- 06 P	Lab Course		
MBSC- 07 T	Immunology	MBSE- 07 T	Agriculture and Veterinary Microbiology	VAC	
MBSC- 07 P	Lab Course	MBSE- 07 P	Lab Course		
MBSC- 08 T	Environmental Microbiology and Microbial Ecology	MBSE- 08 T	Fermentation Technology	MBVAC- 01	Microbes and Human Health
MBSC- 08 P	Lab Course	MBSE- 08 P	Lab Course		
		MBSE- 09 T	Clinical Microbiology		
		MBSE- 09 P	Lab Course		
		MBSE- 10 T	Pharmaceutical Microbiology		
		MBSE- 10 P	Lab Course		
		MBSE- 11 T	Metagenomics, Basic Computer and Bioinformatics		
		MBSE- 11 P	Lab Course		
		MBSE- 12 T	Biosafety and Intellectual Property Rights		
		MBSE- 12 P	Lab Course		

Name and Signature of Convener and Members of CBoS

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Chairman
 Studies
 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)		Semester - I	Session: 2024-25
1	Course Code	MBSC- 01 T	
2	Course Title	Introductory Microbiology and Microbial techniques	
3	Course Type	DSC	
4	Prerequisite (If Any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ relate the development and scope of Microbiology ➤ illustrate the contributions made by prominent scientists including Indian Vedic Knowledge on microbiology ➤ demonstrate the nomenclature and characteristics of different types of microorganisms ➤ identify the basic techniques in microbiology ➤ explain the methods of microbial control	
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 (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	History and scope of microbiology – History, development and Scope of Microbiology, Golden era of microbiology, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Alexander Fleming and Edward Jenner, The Forgotten Past of Microbiology in Indian Vedic Knowledge.		12
II	Systems of classification – Binomial nomenclature, principles of microbial classification, Whittaker's five kingdom and Carl Woese's three domain classification systems and their utility, Major groups of microorganisms; General features and structure of bacteria, virus, fungi, algae and protozoa.		11
III	Microbial culture and staining techniques – Obtaining pure culture by streaking, serial dilution and plating; types of culture media, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria, cultivation of fungi, actinomycetes and algae. Principle, procedure and applications of Simple staining, negative staining; Differential staining- Gram's staining, acid fast staining.		11
IV	Microbial control – Sterilization: Physical Agents - Heat: Boiling, Tyndallization, Steam under pressure (Autoclave), incineration, hot air Oven. Radiations: Ionizing and non-ionizing radiations. Filtration, Chemical agents - Disinfection, Antiseptic, Germicide, Sanitizer, Principle and application of Laminar airflow, Biological agents - Antibiotics		11
Key Words		History and scope, Nomenclature, Pure culture technique, Microbial control	

Name and Signature of Convener and Members of CBoS

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Jaiswal

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Dr. Nelson Xe

Officer-In-Charge (Academic)
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Microbiology: P. D. Sharma, Rastogi Publications.
2. A textbook of Microbiology: R. C. Dubey and Maheshwari, S Chand publications.
3. General Microbiology, Vol. II, C. B. Powar and Dagainawala
4. Fundamentals of Microbiology and Immunology, Ajit Kr. Banerjee and Nirmalya Banerji, Central publication.

Reference Books:

1. Microbiology: Pelczar, MJ Chan ECS and Krieg NR, McGraw-Hill.
2. Microbiology: 5th Edition Prescott, M.J., Harley, J.P. and Klein, D.A. WCB Mc Graw Hill, New York.
3. Microbiology: An Introduction: Pearson Education Tortora, G.J., Funke, B.R. and Case, C.L., Singapore.
4. Fundamentals of Microbiology: VI Edition Alcomo, I.E., Jones and Bartlett Publishers. Sudbury. Massachusetts, (2001).

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

- <https://www.jsscacs.edu.in/sites/default/files/Department%20Files/History%20of%20Microbiology.pdf>
- <https://www.britannica.com/science/microbiology>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7810802/>
- <https://www.slideshare.net/HarinathaReddyA/methods-for-isolation-of-pure-culture>
- <https://microbenotes.com.webpkgcache.com/doc/-s/microbenotes.com/sterilization-physical-and-chemical-methods/>

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

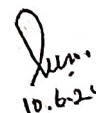
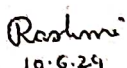
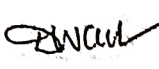
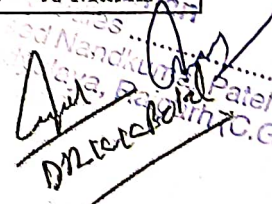
Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	
End Semester Exam (ESE):	Two Section – A & B Section A: Q1, Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks	

Name and Signature of Convener and Members of CBoS

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Officer-in-Charge (Academics)
 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

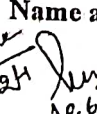
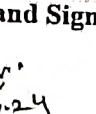
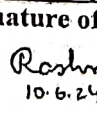
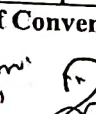
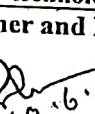
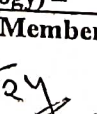
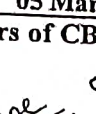
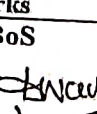
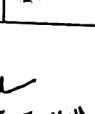
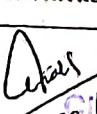
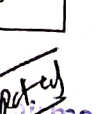
PART – A: Introduction		
Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)		Session: 2024-25
1	Course Code	MBSC- 01 P
2	Course Title	Lab. Course – MBSC-01
3	Course Type	Laboratory Course
4	Prerequisite (If Any)	As per program
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ define the basic laboratory practices and safety measures ➤ explain the principle, working and applications of Instruments ➤ select the proper culture media for microbial growth ➤ identify different microorganisms in the laboratory
6	Credit Value	1 Credit
7	Total Marks	Credit = 30 Hours. Laboratory or Field learning/ Training
		Max. Marks: 50
		Min. Passing marks: 20

PART – B: Content of the Course		
Total No. of learning-Training/ Performance Periods: 30 Periods (30 Hours)		
Module	Topics (Course contents)	No. of Period
Lab./ Field Training/ Experiment contents of Course	1. Good Laboratory Practices and Bio-safety in Microbiology. 2. To study the principle and applications of autoclave, incubator, BOD incubator, hot air oven, laminar air flow, light microscope. 3. Preparation of culture media (liquid & solid), sterilization and assessment of sterility 4. Isolation of microorganisms from environment by pour plate, streak plate and spread plate technique. 5. Observation of microorganisms - cyanobacteria, protozoa, fungi, yeasts and algae from natural habitats. 6. Observation of bacteria by Gram staining technique. 7. Study of common fungi, algae and protozoan using temporary / permanent mounts.	30

PART – C: Learning Resources	
Text Books, Reference Books and Others	
Text Books Recommended:	
1. Experiments in microbiology, plant pathology and biotechnology: K R Aneja 2. Practical microbiology: R C Dubey and D K Maheshwari.	
Online Resources:	
• https://www.youtube.com/watch?v=HndcMyuEXs • https://www.youtube.com/watch?v=CbMGr9wFV2w	

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 course teacher as per lab. status

Name and Signature of Convener and Members of CBoS

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Officer-In-Charge (Academic)
 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor In Life Science (Certificate/Diploma/Degree/Honors)		Semester - II	
		Session: 2024-25	
1	Course Code	MBSC-02 T	
2	Course Title	Bacteriology, Virology and Protozoology	
3	Course Type	DSC	
4	Prerequisite (If Any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ recall the ultrastructure of bacteria ➤ relate ecological distribution of microorganism and their significances for society ➤ illustrate the essential and current knowledge of bacteria ➤ identify virus, protozoan and archaebacteria with their special characteristics ➤ outline the beneficial & harmful behavior of viruses, bacteria, protozoan and other microbes	
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 (01 Hr. per period) - 45 Periods (45 Hours)			
UNIT	TOPIC (Course Contents)		No. of Period
I	Morphology and Ultra structure of Bacteria: Cell size, shape and arrangements. Composition, structure and function of cell membrane, cell wall of gram-positive, gram-negative bacteria, capsule, flagella, pili, ribosomes, inclusions, nucleoid, plasmids. Structure and stages of spore formation.		12
II	Gram negative, positive bacteria & Archaebacteria: Gram negative and positive bacteria; characteristics and examples - Gram negative (non-proteobacteria– <i>Deinococcus</i> , <i>Spirochetes</i> . Alpha proteobacteria, <i>Rhizobium</i> , <i>Agrobacterium</i> . Gamma proteo-bacteria– <i>Escherichia</i> , <i>Pseudomonas</i>). Gram positive low G+C; <i>Bacillus</i> , <i>Clostridium</i> , <i>Staphylococcus</i> . High G+C: <i>Streptomyces</i> , <i>Frankia</i> . General characteristics, Ecological significance and economic importance of Archaea: Methanogens, thermophiles (<i>Thermococcus</i> , <i>pyrococcus</i> , <i>thermoplasma</i>) and halophiles (<i>halobacteria</i> and <i>halococcus</i>).		11
III	Morphology, ultrastructure, Classification & multiplication of viruses: General introduction, morphology and ultra- structure of viruses, capsid, envelopes. Types of Viral genome. Viral related forms -virions, viroids, virusoids, and prions. Classification of viruses. Salient features and life cycle of viruses: Bacteriophages (T4 & Lambda), Plant (TMV & CMV), Animal (Adenovirus & Pox virus).		11
IV	Introduction to protozoa; Occurrence and classification of protozoa. Structure, reproduction, life cycle and diseases caused by important protozoans - <i>Entamoeba</i> , <i>Giardia</i> , <i>Leishmania</i> , <i>Trypanosoma</i> and <i>Plasmodium</i>		11
Key Words		Bacteria, Archaea, Virus, Bacteriophage, Prions, Protozoan	
Name and Signature of Convener and Members of CBoS			

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Dr. Anshu

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Dr. Rashmi

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Dr. Sachana

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Dr. Nand Kumar Patel
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Dr. Nelson Xel

Officer-In-Charge (Academic)
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Vishwavidyalaya, Raigarh (C.G.)

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. General Microbiology; Vol I & II, Powar C.B. and Dagainawala H. I., Himalay Pub. House, Bombay.
2. A Text Book of Microbiology; Dubey & Maheshwari.
3. A Text Book of Microbiology; R. P. Singh.
4. Fundamentals of Microbiology and Immunology, Ajit Kr. Banerjee and Nirmalya Banerji, Central publication.
5. Parasitology; H.S. Singh and P. Rastogi, First Edition, Rastogi Publications.

Reference Books:

6. Prescott's Microbiology. Wiley J M, Sherwood L M and Woolverton C J.
7. Microbiology. Pelczar M J, Chan E C S and Krieg N R.
8. General Microbiology. Stanier R Y, Ingraham J L, Wheelis M L, and Painter P R.
9. Microbiology: An Introduction. Tortora G J, Funke B R and Case C L.

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

- <https://www.ncbi.nlm.nih.gov/books/NBK8477/>
- <https://www.britannica.com/science/archaea>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7150055/>
- <https://nios.ac.in/media/documents/dmlt/Microbiology/Lesson-53.pdf>
- <http://ecoursesonline.iasri.res.in/Courses/Agricultural%20Microbiology/>

Part- D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

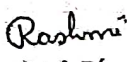
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	

End Semester Exam (ESE):	Two Section – A & B
	Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks
	Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10= 40 Marks

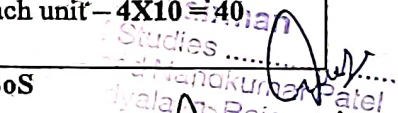
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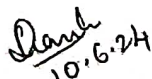

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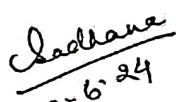

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)		Semester - II	Session: 2024-25
1	Course Code	MBSC-02 P	
2	Course Title	Lab. Course – MBSC-02	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ culture microorganisms and get the knowledge about their morphological features ➤ illustrate different staining procedures ➤ identify bacteria and protozoa from different samples ➤ get practice of identification of colonies on different culture media	
6	Credit Value	1 Credit	Credit = 30 Hours. Laboratory or Field learning/ Training
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)

Module	Topics (Course contents)	No. of Period
Lab./ Field Training/ Experiment contents of Course.	1. Isolation and characterization of bacteria by colony characteristics. 2. Growth on simple media – Nutrient agar and Nutrient broth 3. Growth on complex media – Blood agar, Chocolate agar, Macconkey's, and EMB agar. 4. Differential Staining Techniques: Gram staining and acid-fast staining 5. Special Staining Techniques: Negative staining and Endospore staining 6. Study of cytopathic effects of viruses using photographs. 7. Observation of protozoa from different samples.	30

Key Words Isolation, Identification, Staining Techniques, Cytopathic effects, Protozoa

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>

PART – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

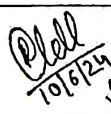
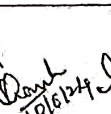
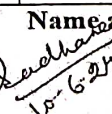
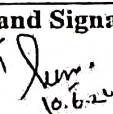
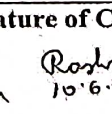
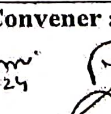
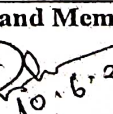
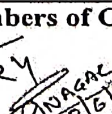
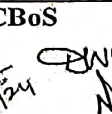
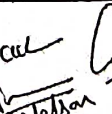
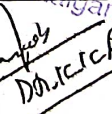
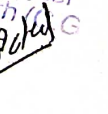
Maximum Marks: 50 Marks

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 course teacher as per lab/status

Name and Signature of Convener and Members of CBoS

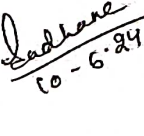
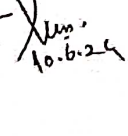
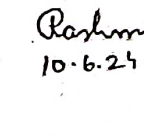
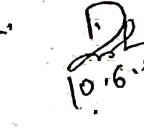
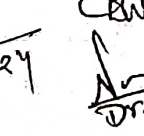
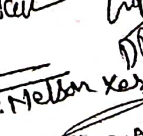
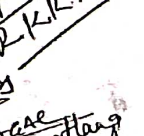
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Officer In-Charge (Academic)
Shahood Nandikumar Patel
Vishwavidyalaya, Raigarh (C.G.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)		Semester - I	Session: 2024-25
1	Course Code	MBGE- 01 T	
2	Course Title	Introductory Microbiology and Microbial techniques	
3	Course Type	Generic Elective (GE)	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ relate the development and scope of Microbiology ➤ illustrate the contributions made by prominent scientists including Indian Vedic Knowledge on microbiology ➤ demonstrate the nomenclature and characteristics of different types of microorganisms ➤ identify the basic techniques in microbiology ➤ explain the methods of microbial control	
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 (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	History and scope of microbiology – History, development and Scope of Microbiology, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Alexander Fleming and Edward Jenner, The Forgotten Past of Microbiology in Indian Vedic Knowledge.		12
II	Nomenclature and General features of microorganisms – Binomial nomenclature, principles of microbial classification, Major groups of microorganisms; General features and structure of bacteria, virus, fungi, algae and protozoa.		11
III	Microbial culture and staining techniques – Pure culture techniques: streaking, serial dilution and plating; types of culture media, cultivation of fungi and algae. Principle, procedure and applications of Simple staining, negative staining; Differential staining- Gram's staining, acid fast staining.		11
IV	Microbial control – Sterilization: Physical Agents - Heat: Boiling, Tyndallization, Steam under pressure (Autoclave), incineration, hot air Oven. Radiations: Ionizing and non-ionizing radiations. Filtration, Chemical agents: types, Disinfection, Antiseptic, Germicide, Sanitizer, Principle and application of Laminar airflow.		11
Key Words		History and scope, Nomenclature, Pure culture technique, Microbial control	

Name and Signature of Convener and Members of CBoS

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Officer-In-Charge (Academic)
 Shaheed Nandkumar Patel
 Vighwavidyalaya, Raigarh (C.O.)

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Microbiology: P. D. Sharma, Rastogi Publications.
2. A textbook of Microbiology: R. C. Dubey and Maheshwari, S Chand publications.
3. General Microbiology, Vol. II, C. B. Powar and Daginawala
4. Fundamentals of Microbiology and Immunology, Ajit Kr. Banerjee and Nirmalya Banerji, Central publication.

Reference Books:

1. Microbiology: Pelczar, MJ Chan ECS and Krieg NR, McGraw-Hill.
2. Microbiology: 5th Edition Prescott, M.J., Harley, J.P. and Klein, D.A. WCB Mc Graw Hill, New York.
3. Microbiology: An Introduction: Pearson Education Tortora, G.J., Funke, B.R. and Case, C.L., Singapore.
4. Fundamentals of Microbiology: VI Edition Alcomo, I.E., Jones and Bartlett Publishers. Sudbury. Massachusetts, (2001).

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

- <https://www.jsscacs.edu.in/sites/default/files/Department%20Files/History%20of%20Microbiology.pdf>
- <https://www.britannica.com/science/microbiology>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7810802/>
- <https://www.slideshare.net/HarinathaReddyA/methods-for-isolation-of-pure-culture>
- <https://microbenotes-com.webplgcache.com/doc/-s/microbenotes.com/sterilization-physical-and-chemical-methods/>

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

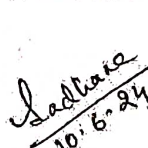
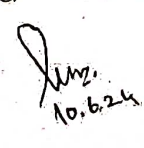
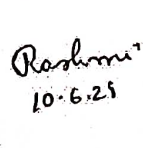
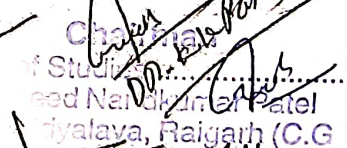
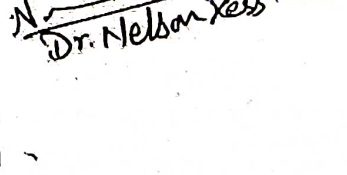
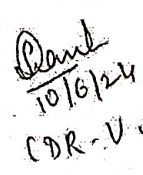
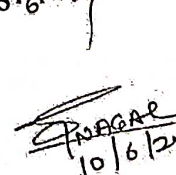
Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	

End Semester Exam (ESE):	Two Section – A & B
	Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks

Name and Signature of Convener and Members of CBoS

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Officer-in-Charge (Academic)
 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction

Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors) -		Semester I		Session: 2024-25
1	Course Code	MBGE- 01 P		
2	Course Title	Lab. Course - MBGE- 01		
3	Course Type	Laboratory Course		
4	Prerequisite (If Any)	As per Program		
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ define the basic laboratory practices and safety measures in microbiology laboratory ➤ explain the principle, working and applications of laboratory Instruments ➤ select the proper culture media for microbial growth ➤ identify different microorganisms in the laboratory		
6	Credit Value	1 Credit	Credit = 30 Hours. Laboratory or Field learning/ Training	
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)

Total No. of learning-Training/ Performance Periods: 30 Periods (30 Hours)		
Module	Topics (Course contents)	No. of Period
Lab./ Field Training/ Experiment contents of Course	1. Good Laboratory Practices and Bio-safety in Microbiology. 2. To study the principle and applications of autoclave, incubator, BOD incubator, hot air oven, laminar air flow, light microscope. 3. Preparation of culture media (liquid & solid), sterilization and assessment of sterility 4. Isolation of microorganisms from environment by pour plate, streak plate and spread plate technique. 5. Observation of microorganisms-fungi, yeasts and algae from natural habitats. 6. Observation of bacteria by Gram staining technique.	30

PART – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Experiments in microbiology, plant pathology and biotechnology; K R Aneja
2. Practical microbiology; R C Dubey and D K Maheshwari.

Online Resources:

- <https://www.youtube.com/watch?v=IIndcMyuEXs>
- <https://www.youtube.com/watch?v=CbMGr9wFV2w>

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
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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 course teacher as per lab. status

Name and Signature of Convener and Members of CBoS

Date 10/6/24 Place 10/6/24 Seal 10/6/24
 Officer-In-Charge (Name and Designation)
 Shahood Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

per lab. status

[Signature]
DR. K. R. Palod
Chairman
10/6/24

[Signature]
Dr. K. R. Palod
Chairman
10/6/24

of Studies.....
Dr. K. R. Palod
Malaya, Raigarh (C.G.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)		Semester - II	
		Session: 2024-25	
1	Course Code	MBGE-02 T	
2	Course Title	Bacteriology, Virology and Protozoology	
3	Course Type	Generic Elective (GE)	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ recall the ultrastructure of bacteria ➤ relate ecological distribution of microorganism and their significances for society ➤ illustrate the essential and current knowledge of bacteria ➤ identify virus, protozoa and archaebacteria with their special characteristics ➤ outline the beneficial & harmful behavior of viruses, bacteria, protozoan and other microbes	
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 (01 Hr. per period) - 45 Periods (45 Hours)			
UNIT	TOPIC (Course Contents)		No. of Period
I	Morphology and Ultra structure of Bacteria: Cell size, shape and arrangements. Composition, structure and function of cell membrane, cell wall of gram-positive, gram-negative bacteria, capsule, flagella, pili, ribosomes, inclusions, endospore, plasmids.		12
II	Eubacteria & Archaeobacteria: Gram negative- Characteristics of non-proteobacteria– <i>Deinococcus</i> , <i>Spirochetes</i> . Alpha proteobacteria- <i>Rhizobium</i> , <i>Agrobacterium</i> . Gamma proteo-bacteria- <i>Escherichia</i> , <i>Pseudomonas</i> . Gram positive- Characteristics of low G+C; <i>Bacillus</i> , <i>Clostridium</i> , <i>Staphylococcus</i> . High G+C: <i>Streptomyces</i> , <i>Frankia</i> . (General characteristics). Ecological significance and economic importance of Archaea: Methanogens, thermophiles (<i>Thermococcus</i> , <i>Pyrococcus</i>) and halophiles (halobacteria and halococcus).		11
III	Morphology, ultrastructure of viruses: General introduction, morphology and ultra- structure of viruses, capsid, envelopes. Types of Viral genome. Viral related forms -virions, viroids, virusoids, and prions. Salient features and life cycle of viruses: Bacteriophages (T4), Plant Virus (TMV), Animal Virus (Pox virus).		11
IV	Introduction to protozoa; Occurrence and classification of protozoa. Structure, reproduction, life cycle and diseases caused by important protozoans - <i>Entamoeba</i> , <i>Leishmania</i> , <i>Trypanosoma</i> and <i>Plasmodium</i>		11
Key Words		Bacteria, Archaea, Virus, Bacteriophage, Prions, Protozoan	

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Dr. Nelson Kers

Officer-In-Charge (Academic)
 Shaheed Nandikumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. General Microbiology; Vol I & II, Powar C.B. and Dagainawala H. I., Himalay Pub. House, Bombay.
2. A Text Book of Microbiology; Dubey & Maheshwari.
3. A Text Book of Microbiology; R. P. Singh.
4. Fundamentals of Microbiology and Immunology, Ajit Kr. Banerjee and Nirmalya Banerji, Central publication.
5. Parasitology; H.S. Singh and P. Rastogi, First Edition, Rastogi Publications.

Reference Books:

6. Prescott's Microbiology. Wiley J.M, Sherwood L M and Woolverton C J.
7. Microbiology. Pelczar M J, Chan E C S and Krieg N R.
8. General Microbiology. Stanier R Y, Ingraham J L, Wheelis M L, and Painter P R.
9. Microbiology: An Introduction. Tortora G J, Funke B R and Case C L.

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

- <https://www.ncbi.nlm.nih.gov/books/NBK8477/>
- <https://www.britannica.com/science/archaea>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7150055/>
- <https://nios.ac.in/media/documents/dmlt/Microbiology/Lesson-53.pdf>
- <http://ecoursesonline.iasri.res.in/Courses/Agricultural%20Microbiology/>

Part- D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	

End Semester Exam (ESE):

Two Section – A & B

Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks

Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks

Name and Signature of Convener and Members of CBOS

Sudhakar
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Suraj
10.6.24

Rashmi
10.6.24

P. D.
10.6.24

Dr. N. K. S.
10.6.24

Dr. R. K. S.
10.6.24

Dr. R. K. S.
10.6.24

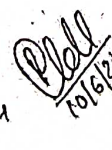
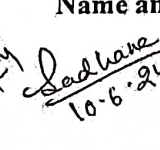
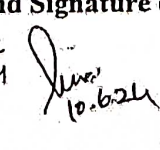
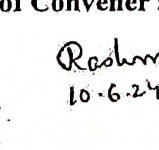
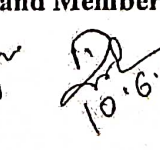
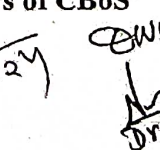
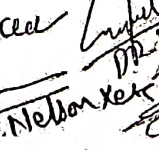
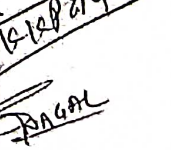
Dr. R. K. S.
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Officer-in-Charge (Academic)
Shaheed Nanakumar Patel
Vishwavidyalaya, Raigarh (C.G.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)		Semester - II	Session: 2024-25
1	Course Code	MBGE-02 P	
2	Course Title	Lab. Course - MBGE-02	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ culture microorganisms and get the knowledge about their morphological features ➤ illustrate different staining procedures ➤ identify bacteria and protozoa from different samples ➤ get practice of identification of colonies on different culture media	
6	Credit Value	1 Credit	Credit = 30 Hours. Laboratory or Field learning/ Training
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)			No. of Period
Module	Topics (Course contents)		
Lab./ Field Training/ Experiment contents of Course	1. Isolation and characterization of bacteria by colony characteristics. 2. Growth on simple media – Nutrient agar and Nutrient broth. 3. Growth on complex media – Blood agar, Chocolate agar, Macconkey's, and EMB agar. 4. Differential Staining Techniques: Gram staining and acid-fast staining 5. Special Staining Techniques: Negative staining and Endospore staining 6. Study of cytopathic effects of viruses using photographs. 7. Observation of protozoa from different samples.		30
Key Words	Isolation, Identification, Staining Techniques, Cytopathic effects, Protozoa		
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			
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 course teacher as per lab. status

Name and Signature of Convener and Members of CBoS

Officer-In-Charge (Academic)
 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Certificate/Diploma/Degree)		Semester - II/ IV/V/VI	Session: 2024-25
1	Course Code	MBSEC-01	
2	Course Title	Mushroom Cultivation	
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 – ➤ explain nutritional and medicinal values of mushroom ➤ relate the types of mushrooms and their spawn preparation ➤ examine the methods of cultivation and economic aspects ➤ attain expertise using different Agro-residues for cultivation of mushrooms ➤ observe post-harvest management of mushrooms	
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	Introduction and Life cycle: Classification and identification of edible and nonedible mushrooms; Nutritional and medicinal value of mushroom, Scope of mushroom cultivation. Taxonomic position and Life cycle of mushroom. Types of mushrooms; Button mushroom (<i>Agaricus biporus</i>), Milky mushroom (<i>Calocybe indica</i>), Oyster mushroom (<i>Pleurotus sajor kaju</i>) and paddy straw mushroom (<i>Volvariella volvacea</i>). (Observation). Principles and Requisites: Sterilization and disinfection of substrates, growth medium, isolation, spawn production and maintenance. (Observation) Techniques of Cultivation: Structure and construction of low-cost mushroom huts, layout of Traditional and Green house method. Maintenance of proper condition in mushroom huts, Composting, bed and polythene bag preparation, Spawning-casing-cropping. (Observation).	15
Lab./Field Training Contents	1.Preparation of laboratory Glassware (Chemical washing, cleaning and drying). 2.Basic information about autoclave, hot air oven, laminar air flow 3.Sterilization and sanitation of mushroom house, instruments etc. 4.Identification of edible and poisonous mushrooms. 5.Preparation of Mother Culture. Spawn- media preparation, Inoculation, and incubation. 6.Preparation of different types of bed for cultivation. 7.Cultivation of Mushroom using compost/ paddy straw/agricultural wastes..... 10.Harvesting and post-harvest management of crops. (Observation & Practice)	30
Key Words	Mushroom, Spawning, Compost, Harvesting	

Name and Signature of Convener and Members of CBoS

Paul
10/6/24

Shweta
10/6/24

Shweta
10/6/24

Rashmi
10-6-24

Shweta
10/6/24

Shweta
10/6/24

Shweta
10/6/24

Shweta
10/6/24

Officer-In-Charge (Academic)
Shahed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Nita Bhal. (2000). Hand book on Mushrooms. 2nded. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Tewari, S. C., Pankaj Kapoor, (1988). Mushroom Cultivation. Mittal Publication, New Delhi.
3. Biotechnology, V. Kumaresan.

Reference Books:

1. Stamets, Paul, and J.S. Chilton. 1983. The Mushroom Cultivator. Agarikon Press, Olympia, WA. 415 p.

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

- [https://nios.ac.in/media/documents/vocational/mushroom production \(revised\)\(618\)/Lesson-01.pdf](https://nios.ac.in/media/documents/vocational/mushroom%20production%20(revised)(618)/Lesson-01.pdf)
- [https://agriportal.cg.nic.in/horticulture/PDF/Download/Mushroom%20Project Part%201.pdf](https://agriportal.cg.nic.in/horticulture/PDF/Download/Mushroom%20Project%20Part%201.pdf)
- <http://nhb.gov.in/pdf/Cultivation.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

Name and Signature of Convener and Members of CBOS

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10-6-24

[Signature]
Dr. Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

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10/6/24

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10-6-24

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Dr. Suresh Kumar Nayak

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10/6/24

Officer in-Charge (Academic)
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

शहीद नंदकुमार पटेल विश्वविद्यालय, रायगढ़ (छ.ग.)

(छत्तीसगढ़ विश्वविद्यालय अधिनियम 1973 द्वारा स्थापित राजकीय विश्वविद्यालय)



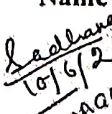
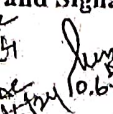
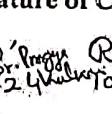
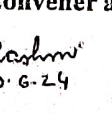
राष्ट्रीय शिक्षा नीति – 2020
के तहत तृतीय एवं चतुर्थ सेमेस्टर
नवीन पाठ्यक्रम
(सत्र 2025–26)

माइक्रोबायोलॉजी

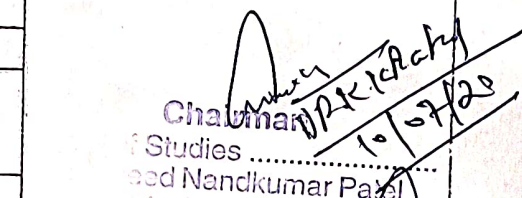
FOUR YEAR UNDERGRADUATE PROGRAM (NEP 2020)
PROGRAM: BACHELOR OF SCIENCE (2024-28)
DISCIPLINE: MICROBIOLOGY
Session: 2024-25

DSC- 01 to 08		DSE- 01 to 12		DGE- 01 to 02	
MBSC- 01 T	Introductory Microbiology and Microbial Techniques	MBSE- 01 T	Microbial Enzyme Technology	MBGE- 01 T	Introductory Microbiology and Microbial Techniques
MBSC- 01 P	Lab Course	MBSE- 01 P	Lab Course	MBGE- 01 P	Lab Course
MBSC- 02 T	Bacteriology, Virology and Protozoology	MBSE- 02 T	Industrial Microbiology	MBGE- 02	Bacteriology, Virology and Protozoology
MBSC- 02 P	Lab Course	MBSE- 02 P	Lab Course	MBGE- 02 P	Lab Course
MBSC- 03 T	Cell Biology and Biochemistry	MBSE- 03 T	Food and Dairy Microbiology		
MBSC- 03 P	Lab Course	MBSE- 03 P	Lab Course		
MBSC- 04 T	Bioinstrumentation and Biostatistics	MBSE- 04 T	Microbial Biotechnology		
MBSC- 04 P	Lab Course	MBSE- 04 P	Lab Course		
MBSC- 05 T	Microbial Physiology and Metabolism	MBSE- 05 T	Medical Microbiology		
MBSC- 05 P	Lab Course	MBSE- 05 P	Lab Course	SEC	
MBSC- 06 T	Molecular Biology and Microbial Genetics	MBSE- 06 T	Mycology and Plant Pathology	MBSEC- 01	Mushroom Cultivation
MBSC- 06 P	Lab Course	MBSE- 06 P	Lab Course		
MBSC- 07 T	Immunology	MBSE- 07 T	Agriculture and Veterinary Microbiology		
MBSC- 07 P	Lab Course	MBSE- 07 P	Lab Course	VAC	
MBSC- 08 T	Environmental Microbiology and Microbial Ecology	MBSE- 08 T	Fermentation Technology	MBVAC- 01	Microbes and Human Health
MBSC- 08 P	Lab Course	MBSE- 08 P	Lab Course		
		MBSE- 09 T	Clinical Microbiology		
		MBSE- 09 P	Lab Course		
		MBSE- 10 T	Pharmaceutical Microbiology		
		MBSE- 10 P	Lab Course		
		MBSE- 11 T	Metagenomics, Basic Computer and Bioinformatics		
		MBSE- 11 P	Lab Course		
		MBSE- 12 T	Biosafety and Intellectual Property Rights		
		MBSE- 12 P	Lab Course		

Name and Signature of Convener and Members of CBOS

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 10/6/24

 10/6/24
 Chairman
 Studies
 Dr. Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester - III	Session: 2024-25
1	Course Code	MBSC-03 T	
2	Course Title	Cell Biology and Biochemistry	
3	Course Type	DSC	
4	Prerequisite (If Any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the student will able to – ➤ illustrate the structural organization of eukaryotic and prokaryotic cells ➤ interpret cell division ➤ classify the biomolecules and compare their characteristics ➤ relate structure and functions of nucleic acids ➤ interpret the mechanism of enzyme action	
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 (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	History of Cell Biology: Contribution of Indian Cell biologists and Biochemists: Ramakrishnan Nagaraj, Joyoti Basu, Veena Krishnaji Parnaik. Cell Structure: Prokaryotic and Eukaryotic cell, cellular organelles; Plasma membrane, Mitochondria, Golgi body, Nucleus, Ribosome, Lysosome, Endoplasmic reticulum. Cell division.		12
II	Carbohydrate: Structure, properties & classification of carbohydrates; Monosaccharides, Disaccharides and Polysaccharides. Proteins: Structure, properties & classification of amino acids. Structure & Classification of Protein- Primary, secondary; salient of α helix, β sheet, tertiary and quaternary.		11
III	Lipid: Structure, properties and classification of lipids. Nucleic acids: Structure of purine and pyrimidine bases, nucleoside and nucleotide; DNA structure and types: A, B, Z form; RNA - Structure, types and functions.		11
IV	Enzymes: Classification of enzymes, mechanisms of enzyme action; Lock and key hypothesis, induced fit hypothesis. Active site and activation energy, coenzyme, Isoenzyme, metal cofactors.; Allosteric enzymes. Enzyme inhibition; competitive, noncompetitive, uncompetitive.		11
Key Words		Cell structure, Carbohydrates, Protein, Lipids, Enzymes, DNA, RNA	

Name and Signature of Convener and Members of CBoS

Plab
10/6/24

Sumi
10.6.24

Rashmi
10.6.24

Dr. Nandkumar Patol
10.6.24

Dr. Nelson
10.6.24

Dr. Nagar
10/6/24

Dr. Nandkumar Patol
10/6/24

Dr. Nandkumar Patol
10.6.24

Officer In-Charge (Academic)
 Shashid Nandkumar Patol
 Vishwavidyalaya, Raigarh (C.O.)

अध्ययन मंडल
 शहीद नंदकुमार पटेल
 विश्वविद्यालय, रायगढ़ (उ.ग.)
 10.07.2025

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Cell and molecular biology; P. K. Gupta
2. Cell biology; C B Pawar
3. Biochemistry; U Satyanarayan and U Chakrapani
4. Fundamentals of Biochemistry; J L Jain, Sanjay Jain and Nitin Jain

Reference Books:

1. Lehninger's principles of Biochemistry; M.M. Cox, D. L. Nelson and W H Freeman,
2. Quick Review Biochemistry; Arun Kumar Singhal, AITBS Pub. India

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

- <https://www.khanacademy.org/science/biology/structure-of-a-cell>
- <https://microbenotes-com.webpkgcache.com/doc/-/s/microbenotes.com/carbohydrates-classification-structure-functions/>
- <https://microbenotes.com/carbohydrates-structure-properties-classification-and-functions/>
- <https://www.onlinebiologynotes.com/classification-of-protein-on-the-basis-of-structure-composition-and-function/>

Part- D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10 Total Marks – 30	
End Semester Exam (ESE):	Two Section – A & B Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type– 5X4= 20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks	

Name and Signature of Convener and Members of CBoS

Adhane
10-6-24

10.6.24

Rashmi
10.6.24

10.6.24

BoS

Anwar Arif
Chairman

Dr. N. K. Patel
Secretary

Dr. Nelson K...
Member

Danh
10/6/24

Plld
10/6/24
Dr. Rachans
Chomally

~~9 NAGAR~~
10/6/24

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10.07.2025

अध्ययन मंडल
शहीद नंदकुमार पटेल
विश्वविद्यालय, रायगढ़ (छ.ग.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction		
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester III
		Session: 2024-25
1	Course Code	MBSC - 03 P
2	Course Title	Lab. Course – MBSC-03
3	Course Type	Laboratory Course
4	Prerequisite (If Any)	As per program
5	Course Learning Outcomes (CLO)	At the end of this course, students will be able to – > identify the various stages of cell division > quantify the carbohydrates and protein in any sample > determine the Vmax and Km value of enzymes > analyse the effect of environmental factors on enzymic activity.
6	Credit Value	1 Credit
7	Total Marks	Credit = 30 Hours, Laboratory or Field learning/ Training
		Max. Marks: 50
		Min. Passing marks: 20

PART – B: Content of the Course

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

Module	Topics (Course contents)	No. of Period
Lab./ Field Training/ Experiment contents of Course	1. Identification of different stages of mitosis in onion root tips. 2. Staining and visualisation of mitochondria by Janus green stain. 3. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars. 4. Qualitative tests for lipids and proteins. 5. Quantitative estimation of proteins by Folin Lowry method. 6. Study of protein secondary and tertiary structures with the help of models. 7. Study of enzyme kinetics – calculation of Vmax, Km values. 8. Study effect of temperature, pH and heavy metals on enzyme activity.	30

PART – C: Learning Resources

Text Books, Reference Books and Others

Books Recommended:

1. Practical microbiology: R C Dubey and D K Maheshwari.
2. An introduction to practical biochemistry: David T Plummer.
3. Basic concepts in clinical Biochemistry: A practical guide: Vijay Kumar, Kiran Dip Gill

Online Resources:

- <https://www.youtube.com/watch?v=hqbt7wtzrs>
- <https://www.youtube.com/watch?v=QacQmS3aaTI>

PART – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

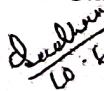
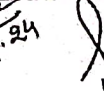
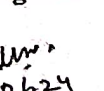
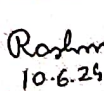
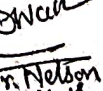
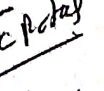
Maximum Marks: 50 Marks

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 Viva-voce (based on principle/ technology) – 05 Marks	Managed by course teacher as per lab. status

Name and Signature of Convener and Members of CBoS

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अध्यक्ष, मंडल
 शहीद बंदुकी पटेल
 निवृत्ति, गणतंत्र (उ.ग.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester - IV	Session: 2024-25
1	Course Code	MBSC – 04 T	
2	Course Title	Bioinstrumentation and Biostatistics	
3	Course Type	DSC	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course the student will able to – ➤ recall the principle of microscopy and compare the types of microscopes for specialized viewing ➤ identify the basic analytical instruments for performing microbiological manipulations ➤ relate the techniques used for processing the microbial samples ➤ recognize the basics of radiobiology and its applications ➤ illustrate basic concept of Biostatistics and develop their application	
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 (01 Hr. per period) - 45 Periods (45 Hours)			
UNIT	TOPIC (Course Contents)		No. of Periods
I	Microscopy: Principle, Mechanism and application of different types of microscopes- Bright field, Dark field and Phase Contrast microscope; Fluorescence microscopy, Confocal microscopy, Scanning and Transmission Electron Microscopy (SEM & TEM). Micrometry pH metry: Principle, Types of electrodes, factors affecting pH measurement, application of pH meter.		12
II	Centrifugation: Principle and Types of Centrifugal Machines, Analytical, Preparatory, differential, Rate zonal and ultracentrifugation and their applications. Chromatography: Principle and techniques with applications of Partition, ion-exchange, exclusion and affinity chromatography. Electrophoresis: Principle of Agarose and Polyacrylamide Gel Electrophoresis, Components, working and applications.		11
III	Spectrophotometry: Electromagnetic spectrum, Basic principles and Law of absorption; principle, mechanism and applications of Visible and UV spectrophotometer. Radiobiology: Radioactivity, forms of radioactive emissions, biological effects of radiation exposure, characters of radioisotopes and their applications, Principles and methods of radioactive detection, GM counter, Scintillation counter and Autoradiography.		11
IV	Biostatistics: Definitions, Basic concepts, sample and population, Measurement scales, Statistical inference and parameters, methods of sampling, Classification of Data, Tabulation, Frequency distribution, diagrammatic and Graphical presentation of data, Data analysis- Central Tendencies (Mean, Median and Mode), Deviation (Variance, SD and SE).		11
Key Words		Microscope, Centrifuge, pH meter, Chromatography, Electrophoresis, Spectrophotometer, Radiobiology, Biostatistics	

Name and Signature of Convener and Members of CBoS

Santhosh
10.6.24

Rashmi
10.6.24

Dr. Nelson
10.6.24

Danil
10/6/24

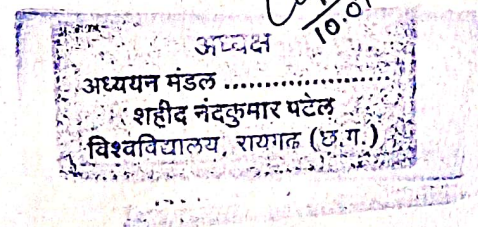
Prabha
10/6/24

Dr. Nelson
10/6/24

Dr. Nelson
10.6.24

Dr. Nelson
10.6.24

Dr. Nelson
10.07.2025



Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Biophysical Chemistry, Principles and Techniques – A. Upadhyay, K. Upadhyay and N. Nath, Himalaya Pub.
2. Biotechniques: Theory and Practice – S.V.S. Rana, Rastogi Pub.
3. Analytical Chemistry – G. Chatwal and Anand, Himalaya Pub.
4. Statistical Methods; S.P. Gupta
5. Fundamentals of Biostatistics; Khan and Khanum, Ukaaz Publications, Hyderabad.

Reference Books:

1. Fundamental of light Microscopy & Electron Imaging. 1st Edition. Murphy D.B.
2. Fundamentals and techniques of biophysics and molecular biology (2016) Pranav Kumar.
3. Techniques and methods in biology PHI publication (2011) K L Ghatak.
4. Biostatistics; Sunder Rao

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](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): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	

End Semester Exam (ESE):	Two Section – A & B
	Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks
	Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks

Name and Signature of Convener and Members of CBoS

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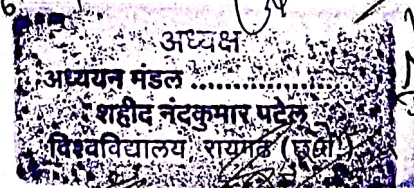
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction

Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester IV	Session: 2024-25
1	Course Code	MBSC - 04 P	
2	Course Title	Lab. Course – MBSC-04	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course the student will able to – ➤ identify microorganisms on the basis of microscopic features ➤ relate common analytical techniques in microbiology ➤ infer the concept of Biostatistics. ➤ explain the significance of central tendencies	
6	Credit Value	1 Credit	Credit = 30 Hours. Laboratory or Field learning/ Training
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)

Module	Topics (Course contents)	No. of Period
Lab./ Field Training/ Experiment contents of Course	1. Study of different parts of microscope. 2. Determination of λ max of given coloured solution and Confirmation of Beer's law. 3. Separation of components of a given mixture using a laboratory scale centrifuge. 4. Separation of Ink components/ chlorophyll / Amino acids by Paper Chromatography. 5. Separation of Amino acids by Thin Layer Chromatography. 6. Demonstration of Gel Filtration Chromatography. 7. Measurement of pH of water and soil samples and maintenance of required pH. 8. Demonstration of SDS-PAGE and Submarine Gel Electrophoresis. 9. Preparation of Tables, Bar diagrams and Histograms from given data. 10. Calculation of Mean, Median and Mode from grouped and ungrouped data.	30
Key Words	Microscopy, Spectrophotometry, Chromatography, Centrifugation, Electrophoresis, Presentation of Data, Calculation of Central Tendencies	

PART – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. An Introduction to practical Biochemistry; McGraw Hill Publication 1987. D.T Plummer.
2. Principles and Techniques in Practical Biochemistry; Wilson & Walker.
3. Biotechniques: Theory and Practice; S.V.S. Rana, Rastogi Pub.
4. 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:

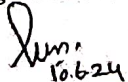
Maximum Marks: 50 Marks

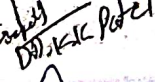
Continuous Internal Assessment (CIA): 15 Marks

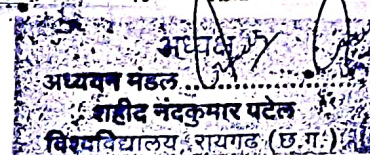
End Semester Exam (ESE): 35 Marks

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 course teacher as per lab. status

Name and Signature of Convener and Members of CBOS



FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction

Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester - III	Session: 2024-25
1	Course Code	MBSE-01 T	
2	Course Title	Microbial Enzyme Technology	
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, the students will be able to – ➤ learn the fundamentals of enzymes, enzyme-action and metabolic reactions ➤ explain the mechanism of enzyme action ➤ relate enzyme modifications ➤ identify the applications of enzymes in various fields ➤ attain knowledge about various biochemical 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 (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	Basic concept of enzymes: Nomenclature, classification, methods for determination of enzyme activity. Enzyme kinetics: Michaelis-Menten equation, effect of pH, substrate concentration, temperature and inhibitors. Iso-enzymes and allosteric enzymes. Enzyme inhibition-competitive and non-competitive inhibition.	12
II	Mechanism of enzyme action: Action of ribonuclease, chymotrypsin and trypsin. Coenzyme catalysis. Mechanism of action of thiamine pyrophosphate enzyme. Control and regulation of enzyme activity and feedback mechanisms. Metabolic compartmentalization in relation to enzyme, enzymes and secondary metabolites.	11
III	Enzyme engineering & applications of microbial enzymes: Chemical modification and site-directed mutagenesis structure & function relationship of industrially important enzymes. Microbial enzymes in textile, leather, wood industries and detergents.	11
IV	Biochemical techniques: Determination of molecular weights, purity, General methods of extraction-salting out, use of organic solvents; Purification; analysis of proteins - mass determination- GC-MS; structure determination-X-ray diffraction.	11
Key Words	Enzyme, Enzyme action, Enzyme inhibition, Enzyme engineering, Biochemical techniques,	

Name and Signature of Convener and Members of CBoS

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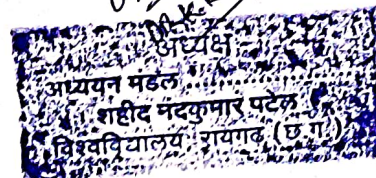
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Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. A Text Book of Microbiology: R. C. Dubey & D. K. Maheshwari
2. A text book of Industrial Microbiology, 2nd edition: Panima Publishing Company, New Delhi.
3. Industrial Microbiology: Patel A H. (1996). 1st edition. MacMillan India Limited Publishing Company Ltd. New Delhi, India.
4. Fundamentals of Biochemistry; Dr. J.L. Jain, Dr. Sanjay Jain, Nitin Jain, S. Chand Publication

Reference Books:

1. Principles of Biochemistry and molecular biology: Wilson & Walker
2. Lehninger Principles of Biochemistry, 8th Edition, David L. Nelson, Micheal M. Cox
3. Biotechnology: Crueger Wand Crueger A. (2000).

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

- <https://www.britannica.com/science/enzyme>
- https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBB2204.pdf
- <https://www.khanacademy.org/science/ap-biology/cellular-energetics/environmental-impacts-on-enzyme-function/a/basics-of-enzyme-kinetics-graphs>
- <https://microbeonline.com/maldi-tof-ms-principle-applications-microbiology/>
- <https://www.technologynetworks.com/analysis/articles/gc-ms-principle-instrument-and-analyses-and-gc-msms-362513>

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	

End Semester Exam (ESE):	Two Section – A & B
	Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4 = 20 Marks
	Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks

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Dr. Roshni Choudhary

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अध्ययन मंडल
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विश्वविद्यालय, रायगढ़ (छ.ग.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester - III	Session: 2024-25
1	Course Code	MBSE-01 P	
2	Course Title	Lab. Course - MBSE-01	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ show the enzyme production by microorganisms ➤ demonstrate the actions of different enzymes ➤ determine various parameters of enzyme action ➤ examine various biochemical techniques used for enzyme technology	
6	Credit Value	1 Credit	Credit = 30 Hours. Laboratory or Field learning/ Training
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)

Total No. of learning- Training/ Performance Periods: 30 Periods (30 Hours)		
Module	Topics (Course contents)	No. of Period
Lab/ Field Training/ Experiment contents of Course	1. Screening of amylase producing microorganisms. 2. Demonstrations of enzyme activity: Phosphatase and Catalase 3. Determination of kinetic constant of enzyme: Amylase activity, V_{max} . Km. 4. Effect of pH and temperature on amylase activity. 5. Effect of inhibitors on amylase activity. 6. Effect of UV absorption on proteins.	30
Key Words	Enzyme, Enzyme activity, Enzyme inhibition, Biochemical techniques	

PART – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Text Books Recommended:**
1. Laboratory Manual of Microbiology and Biotechnology. By Aneja K. R
 2. Practical Microbiology, R. C. Dubey and D. K. Maheshwari.
 3. Laboratory Manual in Microbiology. By P. Gunasekaran.

Online Resources:

- Online Resources:**
- <https://books.google.co.in/books?id=Wh9OTbjcsfUC&printsec=age&q&f=false>
 - https://books.google.co.in/books/about/Practical_Microbiology.html?id=Wh9OTbjcsfUC&redir_esc=y

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

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 course teacher as per lab. status

Name and Signature of Convener and Members of CBoS

Name and Signature
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Rashmi
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 Dr. Nelbank

अध्ययन मंडल
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction

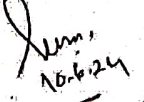
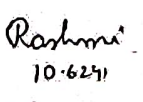
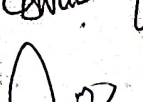
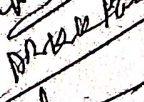
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester - IV	Session: 2024-25
1	Course Code	MBSE-02 T	
2	Course Title	Industrial Microbiology	
3	Course Type	Discipline Specific Elective (DSE)	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ define the role of microorganism in industry ➤ explain the processing of the best microbial strains for the industry ➤ outline the fundamentals of fermenters and fermentation processes ➤ relate metabolic pathways for industrial products ➤ identify the production of various industrially important products	
6	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation.
7	Total Marks	Max. Marks: 100	Minimum Passing marks: 40

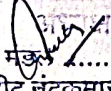
PART – B: Content of the Course

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

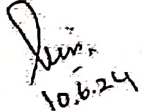
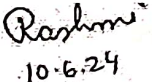
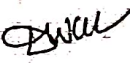
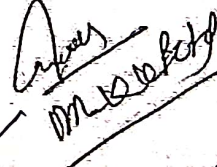
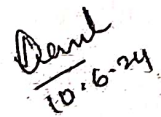
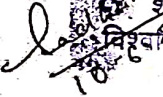
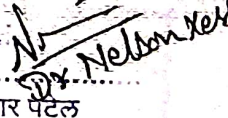
Unit	Topics (Course contents)	No. of Period
I	Multidisciplinary nature of Industrial microbiology: Introduction, brief History, ancient Indian perspective, important characteristics of industrially useful microorganisms. Upstream and Down-stream processing: Detection and assay of the product, Recovery and Purification, storage and packaging methods.	12
II	Scale up, Screening and Strain Development Strategies: Industrial sterilization, Isolation, preservation and maintenance of industrial strains. Production Media and Raw materials, Fermenter design. Types of fermentation: Aerobic and anaerobic Batch, fed-batch and Continuous fermentation.	11
III	Metabolic pathways: Industrial production of citric acid, acetic acid, Lactic acid, Glutamic acid. Vaccines and Hormones: Hepatitis vaccine, Rabies vaccine, insulin.	11
IV	Production of industrial fermentation products: Fermented food and beverages, Ethanol, Amylases, Penicillin, Single Cell Protein, Biofertilizers and Biopesticides	11
Key Words	Scale up, Fermenter, Fermentation, Downstream processing, Metabolic pathways, Fermented food	

Name and Signature of Convener and Members of CBoS

 Rashmi
 Dr. Nelson
 Dr. Nelson
 Dr. Nelson
 Dr. Nelson
 Dr. Nelson
 Dr. Nelson


 अध्यक्ष मंडल
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 विश्वविद्यालय, रायगढ़ (छ.ग.)

Name and Signature of Convener and Members of CBOS

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अध्ययन मंडल
श्रीद नंदकुमार पेटेल
विश्वविद्यालय, अहमदाबाद (छ.प्र.)



FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester IV	Session: 2024-25
1	Course Code	MBSE-02 P	
2	Course Title	Lab. Course - MBSE-02	
3	Course Type	Laboratory course	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ recall Laboratory discipline, instrumentation and techniques involved in industrial microbiology ➤ develop skill to culture and identify industrially important microbes ➤ relate about design of Fermenter ➤ experiment with the whole steps of Fermentation	
6	Credit Value	1 Credit	Credit = 30 Hours. Laboratory or Field learning/ Training
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)

Module	Topics (Course contents)	No. of Period
Lab./ Field Training/ Experiment contents of Course	1. Study of Bioreactor used in large scale production. 2. Isolation and characterization of Industrial microorganisms. 3. Isolation of antibiotic producing microorganisms from soil. 4. Demonstration of production of Amylase/ Protease/ Cellulase by microorganisms. 5. Demonstration of Production of lipase by microorganisms. 6. Production of ethanol by Yeast. 7. Production of Citric acid by <i>Aspergillus niger</i> .	30
Key Words	Fermenter, Bioreactor, Industrial Microorganisms, Production, Preservation techniques	

PART – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Practical Microbiology: Dubey, R.C. and Maheshwari, D.K. 2012., S. Chand & Company, Pvt. Ltd.
2. Experiments in Microbiology, Pathology and Tissue Culture: Aneja, K.R. 1993., Vishwa Prakashan.

Online Resources:

- <http://www.onlinelabs.in>
- <http://www.vlab.co.in>
- <http://asm.org/articles/2020/december/virtual-resources-to-teach-microbiology-techniques>
- <http://www.vlab.amrita.edu>

PART – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

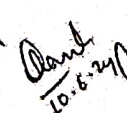
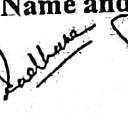
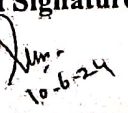
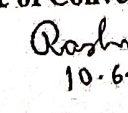
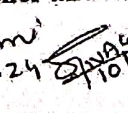
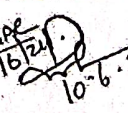
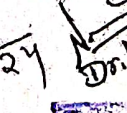
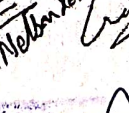
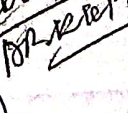
Maximum Marks: 50 Marks

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 course teacher as per lab. status

Name and Signature of Convener and Members of CBoS

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अध्ययन मंडल
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 विश्वविद्यालय, रायपुर (C.G.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Certificate/Diploma/Degree)		Semester - II/ IV/V/VI	Session: 2024-25
1	Course Code	MBSEC-01	
2	Course Title	Mushroom Cultivation	
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 – > explain nutritional and medicinal values of mushroom. > relate the types of mushrooms and their spawn preparation. > examine the methods of cultivation and economic aspects > attain expertise using different Agro-residues for cultivation of mushrooms > observe post-harvest management of mushrooms	
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	Introduction and Life cycle: Classification and identification of edible and nonedible mushrooms. Nutritional and medicinal value of mushroom, Scope of mushroom cultivation. Taxonomic position and Life cycle of mushroom. Types of mushrooms; Button mushroom (<i>Agaricus biporus</i>), Milky mushroom (<i>Calocybe indica</i>), Oyster mushroom (<i>Pleurotus sajor kaju</i>) and paddy straw mushroom (<i>Volvariella volvacea</i>). (Observation). Principles and Requisites: Sterilization and disinfection of substrates, growth medium, isolation, spawn production and maintenance. (Observation) Techniques of Cultivation: Structure and construction of low-cost mushroom huts, layout of Traditional and Green house method. Maintenance of proper condition in mushroom huts, Composting, bed and polythene bag preparation, Spawning-casing-cropping. (Observation).		15
Lab./Field Training Contents	1.Preparation of laboratory Glassware (Chemical washing, cleaning and drying). 2.Basic information about autoclave, hot air oven, laminar air flow 3.Sterilization and sanitation of mushroom house, instruments etc. 4.Identification of edible and poisonous mushrooms. 5.Preparation of Mother Culture. Spawn- media preparation, Inoculation, and incubation. 6.Preparation of different types of bed for cultivation. 7.Cultivation of Mushroom using compost/ paddy straw/agricultural wastes..... 10.Harvesting and post-harvest management of crops. (Observation & Practice)		30
Key Words	Mushroom, Spawning, Compost, Harvesting		

Name and Signature of Convener and Members of CBoS

Dr. Ashwini
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Dr. Anurag
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Dr. Roshmi
10.6.24

Dr. Roshmi
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Dr. Anurag
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Dr. Anurag
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Dr. Anurag
10.6.24

Officer-In-Charge (Academic)
 Shaheed Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Nita Bhal. (2000). Hand book on Mushrooms. 2nded. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Tewari, S. C., Pankaj Kapoor, (1988). Mushroom Cultivation. Mittal Publication, New Delhi.
3. Biotechnology, V. Kumaresan.

Reference Books:

1. Stamets, Paul, and J.S. Chilton. 1983. The Mushroom Cultivator. Agarikon Press, Olympia, WA. 415 p.

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

- [https://nios.ac.in/media/documents/vocational/mushroom_production_\(revised\)\(618\)/Lesson-01.pdf](https://nios.ac.in/media/documents/vocational/mushroom_production_(revised)(618)/Lesson-01.pdf)
- https://agriportal.cg.nic.in/horticulture/PDF/Download/Mushroom%20Project_Part%201.pdf
- <http://nhb.gov.in/pdf/Cultivation.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
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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
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Name and Signature of Convener and Members of CBoS

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Shaheed Nandkumar Patel
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Dr. Nelson

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Dr. Swetlana Nayal

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Officer-In-Charge (Academic)
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

PART – A: Introduction		
Program: Bachelor in Life Science (Diploma/Degree)		Semester - III/IV
		Session: 2024-25
1	Course Code	MBVAC-01
2	Course Title	Microbes and Human Health
3	Course Type	Value Added Course (VAC)
4	Prerequisite (If Any)	As per Program
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ define the basic concept of Infection and disease ➤ explain various serological tests ➤ illustrate the basic knowledge of Immune status of human body ➤ identify various infectious diseases
6	Credit Value	02 Credits Credit = 15 Hours - Learning & Observation
7	Total Marks	Max. Marks: 50 Minimum Pass marks: 20

PART – B: Content of the Course

Total No. of Teaching-Learning Periods: (01 Hr. per Period) - 30 Periods (30 Hours)

Unit	Topics (Course contents)	No. of Periods
I	Infection & Disease: Difference between infection and disease, Important terminologies along with suitable examples; primary infection, secondary infection, contagious infection, nosocomial infections, clinical infection, subclinical infection, zoonoses, vector borne infection. Epidemic, endemic and pandemic diseases.	08
II	Routes of entry and transmission of disease: Portal of entry, Portal of exit, Reservoir, susceptible host. Direct contact, indirect contact, Airborne, vector borne, blood borne, non-contact vehicle transmission. Exposure, risk and standard precautions, expanded precautions. Control of routes of transmission.	08
III	Serological reactions: Basic concept of serological reactions, blood cell counting, Agglutination, precipitation. Blood group determination, Widal test, VDRL test. Total RBC count, Total leucocyte count, Platelet count, Differential count, Estimation of haemoglobin.	07
IV	Viral and Bacterial infection: Common water borne infections, air borne infections; their causes, sign & symptoms, pathogenesis, diagnosis, treatment and prevention.	07

Key Words Infection, Disease, Virulence, Pathogenesis

Name and Signature of Convener and Members of CBoS

Dr. Ank
10/6/24

Dr. P. S. Nag
10/6/24

Dr. S. S. Nag
10.6.24

Rashmi
10-6-24

Dr. P. S. Nag
10.6.24

Dr. P. S. Nag

Dr. P. S. Nag

Dr. P. S. Nag

Dr. P. S. Nag

Officer-in-Charge (Academic)
Shahood Nandlani Patel
Vishwavidyalaya, Raigarh (C.G.)

PART – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. A Text Book of Microbiology; Dubey & Maheshwari.
2. General Microbiology; Vol I & II, Powar C.B. and Dagainawala H.I., Himalayn Pub. House, Bombay.
3. Text book of Microbiology; Ananthanarayan R. and Paniker C.K.J. (2009), 8th edition, University Press Publication
4. A Text Book of Microbiology; P. Chakraborty, 3rd Edn, New Central book Agency (P) Ltd, Kolkata, India 2005.

Reference Books:

1. Preventive and Social Medicine, Park and Park

- https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBMA1302.pdf
- <https://www.news-medical.net/health/Modes-of-Transmission.aspx>
- <https://courses.lumenlearning.com/suny-microbiology/chapter/how-pathogens-cause-disease/>

PART – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

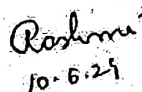
End Semester Exam (ESE): 35 Marks

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
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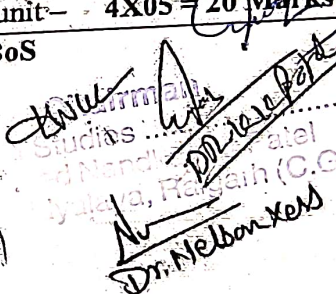
End Semester Exam (ESE):	Two Section – A & B Section A: Q1. Objective 05 X 1 = 05 Mark; Q2. Short answer type – 5X2 = 10 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X05 = 20 Marks
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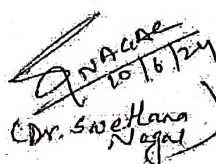
Name and Signature of Convener and Members of CBoS

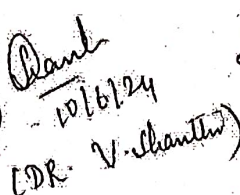

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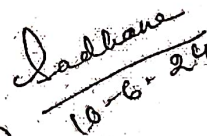

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Officer-In-Charge (Examination)
Shaheed Nanakumar Patel
Vishwavidyalaya, Raigarh (C.G.)

शहीद नंदकुमार पटेल विश्वविद्यालय, रायगढ़ (छ.ग.)

(छत्तीसगढ़ विश्वविद्यालय अधिनियम 1973 द्वारा स्थापित राजकीय विश्वविद्यालय)



राष्ट्रीय शिक्षा नीति – 2020

के तहत V एवं VI सेमेस्टर

नवीन पाठ्यक्रम

(सत्र 2026–27)

माइक्रोबायोलॉजी

FOUR YEAR UNDERGRADUATE PROGRAM (NEP 2020)
PROGRAM: BACHELOR OF SCIENCE (2024-28)
DISCIPLINE: MICROBIOLOGY
Session: 2024-25

DSC- 01 to 08		DSE- 01 to 12		DGE- 01 to 02	
MBSC- 01 T	Introductory Microbiology and Microbial Techniques	MBSE- 01 T	Microbial Enzyme Technology	MBGE- 01 T	Introductory Microbiology and Microbial Techniques
MBSC- 01 P	Lab Course	MBSE- 01 P	Lab Course	MBGE- 01 P	Lab Course
MBSC- 02 T	Bacteriology, Virology and Protozoology	MBSE- 02 T	Industrial Microbiology	MBGE- 02	Bacteriology, Virology and Protozoology
MBSC- 02 P	Lab Course	MBSE- 02 P	Lab Course	MBGE- 02 P	Lab Course
MBSC- 03 T	Cell Biology and Biochemistry	MBSE- 03 T	Food and Dairy Microbiology		
MBSC- 03 P	Lab Course	MBSE- 03 P	Lab Course		
MBSC- 04 T	Bioinstrumentation and Biostatistics	MBSE- 04 T	Microbial Biotechnology		
MBSC- 04 P	Lab Course	MBSE- 04 P	Lab Course		
MBSC- 05 T	Microbial Physiology and Metabolism	MBSE- 05 T	Medical Microbiology		
MBSC- 05 P	Lab Course	MBSE- 05 P	Lab Course	SEC	
MBSC- 06 T	Molecular Biology and Microbial Genetics	MBSE- 06 T	Mycology and Plant Pathology	MBSEC- 01	Mushroom Cultivation
MBSC- 06 P	Lab Course	MBSE- 06 P	Lab Course		
MBSC- 07 T	Immunology	MBSE- 07 T	Agriculture and Veterinary Microbiology		
MBSC- 07 P	Lab Course	MBSE- 07 P	Lab Course	VAC	
MBSC- 08 T	Environmental Microbiology and Microbial Ecology	MBSE- 08 T	Fermentation Technology	MBVAC- 01	Microbes and Human Health
MBSC- 08 P	Lab Course	MBSE- 08 P	Lab Course		
		MBSE- 09 T	Clinical Microbiology		
		MBSE- 09 P	Lab Course		
		MBSE- 10 T	Pharmaceutical Microbiology		
		MBSE- 10 P	Lab Course		
		MBSE- 11 T	Metagenomics, Basic Computer and Bioinformatics		
		MBSE- 11 P	Lab Course		
		MBSE- 12 T	Biosafety and Intellectual Property Rights		
		MBSE- 12 P	Lab Course		

23/06/26
DR. KRISHNA KUMAR PATEL
 ASSISTANT PROFESSOR
 DEPARTMENT OF MICROBIOLOGY
 GOVT. TOL. P.G. COLLEGE JALIGIR (C.G.)
 PIN-495668, MOB. 94061-13245

10/07/20
Dr. R.K. Patel
 Studies
 Dr. R.K. Patel

Name and Signature of Convener and Members of CBoS

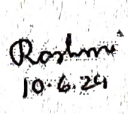
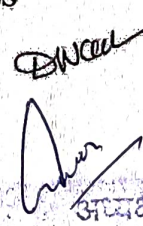
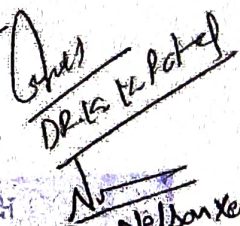
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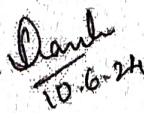
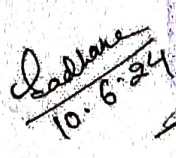
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester - V	Session: 2024-25
1	Course Code	MBSC – 05 T	
2	Course Title	Microbial Physiology and Metabolism	
3	Course Type	DSC	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcome (CLO)	At the end of this course the student will able to – ➤ explain the growth characteristics of the microorganisms ➤ outline bacterial photosynthesis ➤ relate the translocation of metabolic products ➤ examine types of carbohydrate metabolism ➤ summarize lipid and amino acid metabolism	
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 (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Microbial Growth: Definition, Generation time, Phases of growth curve, measurement of microbial growth, Batch culture, Continuous culture, synchronous growth, diauxic growth curve. Factors affecting the growth of microbes, Nutritional types of bacteria.		12
II	Bacterial photosynthesis: Photosynthetic pigments- bacteroid chlorophyll, carotenoids, bacteriorhodopsin and phycobilins. Photosynthetic bacteria- purple sulphur bacteria, purple non- sulphur bacteria, green sulphur bacteria & Green non-sulphur bacteria, heliobacteria Membrane transport: Passive and facilitated diffusion. active transport, concept of uniport, symport and antiport Group translocation.		11
III	Carbohydrate metabolism: Glycolysis, TCA cycle, ED, Pentose phosphate pathway. Electron transport chain: components of ETC, Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation. Glycogenolysis, Gluconeogenesis.		11
IV	Lipid catabolism: alpha, beta and omega oxidation of fatty acids. Amino acid catabolism: Deamination, Transamination and Decarboxylation of amino acids. Urea cycle.		11
Key Words	Microbial growth, Photosynthetic bacteria, carbohydrate metabolism, lipid catabolism		

Name and Signature of Convener and Members of CBoS

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 अध्ययन मंडल
 शहीद नंदकुमार पटेल
 विश्वविद्यालय, रायगढ़ (छ.ग.)
 10/6/24

23/08/24
DR. KRISHNA KUMAR PATEL
 ASSISTANT PROFESSOR
 DEPARTMENT OF MICROBIOLOGY
 GOVT. T.C.E. P.G. COLLEGE JANJIGIR (C.G.)
 PIN-495668, MOB. 94061-13245
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 विश्वविद्यालय, रायगढ़ (छ.ग.)

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. General Microbiology; Vol II C B Pawar & H F Dagainawala.
2. A textbook of Microbiology; R C Dubey & D K Maheshwari.
3. Fundamentals of Biochemistry; J.L. Jain, Dr. Sunil Jain and Nitin Jain, S. Chand Pub.
4. Biochemistry; U. Satyanarayana and U. Chakrapani

Reference Books:

1. Microbiology; Prescott, Harley and Klein, 5th edition, Mc Graw Hill, New York.
2. Brock Biology of Microorganisms; Madigan.
3. Bacterial physiology; Moat & Foster.

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

- <https://byjus.com/biology/carbohydrate-metabolism/>
- <https://www.slideshare.net/subramaniansethupath/overview-of-lipid-metabolism>
- <https://www.britannica.com/science/bacteria/Growth-of-bacterial-populations>

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	

End Semester Exam (ESE):	Two Section – A & B
	Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks
	Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks

Name and Signature of Convener and Members of CBoS

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DR. KRISHNA KUMAR PATEL
ASSISTANT PROFESSOR
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GOVT. TCL P.G. COLLEGE JANJIGIR (C.G.)
PIN-495668, MOB. 94061-13245

23/06/24
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester V	Session: 2024-25
1	Course Code	MBSC - 05 P	
2	Course Title	Lab. Course - MBSC - 05	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcome (CLO)	At the end of this course the student will able to – ➤ relate the growth pattern of bacteria ➤ determine the effect of various environmental factors on growth of microorganisms ➤ apply the factors for microbial control ➤ demonstrate the fermentation process	
6	Credit Value	1 Credit	Credit = 30 Hours. Laboratory or Field learning/ Training
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)

Module	Topics (Course contents)	No. of Period
Lab/ Field Training/ Experiment contents of Course	1. Study of growth curve of bacteria by turbidometric and standard plate count methods. 2. Calculations of generation time and specific growth rate of bacteria from the graph. 3. Effect of temperature/ pH/ salt on growth of bacteria. 4. Demonstration of alcoholic fermentation. 5. Demonstration of the thermal death time and decimal reduction time of <i>E.coli</i> . 6. Isolation of Saccharophilic (starch hydrolysis), Proteolytic (casein and gelatin hydrolysis) and Lipolytic microorganisms. 7. Oxidative and Fermentative test of bacteria.	30
Key Words	Growth Curve, Generation time, Factors of Growth, Fermentation, Microbial Enzymes	

PART – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Experiments in microbiology, plant pathology and biotechnology by K R Aneja
- Practical microbiology by R C Dubey and D K Maheshwari.

Online Resources:

- https://books.google.co.in/books/about/Practical_Microbiology.html?id=Wh9OTbjcsfUC&redir_esc=y
- Practical Microbiology: Microbial Physiology and Biochemistry

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 course teacher as per lab. status

Name and Signature of Convener and Members of CBoS

DR. KRISHNA KUMAR PATEL

ASSISTANT PROFESSOR

DEPARTMENT OF MICROBIOLOGY

CHITRAKOOT COLLEGE, JALNAR (C.G.)

सर्वोच्च शिक्षण समिती

(4)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester - VI	Session: 2024-25
1	Course Code	MBSC-06 T	
2	Course Title	Molecular Biology and Microbial Genetics	
3	Course Type	DSC	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course the student will able to – ➤ recall the structures and functions of biomolecules ➤ relate the DNA replication, recombination and repair mechanism ➤ interpret protein synthesis and protein regulations ➤ explain Mutations and Mutagens ➤ identify and distinguish genetic regulatory mechanisms	
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 (01 Hr. per period) – 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Fundamentals of molecular biology: History and scope of molecular biology, Contributions of scientists, contributions of Dr. Har Govind Khurana, DNA as genetic material – experimental evidences. Components of DNA and RNA, Nucleosides & Nucleotides Double helical structure of DNA (Watson-Crick model), various forms of DNA-A, B and Z.		12
II	Central Dogma of Protein synthesis: DNA replication-Experiments performed, Mechanism, process and enzymes / proteins involved. Transcription in Prokaryotes - initiation, elongation and termination, RNA polymerases and general Transcription factors. Translation in Prokaryotes - initiation, elongation and termination. Factors involved in translation. Genetic code; properties.		11
III	Mutation and DNA repair system: Introduction and type of gene mutation; Base substitution, frame shift (insertion, deletion, miss-sense, nonsense mutation). Mutagens; physical and chemical. DNA repair system (mismatch repair, photo-reactivation, excision and SOS repair).		11
IV	Gene regulation: Concept of gene- Cistron, Recon, Mutton. Principles of gene regulation and Operon concept- <i>lac</i> Operon and <i>trp</i> Operon. Activator, Coactivator and Repressor.		11
Key Words	Replication, transcription, Translation, Repair system, Mutation, Operon		

Name and Signature of Convener and Members of CBoS

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Dr. Nelson K.

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10/6/24

DR. KRISHNA KUMAR PATEL

ASSISTANT PROFESSOR

DEPARTMENT OF MICROBIOLOGY

GOVT. TCL P.G. COLLEGE JANJIGIR (C.G.)

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अध्यक्ष मंडल

शहीद नंदकुमार पटेल

विश्वविद्यालय, रायचूर (म.प्र.)

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. A Text book of Microbiology; Dubey & Maheshwari; S. Chand & Sons.
2. General Microbiology; Powar & Dagainawala Vol. I, Himalaya Publication
3. Cell biology & Genetics; P.K. Gupta

Reference Books:

1. Principles of Genetics; Gardner, Simmons and Snustad.
2. Concepts of Genetics; Klug and Cummings.
3. Microbial Genetics; Freifelder.
4. Genetics; Arora and Sandhu.
5. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology; P.S Verma & V. K. Agarwal
6. Genes XI; B. Lewin.

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

- <https://ucert.nic.in/textbook/pdf/lebo105.pdf>
- https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBB2101.pdf
- [https://bio.libretexts.org/Bookshelves/Microbiology/Microbiology_\(Boundless\)/07%3A_Microbial_Genetics](https://bio.libretexts.org/Bookshelves/Microbiology/Microbiology_(Boundless)/07%3A_Microbial_Genetics)
- <https://microbenotes.com/category/molecular-biology/>
- https://asutoshcollege.in/new-web/Study_Material/microbial_genetics_07042020.pdf

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

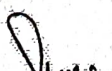
Maximum Marks: 100 Marks

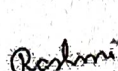
Continuous Internal Assessment (CIA): 30 Marks

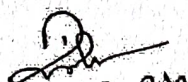
End Semester Exam (ESE): 70 Marks

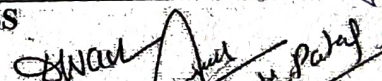
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	
End Semester Exam (ESE):	Two Section – A & B Section A: Q1, Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks	

Name and Signature of Convener and Members of CBoS


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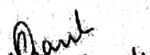

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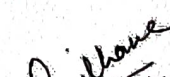

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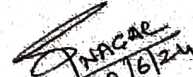

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DR. KRISHNA KUMAR PATEL
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अध्यक्ष मंडल
शहीद नंदलाल पटेल
विश्वविद्यालय, रायगढ़ (छ.ग.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

6

PART – A: Introduction

Program: Bachelor in Life Science (Degree/Honors)		Semester VI		Session: 2024-25	
1	Course Code	MBSC-06 P			
2	Course Title	Lab. Course - MBSC-06			
3	Course Type	Laboratory Course			
4	Prerequisite (If Any)	As per Program			
5	Course Learning Outcomes (CLO)	At the end of this course the student will able to – ➤ experiment with isolation of DNA ➤ demonstrate electrophoretic separation of DNA ➤ develop the concept of mutagenic agents ➤ perform quantitative estimation of DNA & RNA			
6	Credit Value	1 Credit	Credit = 30 Hours. Laboratory or Field learning/ Training		
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)

Module	Topics (Course contents)	No. of Period
Lab./ Field Training/ Experiment contents of Course	1. Study UV light as a mutagenic agent. 2. To perform Replica plating technique. 3. Isolation of genomic DNA. 4. Resolution and visualization of DNA by Agarose Gel Electrophoresis. 5. Isolation of antibiotic resistant mutants by gradient plate technique. 6. Quantitative estimation of DNA by DPA method. 7. Quantitative estimation of RNA by orcinol method.	30

Key Words DNA, Electrophoresis, Mutagenic, Genomic, Antibiotic resistant

PART – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Microbiology – A Practical Approach - Bhavesh Patel and Nandini Phanse
2. Solutions to Practical Microbiology - Bhavesh Patel and Nandini Phanse
3. Experiments in Biotechnology - Nighojkar and Nighojkar
4. Practical Microbiology- Dr. R.C Dubay, Dr. D.K. Maheshwari

Online Resources:

- https://faculty.ksu.edu.sa/sites/default/files/bch361_handnote_1.pdf
- https://www.brainkart.com/article/Isolation-of-DNA-from-plant-materials_38351/
- <https://cales.arizona.edu/spls/sites/cales.arizona.edu.spls/files/PLP%20428528%20Lab%20Manual%202019.pdf>

PART – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

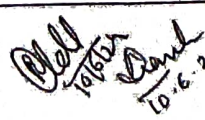
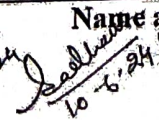
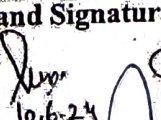
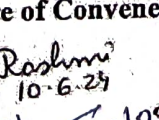
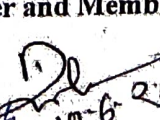
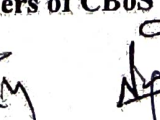
Maximum Marks: 50 Marks

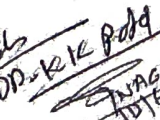
Continuous Internal Assessment (CIA): 15 Marks

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

Name and Signature of Convener and Members of CBoS



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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction

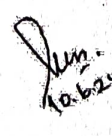
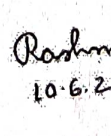
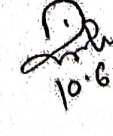
Program: Bachelor in Life Science (Degree/Honors)		Semester - V	Session: 2024-25
1	Course Code	MBSE-03 T	
2	Course Title	Food and Dairy Microbiology	
3	Course Type	Discipline Specific Elective (DSE)	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ define the significance and activities of microorganisms in food ➤ relate the principles in traditional food preservation techniques ➤ identify the starter cultures of different microbial food products ➤ explain the types of food intoxications ➤ examine the food born infections	
6	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation
7	Total Marks	Max. Marks: 100	Minimum Passing marks: 40

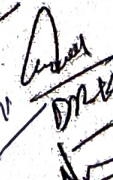
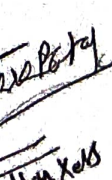
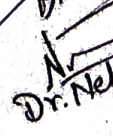
PART – B: Content of the Course

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

Unit	Topics (Course contents)	No. of Period
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. 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.	12
II	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, SO ₂ and antibiotics.	11
III	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.	11
IV	Food borne diseases: food poisoning, food infections and intoxications. Causative agents, symptoms and preventive measures. Food intoxications: Clostridium botulinum and mycotoxins; Food infections: <i>Bacillus cereus</i> , <i>Escherichia coli</i> , <i>Shigella</i> , <i>Listeria monocytogenes</i> .	11
Key Words	Preservation, Food borne diseases, Food intoxications, Microbial spoilage, Prebiotics, Probiotics	

Name and Signature of Convener and Members of CBoS

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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.sathyabama.ac.in/sist_coursematerial/uploads/SMB2203.pdf
- <http://www.cpe.rutgers.edu/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:

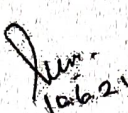
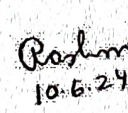
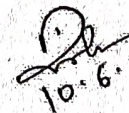
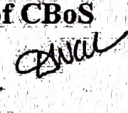
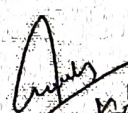
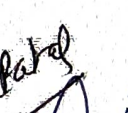
Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	
End Semester Exam (ESE):	Two Section – A & B Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks	

Name and Signature of Convener and Members of CBoS

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester - V	Session: 2024-25
1	Course Code	MBSE-03 P	
2	Course Title	Lab. Course - MBSE-03	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ illustrate methods for isolation, detection and identification of microorganisms from food samples ➤ outline the spoilage microorganisms of food ➤ compare the effect of temperature on the spoilage of food products ➤ relate the parts of mushrooms	
6	Credit Value	1 Credit	Credit = 30 Hours. Laboratory or Field learning/ Training
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)

Module	Topics (Course contents)	No. of Period
Lab./ Field Training/ Experiment contents of Course	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.	30

Key Words Spoilage microorganisms, Food borne bacteria, Food borne fungi, Canned 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:

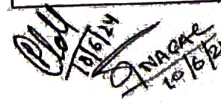
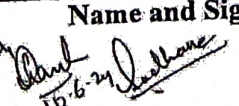
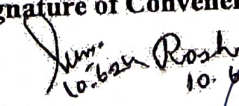
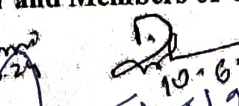
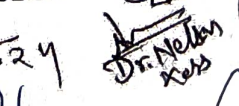
Maximum Marks: 50 Marks

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 course teacher as per lab. status

Name and Signature of Convener and Members of CBoS


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FOUR YEAR UNDERGRADUATE PROGRAM (2924 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

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PART – A: Introduction

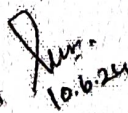
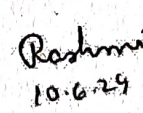
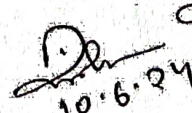
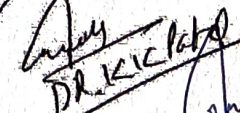
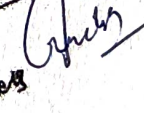
Program: Bachelor in Life Science (Degree/Honors)		Semester - VI	Session: 2024-25
1	Course Code	MBSE-04 T	
2	Course Title	Microbial Biotechnology	
3	Course Type	Discipline Specific Elective (DSE)	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ relate the concepts of genetic engineering ➤ classify different types of vectors ➤ explain the techniques in Molecular Biology ➤ identify cDNA libraries and their applications ➤ examine the products of rDNA technology	
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

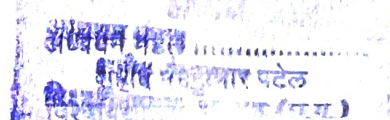
Total No. of Teaching-Learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	Genetic Engineering: Tools and techniques in genetic engineering, Restriction endonucleases- Types and uses, DNA modifying enzymes and their applications: DNA polymerases and DNA ligases. Cloning Vectors: Definition and Properties Plasmid vectors: pBR and pUC series. Bacteriophage lambda and M13 based vectors. Cosmids, BACs, YACs.	12
II	Techniques in Molecular Biology: DNA electrophoresis, Introduction to PCR, RAPD, RFLP. Nucleic acid hybridization techniques- Southern, Northern, Western and Dot blots. DNA microarray analysis.	11
III	cDNA libraries and Applications of rDNA Technology: Genomic and cDNA libraries; Preparation and uses, Screening of libraries; Colony hybridization and colony PCR.	11
IV	Products of recombinant DNA technology: Products of human therapeutic interest - insulin, hCGH, antisense molecules. Bt transgenic - cotton, brinjal, Gene therapy, recombinant vaccines, protein engineering and site directed mutagenesis.	11
Key Words	Vectors, Plasmid, PCR, Colony hybridization, cDNA libraries, Bt transgenic, Gene therapy	

Name and Signature of Convener and Members of CBoS

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Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. A Text Book of Microbiology: R. C. Dubey & D. K. Maheshwari
2. Biotechnology; V. Kumaresan
3. Genetics - Arora and Sandhu

Reference Books:

1. Genes XI - Lewin, B.
2. Principles of Genetics - Gardner, Simmons and Snustad
3. Concepts of Genetics - Klug and Cummings
4. Microbial Genetics - Freifelder
5. Molecular cloning Vol. 1-III. Sambrook & Russel.

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

- <https://www.egyankosh.ac.in/bitstream/123456789/86112/1/Unit-14.pdf>
- <https://file.hukum.uns.ac.id/data/PDIH%20File/e-book/Wilson%20Wall%20C%20Genetic%20DNA%20Technology%20Legal Aspects.pdf>
- https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBB2102.pdf
- <https://asutoshcollege.in/new-web/Study Material/microbial genetics 07042020.pdf>
- https://faculty.ksu.edu.sa/sites/default/files/5_68.pdf

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

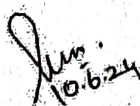
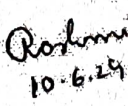
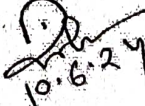
Continuous Internal Assessment (CIA): 30 Marks

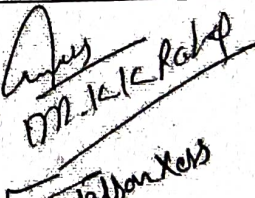
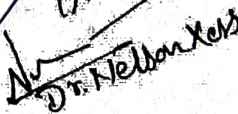
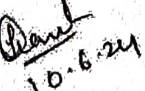
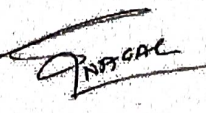
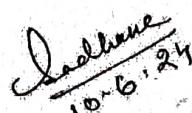
End Semester Exam (ESE): 70 Marks

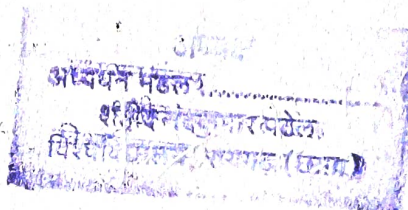
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	

End Semester Exam (ESE):	Two Section – A & B
	Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks

Name and Signature of Convener and Members of CBoS

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PART – A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester -VI	Session: 2024-25
1	Course Code	MBSE-04 P	
2	Course Title	Lab. Course	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➤ identify the competent cells and demonstrate transformation ➤ make use of electrophoresis and examine restriction digestion and ligation ➤ perform Southern blotting ➤ examine PCR results	
6	Credit Value	1 Credit	Credit = 30 Hours. Laboratory or Field learning/ Training
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)

Module	Topics (Course contents)	No. of Period
Lab./ Field Training/ Experiment contents of Course	1. Demonstration of Bacterial Transformation and calculation of transformation efficiency. 2. Interpretation of gel electropherograms. 3. Digestion of DNA using restriction enzymes and analysis by agarose gel electrophoresis. 4. Demonstration of Ligation of DNA fragments. 5. Demonstration of Amplification of DNA by PCR. 6. Demonstration of Southern blotting. 7. Observation of Bt crops.	30
Key Words	Electrophoresis, Restriction enzymes, Ligation, PCR Amplification, Southern blotting	

PART – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Microbiology – A Practical Approach - Bhavesh Patel and Nandini Phanse
2. Experiments in Biotechnology - Nigohkar and Nigohkar
3. Current protocols in molecular biology - Ausbel

Online Resources:

- <https://home.sandiego.edu/~josephprovost/Bacterial%20Transformation%20Protocol.pdf>
- <https://vngocnguyen.files.wordpress.com/2016/04/e8-packet11-2.pdf>
- https://faculty.ksu.edu.sa/sites/default/files/polymerase_chain_reaction_pcr.pdf
- <https://www.deshbandhucollege.ac.in/pdf/e-resources/botany/LS-VI-Blotting-Techniques.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 course teacher as per lab. status

Name and Signature of Convener and Members of CBoS

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DR. KRISHNA KUMAR PATEL
ASSISTANT PROFESSOR
DEPARTMENT OF MICROBIOLOGY
GOVT. TOL. RGS COLLEGE JAMJIRA (C.G.)
PIN-495668, MOB. 94061-13245

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction

Program: Bachelor in Life Science (Certificate/Diploma/Degree)		Semester - II/ IV/V/VI	Session: 2024-25
1	Course Code	MBSEC-01	
2	Course Title	Mushroom Cultivation	
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 – ➤ explain nutritional and medicinal values of mushroom ➤ relate the types of mushrooms and their spawn preparation ➤ examine the methods of cultivation and economic aspects ➤ attain expertise using different Agro-residues for cultivation of mushrooms ➤ observe post-harvest management of mushrooms	
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:

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

Theory – 15 Periods (15 Hrs.) and Lab. or Field Learning / Training 30 Periods (30 Hrs.)		No. of Period
Module	Topics (Course Contents)	
Theory Contents	Introduction and Life cycle: Classification and identification of edible and nonedible mushrooms. Nutritional and medicinal value of mushroom; Scope of mushroom cultivation. Taxonomic position and Life cycle of mushroom. Types of mushrooms; Button mushroom (<i>Agaricus biporus</i>), Milky mushroom (<i>Calocybe indica</i>), Oyster mushroom (<i>Pleurotus sajor kaju</i>) and paddy straw mushroom (<i>Volvariella volvacea</i>). (Observation). Principles and Requisites: Sterilization and disinfection of substrates, growth medium, isolation, spawn production and maintenance. (Observation) Techniques of Cultivation: Structure and construction of low-cost mushroom huts, layout of Traditional and Green house method. Maintenance of proper condition in mushroom huts, Composting, bed and polythene bag preparation, Spawning-casing-cropping. (Observation).	15
Lab./Field Training Contents	1.Preparation of laboratory Glassware (Chemical washing, cleaning and drying). 2.Basic information about autoclave, hot air oven, laminar air flow 3.Sterilization and sanitation of mushroom house, instruments etc. 4.Identification of edible and poisonous mushrooms. 5.Preparation of Mother Culture. Spawn- media preparation, Inoculation, and incubation. 6.Preparation of different types of bed for cultivation. 7.Cultivation of Mushroom using compost/ paddy straw/agricultural wastes. 10.Harvesting and post-harvest management of crops. (Observation & Practice)	30
Key Words	Mushroom, Spawning, Compost, Harvesting	

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Officer-In-Charge (Academic)
Shaheed Nandkumar Patel
shwavidyalaya, Raigarh (C.G.)

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Nita Bhal. (2000). Hand book on Mushrooms. 2nded. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Tewari, S. C., Pankaj Kapoor, (1988). Mushroom Cultivation. Mittal Publication, New Delhi.
3. Biotechnology, V. Kumaresan.

Reference Books:

1. Stamets, Paul, and J.S. Chilton. 1983. The Mushroom Cultivator. Agarikon Press, Olympia, WA. 415 p.

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

- [https://nios.ac.in/media/documents/vocational/mushroom_production_\(revised\)\(618\)/Lesson-01.pdf](https://nios.ac.in/media/documents/vocational/mushroom_production_(revised)(618)/Lesson-01.pdf)
- https://agriportal.cg.nic.in/horticulture/PDF/Download/Mushroom%20Project_Part%201.pdf
- <http://nhb.gov.in/pdf/Cultivation.pdf>

PART: D ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

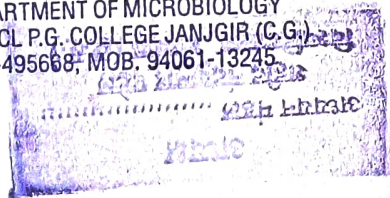
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Dr. Sweet Hans Nayal

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10/6/24

Officer in-Charge (Academic)
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

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