
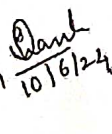
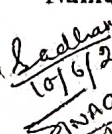
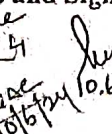
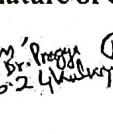
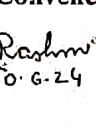

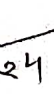


FOUR YEAR UNDERGRADUATE PROGRAM (NEP 2020)
PROGRAM: BACHELOR OF SCIENCE (2024-28)
DISCIPLINE: MICROBIOLOGY
Session: 2024-25

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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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 – <ul style="list-style-type: none"> ➤ 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

Shahed Nandkumar Patel
10/6/24
Officer-In-Charge (Academic)
Shahed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

Rashmi
10.6.24
Sadhana
10.6.24
Dr. Sadhana Jaiswal

Dr. V. Shankar
10/6/24
Dr. NAGAR
10/6/24
Dr. V. Shankar
Dr. NAGAR

Dr. Nelson Xe
Dr. Nelson Xe

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

[Signatures and Dates]



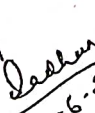
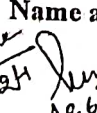
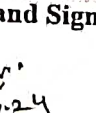
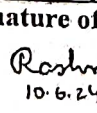
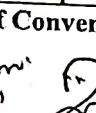
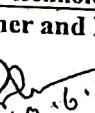
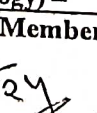
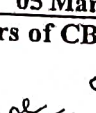
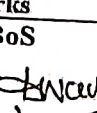
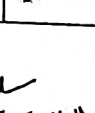
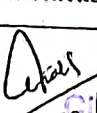
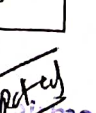

Dr. Rachana Choudhary 10/6/24
Dr. V. Chanthi 10/6/24
Dr. Sachana Taiswal 10-6-24
Dr. Nandkumar Patel 10-6-24
Dr. Nelson Ke 10/6/24

Officer-in-Charge (Academics)
Shahood 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 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. Kanchan Choudhary

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Dr. Anshu

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Dr. Rashmi

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[Signature]
10.06.24
Dr. Sachana

[Signature]
Dr. Nand Kumar Patel
Vishwavidyalaya, Raigarh (C.G.)
[Signature]
Dr. Nelson Xel

Officer-In-Charge (Academic)
Shahood Nandkumar 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

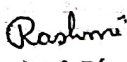
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2): 20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar – 10	
	Total Marks – 30	

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

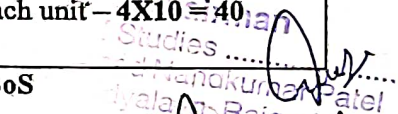
Name and Signature of Convener and Members of CBoS


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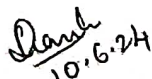

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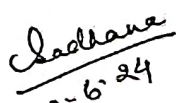

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Dr. Nelson Koss

Officer-In-Charge (Academic)
Shahad Nand Kumar 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 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 – <ul style="list-style-type: none"> ➤ 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:

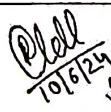
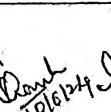
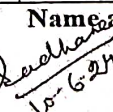
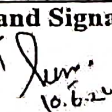
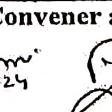
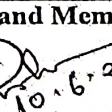
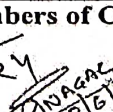
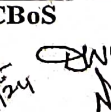
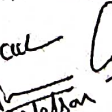
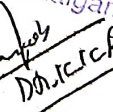
Maximum Marks: 50 Marks

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



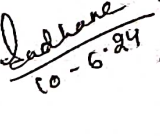
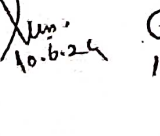
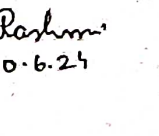
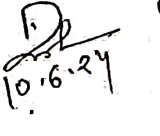
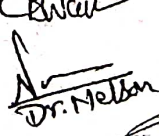
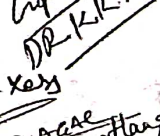
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Officer In-Charge (Academic)
Shahood Nandikumar Patel
Vishwavidyalaya, Raigarh (C.G.)

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 – <ul style="list-style-type: none"> ➤ 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 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

- 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 Assignment/ Seminar = 10 Total Marks – 30	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
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End Semester Exam (ESE):	<p>Two Section – A & B</p> <p>Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks</p> <p>Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 =40 Marks</p>
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Name and Signature of Convener and Members of CBoS

Sadkane
10.6.24

10.6.24

Rashmi
10.6.25

10.6.24

Platt
10/6/24

Paul
10/6/24
(DR-V. Chantre)

SPAGAR
10/6/24

1. Chandana
 of Studies
 and Narayan Patel
 Gyalaya, Raigarh (C.G.)
 Dr. Nelson Xess

Officer-In-Charge (Academic)
Shahood 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 – <ul style="list-style-type: none"> ➤ 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 TO
 Officer-In-Charge (At the time)
 Shahood Nandkumar Patel
 Vishwavidyalaya, Raigarh (C.G.)

per lab. status

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 – <ul style="list-style-type: none">➤ 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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10/6/24
Dr. Radhika Choudhary

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10-6-24

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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

Sadana
10.6.24

Sur
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



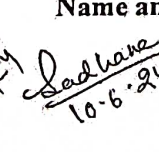
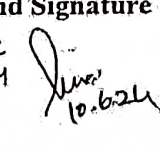
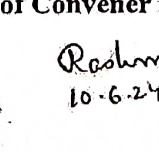
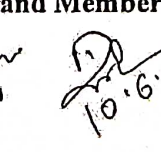
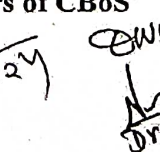
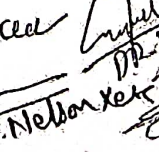
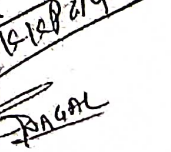
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Officer-In-Charge (Academic)
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

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	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): Assignment/ Seminar + Attendance: Total Marks:	10 & 10 05 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 – B. Spotting based on tools & technology (written) – C. Viva-voce (based on principle/ technology) –		20 Marks 10 Marks 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 – <ul style="list-style-type: none"> ➤ 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


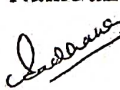
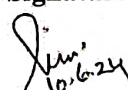
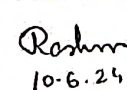

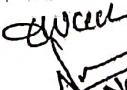
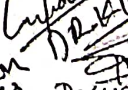
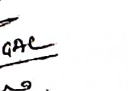
PART – B: Content of the Course

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

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

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- 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:

- 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

End Semester Exam (ESE):		35 Marks	Better Marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 15 Marks
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test/ Quiz – (2): 10 & 10 Assignment/ Seminar + Attendance: 05 Total Marks: 15		
End Semester Exam (ESE):	Laboratory/ Field Skill Performance: On spot Assessment		Managed by Coordinator as per skilling
	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		
Signature of Coordinator and Members of CBoS			

Name and Signature of Convener and Members of CBoS

10-6-24

Rashmi
10-6-24

10.6.24

Dr. Nelson K. V. R.

Plaf
10/6/25

Sadlani
10-6-24

NAGAL
Dr. Swetha Nagal

Dank
10/6/24

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

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

(छत्तीसगढ़ विश्वविद्यालय अधिनियम 1973 द्वारा स्थापित राजकीय विश्वविद्यालय)





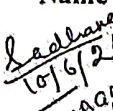
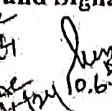
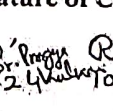
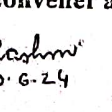
राष्ट्रीय शिक्षा नीति – 2020
के तहत तृतीय एवं चतुर्थ सेमेस्टर
नवीन पाठ्यक्रम
(सत्र 2025–26)

माइक्रोबायोलॉजी

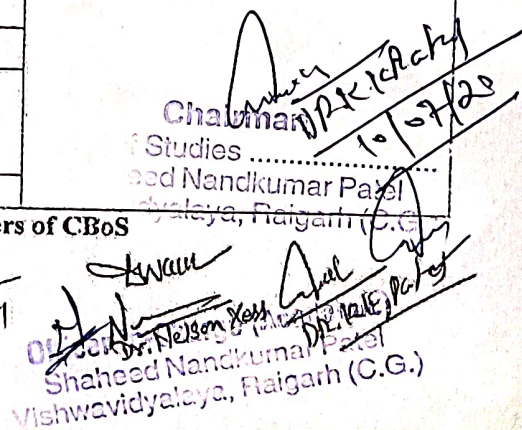
FOUR YEAR UNDERGRADUATE PROGRAM (NEP 2020)
PROGRAM: BACHELOR OF SCIENCE (2024-28)
DISCIPLINE: MICROBIOLOGY
Session: 2024-25

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
 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 – <ul style="list-style-type: none"> ➤ 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.)

Dr. Nandkumar Patol
10-07-2025

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

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

Sadhana
10-6-24

10.6.24

Rashmi
10.6.24

10.6.24

BoS

[Handwritten signatures and stamps are visible over the text]

Chairman

Dr. Nelson X

Danh
10/6/24

Pld
10/6/29
Dr. Rachans
Chomally

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10/6/24

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10.07.2025

अध्ययन मंडल
 शहीद नंदकुमार पटेल
 विश्वविद्यालय, रायगढ़ (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 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	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. 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:



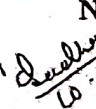
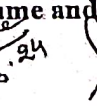
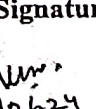
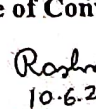
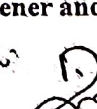
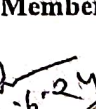
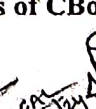
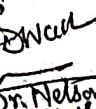


Maximum Marks: 50 Marks

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
 शाहीकंदकुमार पटेल
 निदेशिका, 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 - 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 – <ul style="list-style-type: none"> ➤ 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

Sadhana
10.6.24

Dani
10/6/24

Rashmi
10.6.24

Phell
10/6/24

Dr. N. K. S.
10.6.24

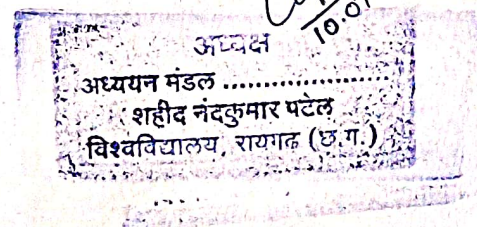
Dr. N. K. S.
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Dr. N. K. S.

Dr. N. K. S.
10.6.24

Dr. Nelson K. S.

Dr. Nelson K. S.
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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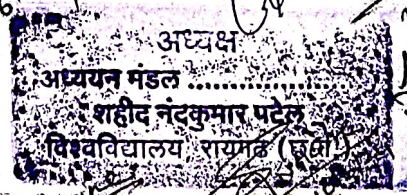
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

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:


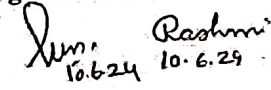
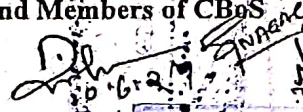
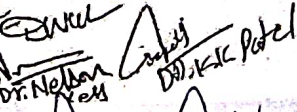
Maximum Marks: 50 Marks

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

अध्यक्ष मंडल
 शहीद नंदकुमार पटेल
 विश्वविद्यालय, रायगड (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 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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DR. K. K. Patil

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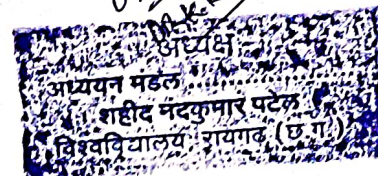
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DR. K. K. Patil



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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Choudhary

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विश्वविद्यालय, रायगढ़ (छ.ग.)


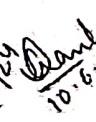
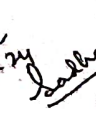
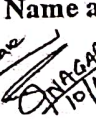
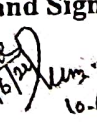
FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)



DEPARTMENT OF MICROBIOLOGY



COURSE CURRICULUM

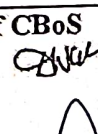

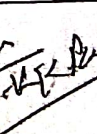

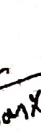
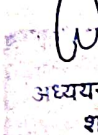
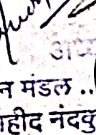

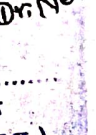






PART – A: Introduction			
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester - III	Session: 2024-25
1	Course Code	MBSE-01 P	
2	Course Title	Lab. Course - MBSE-01	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this 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)			
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, Vmax. 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:			
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:			
• 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	
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, रायगढ़ (छ.ग.)

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

PART – A: Introduction


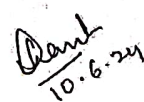
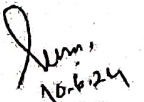
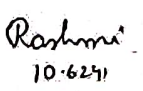
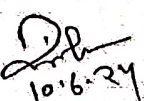
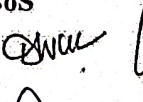
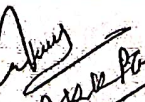
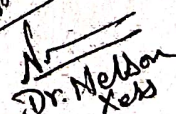
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester - IV	Session: 2024-25
1	Course Code	MBSE-02 T	
2	Course Title	Industrial Microbiology	
3	Course Type	Discipline Specific Elective (DSE)	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – <ul style="list-style-type: none"> ➤ 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

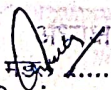
PART – B: Content of the Course

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
 Ansh
 Sumit
 Rashmi
 Ansh
 Ansh
 Ansh
 Dr. Nelson


 अध्यक्ष मंडळ
 शहीद नंदकुमार पटेल
 विश्वविद्यालय, रायगड (छ.ग.)

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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)		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 – <ul style="list-style-type: none"> ➤ 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	<ol style="list-style-type: none"> 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:


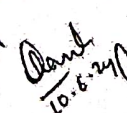
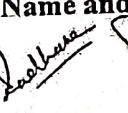
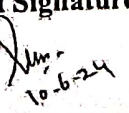
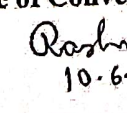
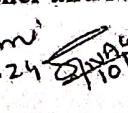
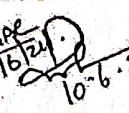
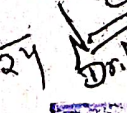
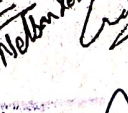
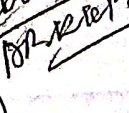
Maximum Marks: 50 Marks

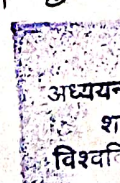
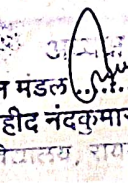
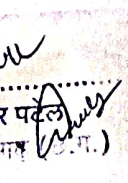
Continuous Internal Assessment (CIA): 15 Marks

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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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

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Dr. Anurag
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Dr. Roshni
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 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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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

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Dr. S. S. Nag
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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

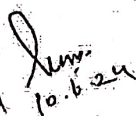
End Semester Exam (ESE): 35 Marks

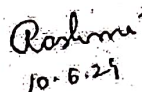
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test/ Quiz – (2): 10 & 10 Assignment/ Seminar + Attendance: 05 Total Marks: 15	Better Marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 15 Marks
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End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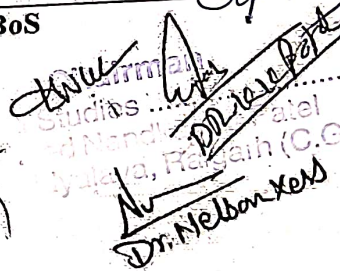
Name and Signature of Convener and Members of CBoS

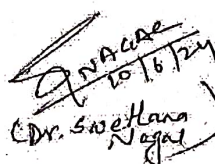

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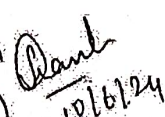

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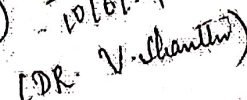

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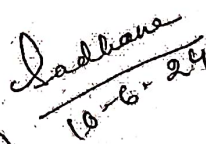

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Officer-In-Charge (Examination)
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