
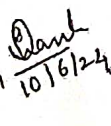
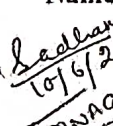
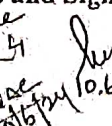
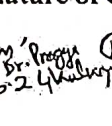
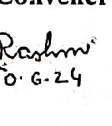
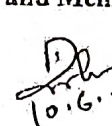
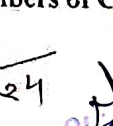
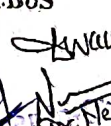
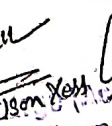
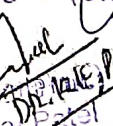



**FOUR YEAR UNDERGRADUATE PROGRAM (NEP 2020)**  
**PROGRAM: BACHELOR OF SCIENCE (2024-28)**  
**DISCIPLINE: MICROBIOLOGY**  
**Session: 2024-25**

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				
MBSC- 06 T	Molecular Biology and Microbial Genetics	MBSE- 06 T	Mycology and Plant Pathology			MBSEC- 01	Mushroom Cultivation
MBSC- 06 P	Lab Course	MBSE- 06 P	Lab Course				
MBSC- 07 T	Immunology	MBSE- 07 T	Agriculture and Veterinary Microbiology	VAC			
MBSC- 07 P	Lab Course	MBSE- 07 P	Lab Course				
MBSC- 08 T	Environmental Microbiology and Microbial Ecology	MBSE- 08 T	Fermentation Technology	MBVAC- 01	Microbes and Human Health		
MBSC- 08 P	Lab Course	MBSE- 08 P	Lab Course				
		MBSE- 09 T	Clinical Microbiology				
		MBSE- 09 P	Lab Course				
		MBSE- 10 T	Pharmaceutical Microbiology				
		MBSE- 10 P	Lab Course				
		MBSE- 11 T	Metagenomics, Basic Computer and Bioinformatics				
		MBSE- 11 P	Lab Course				
		MBSE- 12 T	Biosafety and Intellectual Property Rights				
		MBSE- 12 P	Lab Course				

Name and Signature of Convener and Members of CBoS

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

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

<b>PART – A: Introduction</b>			
<b>Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)</b>		<b>Semester - I</b>	<b>Session: 2024-25</b>
1	<b>Course Code</b>	MBSC- 01 T	
2	<b>Course Title</b>	Introductory Microbiology and Microbial techniques	
3	<b>Course Type</b>	DSC	
4	<b>Prerequisite (If Any)</b>	As per program	
5	<b>Course Learning Outcomes (CLO)</b>	At the end of this course, the students will be able to – > relate the development and scope of Microbiology > illustrate the contributions made by prominent scientists including Indian Vedic Knowledge on microbiology > demonstrate the nomenclature and characteristics of different types of microorganisms > identify the basic techniques in microbiology > explain the methods of microbial control	
6	<b>Credit Value</b>	03 Credits	Credit = 15 Hours - Learning & Observation
7	<b>Total Marks</b>	Max. Marks: 100	Minimum Passing marks: 40
<b>PART – B: Content of the Course</b>			
<b>Total No. of Teaching-Learning Periods (01 Hr. per period) - 45 Periods (45 Hours)</b>			
Unit	Topics (Course contents)	No. of Period	
I	<b>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.</b>	12	
II	<b>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.</b>	11	
III	<b>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.</b>	11	
IV	<b>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</b>	11	
<b>Key Words</b>		History and scope, Nomenclature, Pure culture technique, Microbial control	

Name and Signature of Convener and Members of CBoS

*Patel*  
10/6/24

*Jain*  
10.6.24

*Rashmi*  
10.6.24

*Patel*  
10.6.24

*ANAND*

*Sadhana*  
10.6.24  
Dr. Sadhana  
Jaiswal

*Patel*  
10/6/24  
(DR. V. Jaiswal)

*ANAND*  
10/6/24

*Dr. Nelson Xel*  
10/6/24

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



## Part – C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended:

1. 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

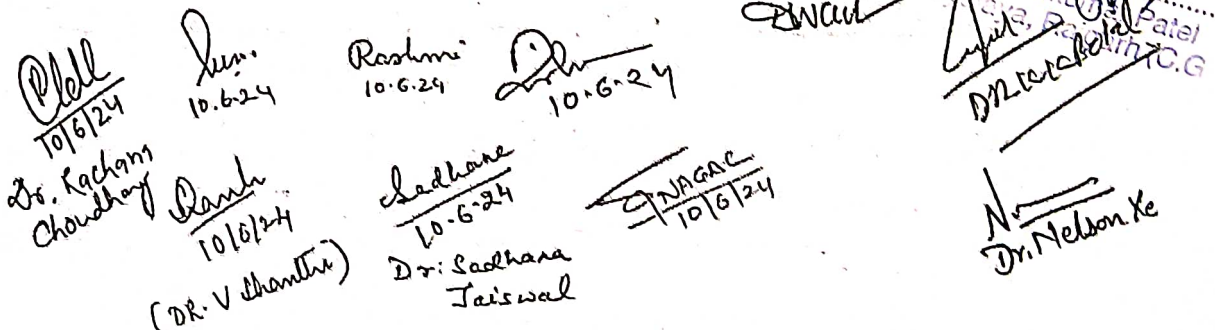
Continuous Internal Assessment (CIA): 30 Marks

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
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Name and Signature of Convener and Members of CBoS


  
 Dr. Rachana Choudhary 10/6/24  
 Dr. V. Chantre 10/6/24  
 Dr. Sachana Jaiswal 10-6-24  
 Rashmi 10-6-24  
 Dr. Nandkumar Patel 10/6/24  
 Dr. Nelson Ke 10/6/24

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

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



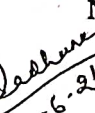
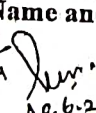






<b>PART – A: Introduction</b>		<b>Semester I</b>		<b>Session: 2024-25</b>
Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)				
1	Course Code	MBSC- 01 P		
2	Course Title	Lab. Course – MBSC-01		
3	Course Type	Laboratory Course		
4	Prerequisite (If Any)	As per program		
5	Course Learning 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	Credit = 30 Hours. Laboratory or Field learning/ Training	
7	Total Marks	Max. Marks: 50		Min. Passing marks: 20

<b>PART – B: Content of the Course</b>		
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

<b>PART – C: Learning Resources</b>	
<b>Text Books, Reference Books and Others</b>	
<b>Text Books Recommended:</b>	
1. Experiments in microbiology, plant pathology and biotechnology: K R Aneja 2. Practical microbiology: R C Dubey and D K Maheshwari.	
<b>Online Resources:</b>	
<ul style="list-style-type: none"> <li><a href="https://www.youtube.com/watch?v=HndcMyuEXs">https://www.youtube.com/watch?v=HndcMyuEXs</a></li> <li><a href="https://www.youtube.com/watch?v=CbMGr9wFV2w">https://www.youtube.com/watch?v=CbMGr9wFV2w</a></li> </ul>	

<b>PART – D: Assessment and Evaluation</b>		
<b>Suggested Continuous Evaluation Methods:</b>		
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**

<b>PART – A: Introduction</b>			
<b>Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)</b>		<b>Semester - II</b>	
		<b>Session: 2024-25</b>	
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 – <ul style="list-style-type: none"> <li>➤ recall the ultrastructure of bacteria</li> <li>➤ relate ecological distribution of microorganism and their significances for society</li> <li>➤ illustrate the essential and current knowledge of bacteria</li> <li>➤ identify virus, protozoan and archaebacteria with their special characteristics</li> <li>➤ outline the beneficial &amp; harmful behavior of viruses, bacteria, protozoan and other microbes</li> </ul>	
6	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation
7	Total Marks	Max. Marks: 100	Minimum Passing marks: 40
<b>PART – B: Content of the Course</b>			
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, pilli, 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

*[Handwritten Signatures and Dates]*  
 Dr. Kacham Choudhary 10.6.24  
 Rashmi 10.6.24  
 Dr. Nelson Kher 10.06.24  
 Dr. Lakshmi Pateri 10.06.24  
 Dr. Nand Kumar Pateri 10.06.24  
 Dr. Vishwavidyalaya, Raigarh (C.G.)  
 Dr. Nelson Kher

Officer-In-Charge (Academic)  
 Shalini Nand Kumar Pateri  
 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 Daginawala 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

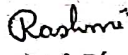
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz – (2):	20+20	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment/ Seminar –	10	
	Total Marks –	30	

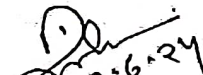
End Semester Exam (ESE):	Two Section – A & B	
	Section A: Q1. Objective 10 X 1 = 10 Mark; Q2. Short answer type – 5X4= 20 Marks	
	Section B: Descriptive answer type qts., 1 out of 2 from each unit – 4X10 = 40 Marks	

Name and Signature of Convener and Members of CBoS


  
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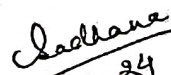
  
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Dr. Nelson Kers

Officer-In-Charge (Academy)  
Shahad Nand Kumar Patel  
Vishwavidyalaya, Raigarh (C.G.)



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

<b>PART – A: Introduction</b>			
Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)		<b>Semester - II</b>	
		<b>Session: 2024-25</b>	
1	Course Code	MBSC-02 P	
2	Course Title	Lab. Course – MBSC-02	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – > culture microorganisms and get the knowledge about their morphological features > illustrate different staining procedures > identify bacteria and protozoa from different samples > get practice of identification of colonies on different culture media	
6	Credit Value	1 Credit	Credit = 30 Hours. Laboratory or Field learning/ Training
7	Total Marks	Max. Marks: 50	Min. Passing marks: 20

**PART – B: Content of the Course**

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

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

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

**PART – C: Learning Resources**

**Text Books, Reference Books and Others**

**Text Books Recommended:**

- Laboratory Manual of Microbiology and Biotechnology: Aneja K. R.
- Practical Microbiology: R. C. Dubey and D. K. Maheshwari.
- 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:**

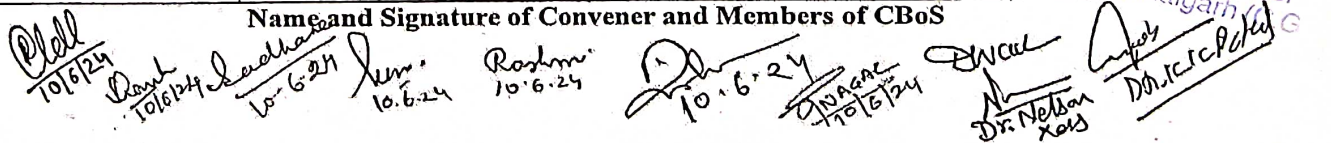
**Maximum Marks: 50 Marks**

**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**


  
 10/6/24, 10/6/24, 10/6/24, 10/6/24, 10/6/24, 10/6/24, 10/6/24, 10/6/24, 10/6/24

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



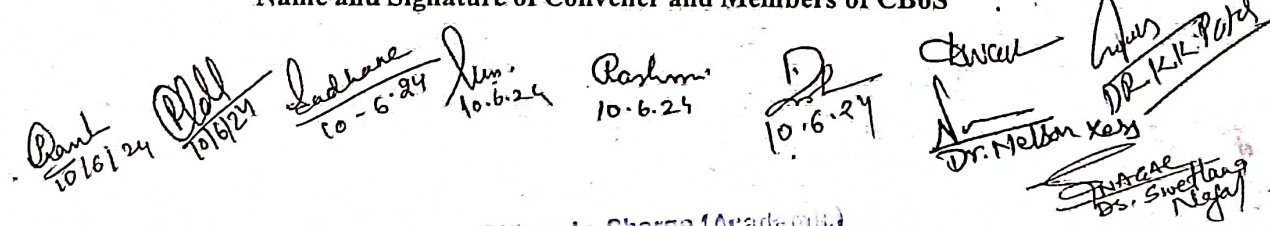
**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF MICROBIOLOGY**  
**COURSE CURRICULUM**

PART – A: Introduction		Semester - I		Session: 2024-25
Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)				
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"> <li>➤ relate the development and scope of Microbiology</li> <li>➤ illustrate the contributions made by prominent scientists including Indian Vedic Knowledge on microbiology</li> <li>➤ demonstrate the nomenclature and characteristics of different types of microorganisms</li> <li>➤ identify the basic techniques in microbiology</li> <li>➤ explain the methods of microbial control</li> </ul>		
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


  
 [Signature] 10/6/24    [Signature] 10/6/24    [Signature] 10-6-24    [Signature] 10.6.24    [Signature] 10.6.24    [Signature] 10.6.24    [Signature] 10.6.24    [Signature] 10.6.24

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



## Part – C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended:

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

#### Reference Books:

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

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

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

## Part – D: Assessment and Evaluation

#### Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

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

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

*Shakti*  
10.6.24

*Shruti*  
10.6.24

*Roshmi*  
10.6.24

*Dr. Nelson*  
10.6.24

*Dr. Nelson*  
10/6/24

*Dr. Nelson*  
10/6/24  
(DR - V. Chaitan)

*Dr. Nelson*  
10/6/24

*Dr. Nelson*  
10/6/24  
Dr. Nelson  
Wishwavidyalaya, Raigarh (C.G.)

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



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

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

**PART – B: Content of the Course**

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

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:**

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

**Online Resources:**

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

Officer-In-Charge (At and for) **Shahood Nandkumar Patel**  
 Vishwavidyalaya, Raigarh (C.G.)

Chairman **DR. K. K. Patel**  
 Vishwavidyalaya, Raigarh (C.G.)



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

<b>PART – A: Introduction</b>			
<b>Program: Bachelor in Life Science</b> (Certificate/Diploma/Degree/Honors)		<b>Semester - II</b>	
		<b>Session: 2024-25</b>	
1	<b>Course Code</b>	MBGE-02 T	
2	<b>Course Title</b>	Bacteriology, Virology and Protozoology	
3	<b>Course Type</b>	Generic Elective (GE)	
4	<b>Prerequisite (If Any)</b>	As per Program	
5	<b>Course Learning Outcomes (CLO)</b>	At the end of this course, the students will be able to – <ul style="list-style-type: none"> <li>➤ recall the ultrastructure of bacteria</li> <li>➤ relate ecological distribution of microorganism and their significances for society</li> <li>➤ illustrate the essential and current knowledge of bacteria</li> <li>➤ identify virus, protozoa and archaebacteria with their special characteristics</li> <li>➤ outline the beneficial &amp; harmful behavior of viruses, bacteria, protozoan and other microbes</li> </ul>	
6	<b>Credit Value</b>	03 Credits	Credit = 15 Hours - Learning & Observation
7	<b>Total Marks</b>	Max. Marks: 100	Minimum Passing marks: 40
<b>PART – B: Content of the Course</b>			
<b>Total No. of Teaching-Learning Periods (01 Hr. per period) - 45 Periods (45 Hours)</b>			
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 & Archaebacteria: 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
<b>Key Words</b>   Bacteria, Archaea, Virus, Bacteriophage, Prions, Protozoan			

Name and Signature of Convener and Members of CBoS.

Signatures and dates: 10/6/24, 10-6-24, 10-6-24, 10.6.24, 10.6.24, 10.6.24, 10/6/24, 10/6/24.

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

## Part – C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended:

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

#### Reference Books:

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

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

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

## Part- D: Assessment and Evaluation

### Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

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

End Semester Exam (ESE):

Two Section – A & B

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

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

Name and Signature of Convener and Members of CBoS

*Sudhakar*  
10.6.24

*Sunil*  
10.6.24

*Rashmi*  
10.6.24

*P. D.*  
10.6.24

*Dr. N. K. S.*  
10.6.24

*Dr. N. K. S.*  
10/6/24

*Dr. N. K. S.*  
10/6/24

*S. NAGAR*  
10/6/24

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



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

<b>PART – A: Introduction</b>	
Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)	
<b>Semester - II</b>	
<b>Session: 2024-25</b>	
1	Course Code
2	Course Title
3	Course Type
4	Prerequisite (If Any)
5	Course Learning Outcomes (CLO)
6	Credit Value
7	Total Marks

**MBGE-02 P**

**Lab. Course - MBGE-02**

**Laboratory Course**

**As per Program**

**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

**1 Credit**    *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)		No. of Period
Module	Topics (Course contents)	
Lab./ Field Training/ Experiment contents of Course	<ol style="list-style-type: none"> <li>1. Isolation and characterization of bacteria by colony characteristics.</li> <li>2. Growth on simple media – Nutrient agar and Nutrient broth</li> <li>3. Growth on complex media – Blood agar, Chocolate agar, Macconkey's, and EMB agar.</li> <li>4. Differential Staining Techniques: Gram staining and acid-fast staining</li> <li>5. Special Staining Techniques: Negative staining and Endospore staining</li> <li>6. Study of cytopathic effects of viruses using photographs.</li> <li>7. Observation of protozoa from different samples.</li> </ol>	<b>30</b>
Key Words	<b>Isolation, Identification, Staining Techniques, Cytopathic effects, Protozoa</b>	

**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**

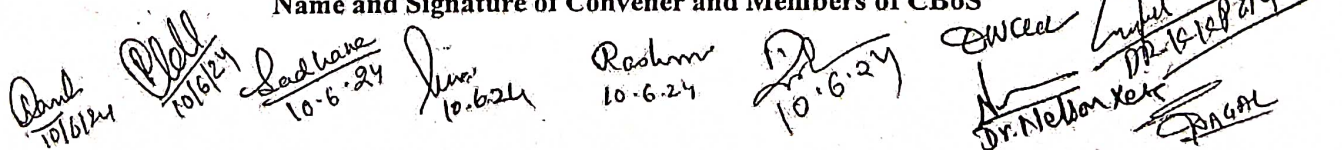
**Continuous Internal Assessment (CIA): 15 Marks**

**End Semester Exam (ESE): 35 Marks**

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

End Semester Exam (ESE):	Laboratory/ Field Skill Performance: On spot Assessment		Managed by course teacher as per lab. status
	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	

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**

<b>PART – A: Introduction</b>			
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)	<p>At the end of this course, the students will be able to –</p> <ul style="list-style-type: none"> <li>➤ explain nutritional and medicinal values of mushroom</li> <li>➤ relate the types of mushrooms and their spawn preparation</li> <li>➤ examine the methods of cultivation and economic aspects</li> <li>➤ attain expertise using different Agro-residues for cultivation of mushrooms</li> <li>➤ observe post-harvest management of mushrooms</li> </ul>	
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	<p><b>Introduction and Life cycle:</b> 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).</p> <p><b>Principles and Requisites:</b> Sterilization and disinfection of substrates, growth medium, isolation, spawn production and maintenance. (Observation)</p> <p><b>Techniques of Cultivation:</b> 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).</p>	15
Lab./Field Training Contents	<p>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 &amp; Practice)</p>	30
Key Words	Mushroom, Spawning, Compost, Harvesting	

**Name and Signature of Convener and Members of CBoS**

Convener: *Shahed Nandkumar Patel*, 10/6/24  
 Members: *Rashmi*, 10-6-24; *Wacek*, 10.6.24; *Dr. Swetha*, 10/6/24; *Dr. Swetha*, 10/6/24.

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



## Part – C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended:

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

#### Reference Books:

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

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

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

## PART: D ASSESSMENT AND EVALUATION

#### Suggested Continuous Evaluation Methods:

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

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test/ Quiz – (2): 10 & 10 Assignment/ Seminar + Attendance: 05 Total Marks: 15	Better Marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory/ Field Skill Performance: On spot Assessment A. Performed the Task based on lab. work – 20 Marks B. Spotting based on tools & technology (written) - 10 Marks C. Viva-voce (based on principle/ technology) – 05 Marks	Managed by Coordinator as per skilling

Name and Signature of Convener and Members of CBoS

*Sum*  
10-6-24

*Rashmi*  
10-6-24

*DD*  
10-6-24

*Dr. Nandkumar Patel*  
Dr. Nandkumar Patel  
Vishwavidyalaya, Raigarh (C.G.)

*Pradip*  
10/6/24

*Leadwase*  
10-6-24

*Dr. Sivakumar*  
Dr. Sivakumar (N.Y. 2)

*Darsh*  
10/6/24

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