FOUR YEAR UNDERGRADUATE PROGRAM (NEP 2020)
PROGRAM: BACHELOR OF SCIENCE (2024-28)
DISCIPLENE: 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		

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

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

Dr. Nelson Kerketta
Shaheed Nandkumar Patel
Vishwavidyalaya, Raigarh (C.G.)

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

PART – A: Introduction				
Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)		**Semester - I**		**Session: 2024-25**
1	**Course Code**	**MBSC- 01 T**		
2	**Course Title**	**Introductory Microbiology and Microbial techniques**		
3	**Course Type**	**DSC**		
4	**Prerequisite (If Any)**	**As per program**		
5	**Course Learning Outcomes (CLO)**	**At the end of this course, the students will be able to –** ➢ relate the development and scope of Microbiology ➢ illustrate the contributions made by prominent scientists including Indian Vedic Knowledge on microbiology ➢ demonstrate the nomenclature and characteristics of different types of microorganisms ➢ identify the basic techniques in microbiology ➢ explain the methods of microbial control		
6	**Credit Value**	**03 Credits**	**Credit = 15 Hours - Learning & Observation**	
7	**Total Marks**	**Max. Marks: 100**	**Minimum Passing marks: 40**	

PART – B: Content of the Course

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

Unit	**Topics (Course contents)**	**No. of Period**
I	**History and scope of microbiology** – History, development and Scope of Microbiology, Golden era of microbiology, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Alexander Fleming and Edward Jenner, The Forgotten Past of Microbiology in Indian Vedic Knowledge.	**12**
II	**Systems of classification** – Binomial nomenclature, principles of microbial classification, Whittaker's five kingdom and Carl Woese's three domain classification systems and their utility, Major groups of microorganisms; General features and structure of bacteria, virus, fungi, algae and protozoa.	**11**
III	**Microbial culture and staining techniques** – Obtaining pure culture by streaking, serial dilution and plating; types of culture media, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria, cultivation of fungi, actinomycetes and algae. Principle, procedure and applications of Simple staining, negative staining; Differential staining- Gram's staining, acid fast staining.	**11**
IV	**Microbial control** – Sterilization: Physical Agents - Heat: Boiling, Tyndallization, Steam under pressure (Autoclave), incineration, hot air Oven. Radiations: Ionizing and non-ionizing radiations. Filtration, Chemical agents - Disinfection, Antiseptic, Germicide, Sanitizer, Principle and application of Laminar airflow, Biological agents - Antibiotics	**11**
Key Words	**History and scope, Nomenclature, Pure culture technique, Microbial control**	

Name and Signature of Convener and Members of CBoS

10/6/24 10.6.24 Rashmi 10.6.24 10.6.24 10/6/24 10/6/24 10/6/24

Dr. Sadhana Taiload Dr. V. Chandhe Dr. K.K. Patel Dr. Nelson Xe

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

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Microbiology: P. D. Sharma, Rastogi Publications.
2. A textbook of Microbiology: R. C. Dubey and Maheshwari, S Chand publications.
3. General Microbiology, Vol. II, C. B. Powar and 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 Prescot, 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 Assignment/ Seminar – 10 Total Marks – 30	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
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

10/6/24 10.6.24 10.6.24 10.6.24

Dr. Kachan Choudhary 10/6/24 (DR. V Shanthi) 10.6.24 Dr. Sadhana Jaiswal 10/6/24

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

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

PART – A: Introduction			
Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)		**Semester I**	**Session: 2024-25**
1	**Course Code**	**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**

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=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

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

PART – A: Introduction			
Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)		**Semester - II**	**Session: 2024-25**
1	**Course Code**	MBSC-02 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, 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, 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–*Deinococcus, Spirochetes*. Alpha proteobacteria, *Rhizobium, Agrobacterium*. Gamma proteo-bacteria– *Escherichia, Pseudomonas)*. Gram positive low G+C; *Bacillus, Clostridium, Staphylococcus*. High G+C: *Streptomyces, Frankia*. General characteristics, **Ecological significance and economic importance of Archaea:** Methanogens, thermophiles (Thermococcus, pyrococcus, thermoplasma) and halophiles (halobacteria and halococcus).	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 - *Entamoeba, Giardia, Leishmania, Trypanosoma* and *Plasmodium*	11
Key Words	**Bacteria, Archaea, Virus, Bacteriophage, Prions, Protozoan**	

Name and Signature of Convener and Members of CBoS

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

10/6/24
Dr. Kadambari Chadar

10.6.24

Roshni
10.6.24

10.6.24

DR. L.K. Patel

Dr. Nelson Xes

10/6/24

10/6/24

Sadhana
10.06.24

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 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** Assignment/ Seminar – **10** Total Marks – **30**	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against **30** Marks
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

Chairman Studies ..... Manokumar Patel Vishwavidyalaya, Raigarh, C.G

10/6/24 · 10.6.24 · Rashmi 10.6.24 · 10.6.24 · 10/6/24 · 10.6.24 · 10.6.24 · Dr. Nelson Xess

Officer-In-Charge (Academic) Shaheed 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 –** ➢ 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, Maconkey'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

10/6/24 10/6/24 10.6.24 10.6.24 10.6.24 10.6.24 10/6/24 Dr. Nelson Xess Dr. R.C. Dubey

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

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

PART – A: Introduction

Program: Bachelor in Life Science (Certificate/Diploma/Degree/Honors)		Semester - I	Session: 2024-25
1	Course Code	MBGE- 01 T	
2	Course Title	Introductory Microbiology and Microbial techniques	
3	Course Type	Generic Elective (GE)	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➢ relate the development and scope of Microbiology ➢ illustrate the contributions made by prominent scientists including Indian Vedic Knowledge on microbiology ➢ demonstrate the nomenclature and characteristics of different types of microorganisms ➢ identify the basic techniques in microbiology ➢ explain the methods of microbial control	
6	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation
7	Total Marks	Max. Marks: 100	Minimum Passing marks: 40

PART – B: Content of the Course

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

Unit	Topics (Course contents)	No. of Period
I	**History and scope of microbiology** – History, development and Scope of Microbiology, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Alexander Fleming and Edward Jenner, The Forgotten Past of Microbiology in Indian Vedic Knowledge.	12
II	**Nomenclature and General features of microorganisms** – Binomial nomenclature, principles of microbial classification, Major groups of microorganisms; General features and structure of bacteria, virus, fungi, algae and protozoa.	11
III	**Microbial culture and staining techniques** – Pure culture techniques: streaking, serial dilution and plating; types of culture media, cultivation of fungi and algae. Principle, procedure and applications of Simple staining, negative staining; Differential staining- Gram's staining, acid fast staining.	11
IV	**Microbial control** – Sterilization: Physical Agents - Heat: Boiling, Tyndallization, Steam under pressure (Autoclave), incineration, hot air Oven. Radiations: Ionizing and non-ionizing radiations. Filtration, Chemical agents – types, Disinfection, Antiseptic, Germicide, Sanitizer, Principle and application of Laminar airflow.	11
Key Words	**History and scope, Nomenclature, Pure culture technique, Microbial control**	

Name and Signature of Convener and Members of CBoS

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Officer-In-Charge (Academic)
Shaheed Nandkumar Patel
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 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 Prescot, 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 Assignment/ Seminar – 10 Total Marks – 30	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
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

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

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

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

PART – B: Content of the Course

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

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

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.)

Chairman
Board of 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 - II	Session: 2024-25
1	Course Code	MBGE-02 T	
2	Course Title	Bacteriology, Virology and Protozoology	
3	Course Type	Generic Elective (GE)	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➢ recall the ultrastructure of bacteria ➢ relate ecological distribution of microorganism and their significances for society ➢ illustrate the essential and current knowledge of bacteria ➢ identify virus, protozoa and archaebacteria with their special characteristics ➢ outline the beneficial & harmful behavior of viruses, bacteria, protozoan and other microbes	
6	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation
7	Total Marks	Max. Marks: 100	Minimum Passing marks: 40

PART – B: Content of the Course

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

UNIT	TOPIC (Course Contents)	No. of Period
I	**Morphology and Ultra structure of Bacteria:** Cell size, shape and arrangements. Composition, structure and function of cell membrane, cell wall of gram-positive, gram-negative bacteria, capsule, flagella, pili, ribosomes, inclusions, endospore, plasmids.	12
II	**Eubacteria & Archaebacteria:** Gram negative- Characteristics of non-proteobacteria–*Deinococcus, Spirochetes.* Alpha proteobacteria- *Rhizobium, Agrobacterium.* Gamma proteo-bacteria- *Escherichia, Pseudomonas.* Gram positive- Characteristics of low G+C; *Bacillus, Clostridium, Staphylococcus.* High G+C: *Streptomyces, Frankia.* (General characteristics.) **Ecological significance and economic importance of Archaea:** Methanogens, thermophiles (Thermococcus, Pyrococcus) 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 - *Entamoeba, Leishmania, Trypanosoma* and *Plasmodium*	11
Key Words	**Bacteria, Archaea, Virus, Bacteriophage, Prions, Protozoan**	

Name and Signature of Convener and Members of CBoS

Dr. Radhey Choudhary 10/6/24 — 10-6-24 — 10.6.24 — 10.6.24 — 10/6/24 — 10/6/24 — Dr. Nelson Xess

Officer-In-Charge (Academic)
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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 Assignment/ Seminar – 10 Total Marks – 30	Better marks out of the two Test/ Quiz + obtained marks in Assignment shall be considered against 30 Marks
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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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)		
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, Maconkey'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**

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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 (Agaricus biporus), Milky mushroom (*Calocybe indica*), Oyster mushroom (*Pleurotus sajor kaju*) and paddy straw mushroom (*Volvariella volvacea*). (Observation). **Principles and Requisites:** Sterilization and disinfection of substrates, growth medium, isolation, spawn production and maintenance. (Observation) **Techniques of Cultivation:** Structure and construction of low-cost mushroom huts, layout of Traditional and Green house method. Maintenance of proper condition in mushroom huts, Composting, bed and polythene bag preparation, Spawning-casing-cropping. (Observation).	15
Lab./Field Training Contents	1.Preparation of laboratory Glassware (Chemical washing, cleaning and drying). 2.Basic information about autoclave, hot air oven, laminar air flow 3.Sterilization and sanitation of mushroom house, instruments etc. 4.Identification of edible and poisonous mushrooms. 5.Preparation of Mother Culture. Spawn- media preparation, Inoculation, and incubation. 6.Preparation of different types of bed for cultivation. 7.Cultivation of Mushroom using compost/ paddy straw/agricultural wastes. 10.Harvesting and post-harvest management of crops. (Observation & Practice)	30
Key Words	Mushroom, Spawning, Compost, Harvesting	

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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://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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