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

PART – A: Introduction				
Program: Bachelor in Life Science (Diploma/Degree/Honors)		**Semester - III**		**Session: 2024-25**
1	**Course Code**	**MBSC-03 T**		
2	**Course Title**	**Cell Biology and Biochemistry**		
3	**Course Type**	**DSC**		
4	**Prerequisite (If Any)**	**As per program**		
5	**Course Learning Outcomes (CLO)**	**At the end of this course, the student will able to –** ➢ illustrate the structural organization of eukaryotic and prokaryotic cells ➢ interpret cell division ➢ classify the biomolecules and compare their characteristics ➢ relate structure and functions of nucleic acids ➢ interpret the mechanism of enzyme action		
6	**Credit Value**	**03 Credits**	**Credit = 15 Hours - Learning & Observation**	
7	**Total Marks**	**Max. Marks: 100**	**Minimum Passing marks: 40**	

PART – B: Content of the Course

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

Unit	Topics (Course contents)	No. of Period
I	**History of Cell Biology:** Contribution of Indian Cell biologists and Biochemists: Ramakrishnan Nagaraj, Joyoti Basu, Veena Krishnaji Parnaik. **Cell Structure:** Prokaryotic and Eukaryotic cell, cellular organelles; Plasma membrane, Mitochondria, Golgi body, Nucleus, Ribosome, Lysosome, Endoplasmic reticulum. Cell division.	12
II	**Carbohydrate:** Structure, properties & classification of carbohydrates; Monosaccharides, Disaccharides and Polysaccharides. **Proteins:** Structure, properties & classification of amino acids. Structure & Classification of Protein- Primary, secondary; salient of α helix, β sheet, tertiary and quaternary.	11
III	**Lipid:** Structure, properties and classification of lipids. **Nucleic acids:** Structure of purine and pyrimidine bases, nucleoside and nucleotide; DNA structure and types: A, B, Z form; RNA - Structure, types and functions.	11
IV	**Enzymes:** Classification of enzymes, mechanisms of enzyme action; Lock and key hypothesis, induced fit hypothesis. Active site and activation energy, coenzyme, Isoenzyme, metal cofactors.; Allosteric enzymes. Enzyme inhibition; competitive, noncompetitive, uncompetitive.	11
Key Words	**Cell structure, Carbohydrates, Protein, Lipids, Enzymes, DNA, RNA**	

Name and Signature of Convener and Members of CBoS

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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** 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

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 enzyme 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 Lawry 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=hqbt7wtznrs
- 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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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF MICROBIOLOGY
COURSE CURRICULUM

PART – A: Introduction				
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester - IV		Session: 2024-25
1	Course Code	MBSC – 04 T		
2	Course Title	Bioinstrumentation and Biostatistics		
3	Course Type	DSC		
4	Prerequisite (If Any)	As per Program		
5	Course Learning Outcomes (CLO)	At the end of this course the student will able to – ➢ recall the principle of microscopy and compare the types of microscopes for specialized viewing ➢ identify the basic analytical instruments for performing microbiological manipulations ➢ relate the techniques used for processing the microbial samples ➢ recognize the basics of radiobiology and its applications ➢ illustrate basic concept of Biostatistics and develop their application		
6	Credit Value	03 Credits	Credit = 15 Hours - Learning & Observation	
7	Total Marks	Max. Marks: 100		Minimum Passing marks: 40

PART – B: Content of the Course

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

UNIT	TOPIC (Course Contents)	No. of Periods
I	**Microscopy:** Principle, Mechanism and application of different types of microscopes- Bright field, Dark field and Phase Contrast microscope; Fluorescence microscopy, Confocal microscopy, Scanning and Transmission Electron Microscopy (SEM & TEM). Micrometry **pH metry:** Principle, Types of electrodes, factors affecting pH measurement, application of pH meter.	12
II	**Centrifugation:** Principle and Types of Centrifugal Machines, Analytical, Preparatory, differential, Rate zonal and ultracentrifugation and their applications. **Chromatography:** Principle and techniques with applications of Partition, ion-exchange, exclusion and affinity chromatography. **Electrophoresis:** Principle of Agarose and Polyacrylamide Gel Electrophoresis, Components, working and applications.	11
III	**Spectrophotometry:** Electromagnetic spectrum, Basic principles and Law of absorption; principle, mechanism and applications of Visible and UV spectrophotometer. **Radiobiology:** Radioactivity, forms of radioactive emissions, biological effects of radiation exposure, characters of radioisotopes and their applications, Principles and methods of radioactive detection, GM counter, Scintillation counter and Autoradiography.	11
IV	**Biostatistics:** Definitions, Basic concepts, sample and population, Measurement scales, Statistical inference and parameters, methods of sampling, Classification of Data, Tabulation, Frequency distribution, diagrammatic and Graphical presentation of data, Data analysis- Central Tendencies (Mean, Median and Mode). Deviation (Variance, SD and SE).	11
Key Words	**Microscope, Centrifuge, pH meter, Chromatography, Electrophoresis, Spectrophotometer, Radiobiology, Biostatistics**	

Name and Signature of Convener and Members of CBoS

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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%2M2).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 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

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester IV	Session: 2024-25
1	Course Code	MBSC - 04 P	
2	Course Title	Lab. Course – MBSC-04	
3	Course Type	Laboratory Course	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course the student will able to – ➢ identify microorganisms on the basis of microscopic features ➢ relate common analytical techniques in microbiology ➢ infer the concept of Biostatistics ➢ explain the significance of central tendencies	
6	Credit Value	1 Credit	*Credit = 30 Hours. Laboratory or Field learning/ Training*
7	Total Marks	Max. Marks: 50	Min. Passing marks: 20

PART – B: Content of the Course

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

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

PART – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

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

Online Resources:

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

PART – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

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

Name and Signature of Convener and Members of CBoS

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

PART – A: Introduction			
Program: Bachelor in Life Science (Diploma/Degree/Honors)		**Semester - III**	**Session: 2024-25**
1	**Course Code**	**MBSE-01 T**	
2	**Course Title**	**Microbial Enzyme Technology**	
3	**Course Type**	**Discipline Specific Elective (DSE)**	
4	**Prerequisite (If Any)**	**As per Program**	
5	**Course Learning Outcomes (CLO)**	**At the end of this course, the students will be able to –** ➢ learn the fundamentals of enzymes, enzyme-action and metabolic reactions ➢ explain the mechanism of enzyme action ➢ relate enzyme modifications ➢ identify the applications of enzymes in various fields ➢ attain knowledge about various biochemical techniques	
6	**Credit Value**	**03 Credits**	**Credit = 15 Hours - Learning & Observation**
7	**Total Marks**	**Max. Marks: 100**	**Minimum Passing marks: 40**

PART – B: Content of the Course

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

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

Name and Signature of Convener and Members of CBoS

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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 ob 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** 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 Rashmi 10.6.24 10.6.24 10.6.24 Dr. Nelson Xess 10.6.24 10/6/24 10.6.24 10/6/24 Dr. Kachan Chowdhury

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

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

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

PART – B: Content of the Course

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

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

Name and Signature of Convener and Members of CBoS

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Dr. Nelson Xalxo

Part – C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. Industrial Microbiology: Patel A. H. (1996). I edition, MacMillan India Limited publishing company Ltd New Delhi, India.
2. A Text Book of Microbiology: R. C. Dubey & D. K. Maheshwari
3. Industrial Microbiology by Prescott & Dunns, AVI Publishing Company Inc.
4. Biotechnology; V. Kumaresan, Saras Publications

Reference Books:

1. Modern Industrial Microbiology and Biotechnology: Okafor N. (2007).1st edition. Bios Scientific Publishers Limited. USA.
2. Industrial Microbiology: Casida LE, New age International (P) Ltd.

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

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

Part – D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**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

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF MICROBIOLOGY

COURSE CURRICULUM

PART – A: Introduction			
Program: Bachelor in Life Science (Diploma/Degree/Honors)		Semester IV	Session: 2024-25
1	Course Code	MBSE-02 P	
2	Course Title	Lab. Course - MBSE-02	
3	Course Type	Laboratory course	
4	Prerequisite (If Any)	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to – ➢ recall Laboratory discipline, instrumentation and techniques involved in industrial microbiology ➢ develop skill to culture and identify industrially important microbes ➢ relate about design of Fermenter ➢ experiment with the whole steps of Fermentation	
6	Credit Value	1 Credit	*Credit = 30 Hours. Laboratory or Field learning/ Training*
7	Total Marks	Max. Marks: 50	Min. Passing marks: 20

PART – B: Content of the Course

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

Module	Topics (Course contents)	No. of Period
Lab./ Field Training/ Experiment contents of Course	1. Study of Bioreactor used in large scale production. 2. Isolation and characterization of Industrial microorganisms. 3. Isolation of antibiotic producing microorganisms from soil. 4. Demonstration of production of Amylase/ Protease/ Cellulase by microorganisms. 5. Demonstration of Production of lipase by microorganisms. 6. Production of ethanol by Yeast. 7. Production of Citric acid by *Aspergillus niger.*	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-microiology-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

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

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

PART – B: Content of the Course

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

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

Name and Signature of Convener and Members of CBoS

10/6/24 10/6/24 10.6.24 10-6-24 10.6.24 DR. K K Pcts DR. Nelson Xess DNAGAR (Dr. S Nagar)

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 Daginawala 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. Chakraborthy, 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
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**	

Name and Signature of Convener and Members of CBoS

10/6/24 10.6.24 Roshini 10.6.24 10.6.24 Dr. Nelson Xess

10/6/24 (Dr. Swetlana Nagar) 10/6/24 (DR. V. Shanthi) 10-6-24