

Shiv Chhatrapati Shikshan Sanstha's
Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)



**Structure and Curriculum of Four Year
Multidisciplinary Degree (Honors/Research)
Programme with Multiple Entry and Exit option**

Undergraduate Programme of Science and Technology

B.Sc. (Honors/Research) in Microbiology

Board of Studies

in

Microbiology

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

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**Rajarshi Shahu Mahavidyalaya,
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w.e.f. June, 2023

(In Accordance with NEP-2020)

Review Statement

The NEP Cell reviewed the Curriculum of **B.Sc. (Honors/Research) in Microbiology** Programme to be effective from the **Academic Year 2023-24**. It was found that, the structure is as per the NEP-2020 guidelines of Govt. of Maharashtra.

Date: 09/08/2023

Place: Latur

NEP CELL

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CERTIFICATE

I hereby certify that the documents attached are the Bonafide copies of the Curriculum of **B.Sc. (Honors/Research) in Microbiology** Programme to be effective from the **Academic Year 2023-24**.

Date: 14-07-2023

Place: Latur



(Dr. K.G. Maske)

Chairperson

Board of Studies in Microbiology
Rajarshi Shahu Mahavidyalaya, Latur
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Members of Board of Studies in the Subject Microbiology Under the Faculty of Science and Technology

Sr. No.	Name	Designation	In position
1	Dr.K.G.Maske Head, Department of Microbiology, Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)	Chairperson	HoD
2	Dr. B. S.Nagoba Assistant Dean (R D), Professor of Microbiology, MIMSR Medical College, Latur- 413 512 (MS), India	Member	V.C. Nominee
3	Dr. Ulhas K. Patil Government Institute of Science Aurangabad	Member	Academic Council Nominee
4	Dr A. M. Deshmukh Former Professor and President, Microbiologist Society of India	Member	Academic Council Nominee
5	Dr. Manmohan Bajaj Product Manager, BIOGENE INDIA, New Delhi	Member	Expert from outside for Special Course
6	Dr.Vinodkumar Patil Director, Dyna Biotech 98/A5,Hadapsar Industrial Estate Bhd. Kirloskar Pneumatic Co., Hadapsar, Pune	Member	Expert from Industry
7	Dr Mahesh S. Dharane Sr.Scientist, Division of Biochemical Sciences,Dr. Homi Babha Road,Pashan, NCL, Pune	Member	P.G. Alumni
8	Dr.D.V.Vedpathak	Member	Faculty Member
9	Dr.K.I.Momin	Member	Member from same Faculty

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From the Desk of the Chairperson...

The National Education Policy lays particular emphasis on the development of the creative potential of each individual. NEP-2020 has conceptualized the idea to develop well rounded competent individuals for making the nation a self-reliant and global leader.

Department of Microbiology has developed a curriculum framework to encompass the goals of NEP 2020. Microbiology is study of microorganisms such as bacteria, protozoa, algae, fungi, viruses, etc. These studies integrate cytology, physiology, ecology, genetics and molecular biology, evolution, taxonomy and systematics with a focus on microorganisms. It is one of the significant branches of sciences to understand the principles of life which has roots in the study of various microbial systems. Microbiology has been at the forefront of research in industry, environment, agriculture, food, dairy, medicine and biology. It is one of the rapidly growing and applied areas of the science. Many job opportunities available for student in this stream. Trained manpower is required in industrial production of microbial products. Considering rural and agro based life background and awareness about the general health and hygiene , our curriculum is designed to educate our students in various important microbiological domains, as well as to promote and develop skills and competencies that have great value.

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Board of Studies in Microbiology

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Faculty of Science and Technology

Structure for Four Year Multidisciplinary Undergraduate Degree Programme in Microbiology Multiple Entry and Exit (In accordance with NEP-2020)

Year & Level	Sem	Major		Minor	GE/OE	VSC/SEC (VSEC)	AEC/VEC	OJT,FP,CEP,RP	Credit per Sem.	Cum./Cr. per exit
		DSC	DSE							
1	2	3		4	5	6	7	8	9	10
I 4.5	I	DSC I: 04 Cr. DSC II: 04 Cr.	NA	NA	GE-I: 04 Cr.	VSC-I: 02 Cr. SEC-I: 02 Cr.	AEC-I MIL: 02 Cr. VEC-I: 02 Cr.	CC-I: 02 Cr. (NSS, NCC, Sports, Cultural)/ CEP-I: 02 Cr. (SES-I)/ OJT: 02 Cr. / Mini Project: 02 Cr.	22	44 Cr. UG Certificate
	II	DSC III: 04 Cr. DSC IV: 04 Cr.	NA	NA	GE-II: 04 Cr.	VSC-II: 02 Cr. SEC-II: 02 Cr.	AEC-II MIL: 02 Cr. VEC-II: 02 Cr.	Generic IKS: 02 Cr.	22	
	Cum. Cr.	16	-	-	08	04+04 = 08	04+02 +02=0 8	04	44	
Exit Option: Award of UG Certificate in Major with 44 Credits and Additional 04 Credits Core NSQF Course/Internship or continue with Major and Minor										

Abbreviations:

1. DSC : Discipline Specific Core (Major)
2. DSE : Discipline Specific Elective (Major)
3. DSM : Discipline Specific Minor
4. GE/OE : Generic/Open Elective
5. VSEC : Vocational Skill and Skill Enhancement Course
6. VSC : Vocational Skill Courses
7. SEC : Skill Enhancement Course
8. AEC : Ability Enhancement Course
9. MIL : Modern Indian Languages
10. IKS : Indian Knowledge System
11. FSRCE : Fostering Social Responsibility & Community Engagement
12. VEC : Value Education Courses
13. OJT : On Job Training
14. FP : Field Projects
15. CEP : Community Engagement and Service
16. CC : Co-Curricular Courses
17. RP : Research Project/Dissertation
18. SES : Shahu Extension Services

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Department of Microbiology

B.Sc. (Honors/Research) Microbiology

Year & Level	Semester	Course Code	Course Title	Credits	No. of Hrs.	
I 4.5	I	101MIB1101 (DSC-I)	Introductory Microbiology	03	45	
		101MIB1103	Lab Course-I	01	30	
		101MIB1102 (DSC-II)	Methods in Microbiology	03	45	
		101MIB1104	Lab Course-II	01	30	
		GE-I	From Basket	04	60	
		101MIB1501 (VSC-I)	Food Fermentation Technology	02	45	
		(SEC-I)	From Basket	02	30	
		(AEC-I)	From Basket	02	30	
		(VEC-I)	Constitution of India	02	30	
		AIPC/OJT-I	Field Project	02	60	
	Total Credits				22	
	II	101MIB2101 (DSC-III)	Basics of Microbiology and Biomolecules	03	45	
		101MIB2103	Lab Course-III	01	30	
		101MIB2102 (DSC-IV)	Microbial Nutrition	03	45	
		101MIB2104	Lab Course-IV	01	30	
		GE-II	From Basket	04	60	
		101MIB2502 (VSC-II)	Bio pesticide production	02	45	
		(SEC-II)	From Basket	02	30	
		(AEC-II)	From Basket	02	30	
		(VEC-II)	FSRCE (CBPR)	02	30	
		Generic IKS	Introduction to Indian Knowledge System	02	60	
	Total Credits				22	
Total Credits (Semester I & II)				44		



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Faculty of Science & Technology After the completion of the B.Sc. programme, a student will have obtained:

Programme Outcomes (POs) for B.Sc. Programme	
After the completion of the B.Sc. programme, a student will have obtained:	
PO 1	Disciplinary Knowledge Comprehensive knowledge of science subjects which constitute the graduate programme and execution of scientific knowledge in the specific area.
PO 2	Scientific Outlook The qualities of a science graduate such as observation, precision, analytical mind, logical thinking, clarity of thought and expression and systematic approach.
PO 3	Self-Directed Life-long Learning Ability to appear for various competitive examinations or choose the post graduate programme or other related programme of their choice.
PO 4	Research Skills Functional knowledge and applications of instrumentation and laboratory techniques to do independent experiments, interpret the results and develop research ethos.
PO 5	Problem Solving Skills Analytical and logical skills and critical thinking to extract information from qualitative and quantitative data, formulate and solve problems in a systematic and rational manner.
PO 6	Professional Competence and Ethics Aptitude and skills to perform the jobs in diverse fields such as science, engineering, industries, survey, education, banking, development and planning, business, public service, self-business etc. with human rationale and moral values.



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Programme Specific Outcomes (PSOs) for B.Sc. Microbiology (Honors/Research)	
PSO No.	Upon completion of this programme the students will be able to
PSO 1	Academic Competence Comprehensive knowledge in the underlying principles of Microbiology, basics in Microbiology and Biomolecules, Methods, Microbial nutrition and growth, fundamentals of immunology, Environmental Microbiology, Production of Biofertilizer, Agricultural Microbiology.
PSO 2	Scientific Outlook Scientific temperament with the help of experiments and practicals in Microbiology such as observation of microorganism through microscope, use of microbial techniques, experiments to test physiochemical factors, perform hematological procedures
PSO 3	Personal and Professional Competence Competence to do awareness about hematological, microorganisms and causation of diseases, environmental, agricultural issues and can work to solve the environmental issues with the help of knowledge in Microbiology.
PSO 4	Entrepreneurial Competence Capacity to move in the start-up of bio fertilizer, pathology lab, Food Fermentation, Production of Probiotics for good health, medical services or work for the conservation of environment or can work in such organizations.
PSO 5	Research Competence An ability to work over minor and preliminary research in human health, environmental issues, production of various secondary metabolites of human benefit by fermentation processes and other related issues.

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Department of Microbiology

Course Type: DSC-I

Course Title: Introductory Microbiology

Course Code: 101MIB1101

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To learn scope of microbiology.
- LO 2. To understand beneficial and harmful role of microorganism
- LO 3. To understand the contribution of scientists in development of Microbiology.
- LO 4. To study different types of microorganisms and their characteristics.
- LO 5. To study taxonomy of Microbes and methods of their classification.

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Describe Scope of microbiology in the various fields
- CO 2. Explain historical developments in microbiology
- CO 3. Explain characteristics of different types of microorganisms
- CO 4. Explain various methods of classification.
- CO 5. Explain ecofriendly applications of microbial activities for better human life

Unit No.	Title of Unit & Contents	Hrs.
I	Scope of Microbiology	10
	<ol style="list-style-type: none">1. Definition and concept.2. Distribution of Microorganisms in nature.3. Scope in applied fields of Microbiology: Air Microbiology, Water Microbiology, Sewage Microbiology, Agricultural Microbiology, Food & dairy Microbiology, Industrial Microbiology, Medical Microbiology.4. Scope in advanced fields of microbiology: Advanced branches in Microbiology: Pharmaceutical microbiology, Geomicrobiology, Nano-biotechnology and Space Microbiology, Bioinformatics.5. Role of Micro-organisms in human welfare-Agriculture, Human health and Industries	
	Unit Outcomes: UO 1. Student will be able communicate importance of microorganisms in society UO 2. Student will be able Execute Ecofriendly applications of microbial activities for better human life.	
II	Historical developments in microbiology	12
	<ol style="list-style-type: none">1. Discovery of microbial world: Contribution of Antony van Leeuwenhoek	

Unit No.	Title of Unit & Contents	Hrs.
	<ol style="list-style-type: none"> 2. Controversy over spontaneous generation - Contribution of Fransisco Redi, John Needham, Lazzaro Spallanzani, Theodor Schwan, Franz Schulze, Friedrich Schroder, Von Dusch, Louis Pasteur, John Tyndall 3. Contribution of Robert Koch in Recognition of microbial role in diseases and pure culture concept. 4. Contribution of Louis Pasteur: Recognition of microbial role in Fermentation and Pasteurization . 5. Breakthroughs in medical field: Contribution of Joseph Lister (antiseptic surgery), Paul Ehrlich (Chemotherapy), Alexander Fleming (Penicillin), Discovery of Streptomycin by Walksman, 6. Development of Immunology: Edward Jenner Vaccination, Story of Rabies vaccine, contribution of Elie Metchnikoff (Phagocytosis). 7. Development of Soil Microbiology: Contribution of Martinus W. Beijerinck, Sergei N. Winogradsky. <p>Unit Outcome:</p> <p>UO 1. Student will be able to perform experiments used to study role of microbes by scientists.</p> <p>UO 2. Student will explain contribution of scientist's in development of different fields of microbiology</p>	
III	Types of microorganisms and their characteristics	13
	<ol style="list-style-type: none"> 1. Types of microorganisms and their characteristics (with reference to classification, occurrence, morphology, replication, and importance) Bacteria (Eubacteria, Archaeobacteria, Actinomycetes), Protozoa , Fungi, Algae, Viruses . 2. The eukaryotic cell structure. 3. The Prokaryotic cell structure. 4. Comparison between Eukaryotic and Prokaryotic cell. 5. General characteristics of Rickettsia 6. General characteristics Chlamydia and Mycoplasma <p>Unit Outcomes:</p> <p>UO 1. Student will be able to describe Eukaryotic and Prokaryotic cell</p> <p>UO 2. Student will be able to examine morphological and differential characteristics of different groups of microorganisms</p>	
IV	Taxonomy of Microbes	10
	<ol style="list-style-type: none"> 1. Classification. 2. Systems of classification: Three domain classification and Whittaker's Five kingdom 3. Taxonomic Groups 4. Goals of classification 5. Nomenclature. 6. Polyphasic taxonomy. 	

Unit No.	Title of Unit & Contents	Hrs.
	<p>7. Bacterial Taxonomy - Introduction to Bergey's Manual of Systematics of Archae & Bacteria (BMSAB) and Bergey's International Society for Microbial Taxonomy (BISMIS).</p> <p>Unit Outcomes: UO 1. Student will apply this knowledge to identify microorganisms UO 2. Student will be able to describe nomenclature of microorganisms</p>	

Learning Resources:

1. A Chronology of Microbiology in Historical Context, Beck R. W. (2000). United Kingdom: ASM Press.
2. A textbook of fungi, bacteria and Viruses, Dubey H. C. (2004), Vikas Publishing House Private Limited. New Delhi, India
3. A textbook of Microbiology, Dubey R. C. and D. K. Maheshwary. (2012), S Chand and Company. New Delhi, India
4. A Textbook of Microbiology, Ananthanarayan and Paniker (Orient Black Swan, 7th edition) 2016
5. Brock Biology of Microorganisms, Bender K. S., Buckley D. H., Stahl D. A., Sattley W. M. And Madigan M. T. (2017). E-Book, Global Edition. United Kingdom: Pearson Education.
6. Elementary Microbiology, Vol. I and II. Dr. A. H Modi, Akta Prakashan. Nadiad
7. Essentials of Microbiology, Jain A. and Jain P. (2019). Elsevier- India.
8. Fundamental Principles of Bacteriology, Salle A. J. (McGraw-Hill Book Co. New York and London 1973) 7th Edition
9. Fundamentals of Microbiology, Frobisher M., (W. B. Saunders, Philadelphia, 1962) 7th edition.
10. General Microbiology . Stanier R. Y., Ingraham J. L., Wheelis M. L. and Painter P. R., (Macmillan Education Ltd., London, 2001) 5th edition.
11. General microbiology ,Volume I. Powar C. B. and Daginawala H. I. (2005).. Himalaya Publishing House Private Limited, Pune, India.
12. General microbiology, Volume II. Powar C. B. and Daginawala H. I. (2005). Himalaya Publishing House, Private Limited, Pune, India
13. Microbiology: An Application based Approach, Pelczar M. J. Jr., Chan E.C.S. and Krieg N. R. (2010). McGraw-Hill Education (India) Private Limited, New Delhi, India.
14. Microbiology: Principles and Explorations, 7th edition. Black JG. (2008).. Prentice Hall
15. Principles of Microbiology, Atlas RM. (1997). 2nd edition. WM.T.Brown Publishers.



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Department of Microbiology

Course Type: Lab Course

Course Title: Lab Course –I (Based on DSC-I)

Course Code: 101MIB1103

Credits: 01

Max. Marks: 50

Hours: 30

Learning Objectives

- L O 1. To learn good laboratory practices and bio safety measures.
- L O 2. To understand principles involved in working of light microscope.
- L O 3. To study principle and working of laboratory instruments.
- L O 4. To learn staining techniques for observation of microbial morphology
- L O 5. To understand SOP for handling and disposal of microbial cultures.

Course outcomes

After completion of the course, students will be able to-

- CO 1. Appropriately prepare slides for microscopic observations.
- CO 2. Handle light microscope and observe microorganisms.
- CO 3. Use aseptic techniques for the transfer and handling of microbial cultures.
- CO 4. Prepare and use appropriate microbiological culture media and test systems;
- CO 5. Record morphology of algae, fungi and protozoa.

Practical No.	Unit
1	Biosafety in microbiology laboratory
2	Biosafety measures-Laboratory sanitation
3	To understand Good laboratory practices.
4	Handling of microbial cultures precaution and disposal.
5	Microscopy- Different parts of compound microscope.
6	Use, care & Handling of compound microscope.
7	Study of laboratory equipments used for Sterilization: Autoclave, Hot air oven, Bacterial filters.
8	Study of laboratory equipments used for Cultivation-Incubator, Biosafety cabinet Anaerobic jar.
9	Simple staining: Monochrome and Negative staining.
10	Differential: Gram's staining, acid fast staining.
11	To record morphology of algae, fungi and protozoa.

N.B.: Any Ten Practical from above.

Learning Resources:

- 1) Handbook of media, stains and reagents in microbiology, A. M. Deshmukh, PAMA publication, Karad, 1997
- 2) Microbiology, Singh R.P., Kalyani Publication.
- 3) Practical Microbiology, Dubey, Maheshwari, S. Chand, 2022
- 4) Microbiology, Yadav Manju, Discovery Publishing House, New Delhi
- 5) Biochemical Methods, s. Sadasivam and A. Manickam, New age international publishers, 2008
- 6) Handbook of Microbiology, P. S. Bisen and Kavita Verma, CBS publishers and distributors, new Delhi, 2007
- 7) Modern Tools and Techniques to Understand Microbes, Ajit Varma, Arun Kumar Sharma, Springer International Publishing, 2017.
- 8) Handbook of media, stains and reagents in microbiology, A. M. Deshmukh, PAMA publication, Karad, 1997
- 9) Microbiology, Singh R.P., Kalyani Publication.
- 10) Practical Microbiology, Dubey, Maheshwari, S. Chand, 2022
- 11) Microbiology, Yadav Manju, Discovery Publishing House, New Delhi
- 12) Biochemical Methods, s. Sadasivam and A. Manickam, New age international publishers, 2008
- 13) Handbook of Microbiology, P. S. Bisen and Kavita Verma, CBS publishers and distributors, new Delhi, 2007
- 14) Modern Tools and Techniques to Understand Microbes, Ajit Varma, Arun Kumar Sharma, Springer International Publishing, 2017



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Department of Microbiology

Course Type: DSC-II

Course Title: Methods in Microbiology

Course Code: 101MIB1102

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives

- LO 1. To understand principle and working of light microscope
- LO 2. To understand principle and working of light microscope
- LO 3. To learn microbial staining technique.
- LO 4. To study different agents and methods of sterilization.
- LO 5. To study agents used for controlling growth of microorganisms.

Course outcomes

After completion of the course, students will be able to-

- CO 1. Apply staining methods to observe different morphological forms of microorganisms.
- CO 2. Handle microscope for observation of microorganisms.
- CO 3. Apply different methods of sterilization.
- CO 4. Perform pure culture techniques.
- CO 5. Explain effect of various environmental factors on growth.

Unit No.	Title of Unit & Contents	Hrs
I	Microscopy	10
	<ol style="list-style-type: none">1. Terms in microscopy – Electromagnetic spectrum of light, concepts of magnification, Refractive index, Numerical aperture, Resolving power2. Types of Microscopes : Bright field, Dark field, Phase contrast, fluorescent microscope3. Compound Microscope: Part of microscope -condensers, eyepieces and objectives, image formation, Ray diagram and applications.4. Concept of aberrations in lenses - spherical, chromatic.5. Electron Microscope –Parts, principle of image formation, Ray diagram and applications. Comparative study of compound and electron microscope. Unit Outcome: UO 1.Student will explain design and working of microscope. UO 2. Student can observe microorganisms using microscope	
II	Microbial Staining Techniques	12
	<ol style="list-style-type: none">1. Definitions: Stain, Dye, Mordent, Chromogen , Leuco	

	<p>compound, Flurochrome ,Decolorizing agent and Counter stain.</p> <ol style="list-style-type: none"> Types of stains: Auxochrome, chromophore, Acidic stain, Basic stain, Neutral stain ,Chromogen. Theories of Staining: Physical and chemical. Simple staining: Monochrome & Negative staining (Principles, Mechanism, Procedure and Observation). Differential staining: Gram's and Acid Fast staining (Principles, Mechanism, Procedure and Observation). Structural staining: Cell wall, Capsule, Endospore, Flagella. PHB and Metachromatic granule Staining. <p>Unit Outcome: UO 1. Student will be able to identify various morphological forms of bacteria using simple and differential staining techniques. UO 2. Student will be able to use staining methods for observation of different structures of bacteria.</p>	
III	Sterilization and disinfection	13
	<ol style="list-style-type: none"> Definition of Sterilization, Disinfection, Antiseptic, Germicide, Sanitizer, Fungicide, Vermicide, Bacteriostatic and Bactericidal agent. Sterilization by Physical Agent Heat: Moist Heat: Steam under pressure (Autoclaving) , Boiling, Pasteurization Dry heat: Incineration, Hot air Oven. Radiation: Ionizing and Non-ionizing radiations. Filtration: Types of Bacteriological filters Chemical Disinfectants -Characteristics of an ideal disinfectant, Evaluation of Disinfectant by Phenol Coefficient method. Chemical Agents: Phenol and Phenolic compounds, Alcohols, Halogens. Gaseous sterilizing Agents: Formaldehyde, Ethylene Oxide, β-Propiolactone. <p>Unit Outcomes: UO 1. Student will be able to apply methods of sterilization and disinfection UO 2. Student can apply this knowledge for personal hygiene</p>	
IV	Effect of environmental factors on microbial growth and survival	10
	<ol style="list-style-type: none"> Effect of Temperature on Growth Effect of pH (Acidic environment) on Growth. Effect of Osmotic pressure (Saline environment) on Growth. Effect of Oxygen on Growth. Effect of Hydrostatic pressure on Growth. Effect of Heavy metals on Growth. <p>Survival of bacteria under unfavorable conditions: Endospore and cyst.</p> <p>Unit Outcome: UO 1. Student will be able to describe effect of environ-mental</p>	

	factors on microbial growth.	
	UO 2. Student will be able to apply this concept for controlling microbial growth	

Learning Resources:

1. A textbook of Microbiology. Dubey R. C. and D. K. Maheshwary. (2012). S Chand and Company. New Delhi, India
2. Brock Biology of Microorganisms. Bender K. S., Buckley D. H., Stahl D. A., Sattley W. M. And Madigan M. T. (2017). E-Book, Global Edition. United Kingdom: Pearson Education.
3. Elementary Microbiology Vol. I and II. Dr. A. H Modi. Akta Prakashan. Nadiad
4. Essentials of Microbiology. Jain A. and Jain P. (2019). Elsevier- India.
5. Fundamental Principles of Bacteriology, Salle A. J. (McGraw-Hill Book Co. New York and London 1973) 7th Edition
6. Fundamentals of Microbiology, Frobisher M., (W. B. Saunders, Philadelphia, 1962) 7th edition.
7. General Microbiology . Stanier R. Y., Ingraham J. L., Wheelis M. L. and Painter P. R., (Macmillan Education Ltd., London, 2001) 5th edition.
8. General microbiology Volume I. Powar C. B. and Daginawala H. I. (2005).. Himalaya Publishing House Private Limited, Pune, India.
9. General microbiology Volume II. Powar C. B. and Daginawala H. I. (2005). Himalaya Publishing House, Private Limited, Pune, India
10. Microbiology by Prescott L.M. Harley J.P. and Klein Donald A., W. M. C. Brown publishers.
11. Microbiology: An Application based Approach. Pelczar M. J. Jr., Chan E.C.S. and Krieg N. R. (2010). McGraw-Hill Education (India) Private Limited, New Delhi, India.
12. Microbiology: Fundamentals and Applications by Purohit S.S. Agro-Botanical publishers Bikaner, India.
13. Microbiology: Principles and Explorations. 7th edition. Black JG. (2008).. Prentice Hall
14. Principles of Microbiology. Atlas RM. (1997). 2nd edition. WM.T.Brown Publishers.

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Department of Microbiology

Course Type: Lab Course

Course Title: Lab Course -II (Based on DSC-II)

Course Code: 101MIB1104

Credits: 01

Max. Marks: 50

Hours: 30

Learning Objectives

LO 1. To study technique for measurement bacterial size

LO 2. To stain and observe structural features of bacterial cells.

LO 3. To study methods of controlling microbial growth and contaminants.

LO 4. To study preparation and sterilization of simple media.

LO 5. To study preparation and sterilization of differential media.

Course outcomes

After completion of course the student will be able to-

CO 1. Determine size of microorganisms.

CO 2. Perform staining of cell structures and record observations.

CO 3. Use aseptic techniques .

CO 4. Prepare and sterilize culture media.

CO 5. Prepare agar plates and agar slants.

Practical No.	Unit
1	Measurement of bacterial cell size: Micrometry.
2	Staining and observation of Cell wall and Capsule.
3	Staining of Endospores by Dorner's method
4	Staining of Flagella by PKG method
5	Staining and observation of PHB granules .
6	Demonstration of basic techniques in Microbiology: Wrapping of glassware, cotton plugging, cleaning and washing glassware.
7	Preparation and sterilization of Nutrient broth , Nutrient Agar, MacConkey's Broth , MacConkey's Agar and Sugar fermentation media.
8	Preparation of Simple medium for cultivation of autotrophs.
9	To Study methods for Controlling growth and spread of microbes in laboratory
10	To understand SOP for biological waste disposal

Learning Resources:

- 1) Handbook of media, stains and reagents in microbiology, A. M. Deshmukh, PAMA publication, Karad, 1997

- 2) Microbiology, Singh R.P., Kalyani Publication.
- 3) Practical Microbiology, Dubey, Maheshwari, S. Chand, 2022
- 4) Microbiology, Yadav Manju, Discovery Publishing House, New Delhi
- 5) Biochemical Methods, s. Sadasivam and A. Manickam, New age international publishers, 2008
- 6) Handbook of Microbiology, P. S. Bisen and Kavita Verma, CBS publishers and distributors, new Delhi,2007
- 7) Modern Tools and Techniques to Understand Microbes, Ajit Varma, Arun Kumar Sharma, Springer International Publishing, 2017.
- 8) Handbook of media, stains and reagents in microbiology, A. M. Deshmukh, PAMA publication, Karad, 1997
- 9) Microbiology, Singh R.P., Kalyani Publication.
- 10) Practical Microbiology, Dubey, Maheshwari, S. Chand, 2022
- 11) Microbiology, Yadav Manju, Discovery Publishing House, New Delhi
- 12) Biochemical Methods, s. Sadasivam and A. Manickam, New age international publishers, 2008
- 13) Handbook of Microbiology, P. S. Bisen and Kavita Verma, CBS publishers and distributors, new Delhi,2007
- 14) Modern Tools and Techniques to Understand Microbes, Ajit Varma, Arun Kumar Sharma, Springer International Publishing, 2017



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Rajarshi Shahu Mahavidyalaya,
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Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Department of Microbiology

Course Type: VSC-I

Course Title: Food Fermentation Technology

Course Code: 101MIB1501

Credits: 02

Max. Marks: 50

Lectures: 30 Hrs.

Learning Objectives:

- LO 1. To emphasize vocational importance of fermented food technology
- LO 2. To explain the advantages and health benefits of fermented foods
- LO 3. To demonstrate the role of microorganisms in production of fermented foods
- LO 4. To develop skills and techniques for production of fermented food products

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Describe the health benefits of fermented food products
- CO 2. Describe the biochemical and technological aspects of fermented foods
- CO 3. Design their own marketable products using the basic knowledge of fermentation technology

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to Fermentation Process:	8
	Fermentation process and microorganisms involved in it, Fermentation media and conditions of fermentation, Design of fermenter. Fermentation and Probiotics - Definition, types, advantages and health benefits	
	Unit Outcomes: UO 1. Students able to explain the fermented foods and their advantages in human health UO 2. Students able to observe and recognize different types of microorganisms involved in food fermentation process	
II	Milk Based Fermented Foods	7
	Curd, Yogurt, and cheese: Preparation of inoculums, types of microorganisms, Biochemical process	
	Unit Outcomes: UO 1. Students able to explain different types of fermented milk products and the biochemical reactions involved in its production UO 2. Students will prepare inoculum and produce yogurt	
III	Vegetable and Fruit based Fermented Foods	8

	Pickles, Sauerkraut, wine: Microorganisms involved, Biochemical activity and Production process	
	Unit Outcome: UO 1. Students able to explain different types of fermented Vegetable and fruit products and the biochemical activities involved in its production UO 2. Students will prepare pickle and fruit wine.	
IV	Cereal Based Fermented Foods	7
	Idli, Dosa, Fermented millet: Microorganisms, Biochemical activity and Production process	
	Unit Outcomes: UO 1. Students able to explain different types of fermented cereal products and the biochemical activities involved in its production UO 2. Students will prepare idli	
V	Practicals (Included in above 04 units)	
	1. Demonstration of different types of microorganisms involved in fermentation process 2. Preparation of inoculum for milk based fermented foods 3. Production of Yogurt 4. Production of pickle 5. Production of fruit Wine 6. Production of Idli	

Learning Resources:

1. An Introduction to Industrial Microbiology. K. Sukesh. S. Chand Limited · 2010
2. Handbook of food and fermentation technology. Hui YH, Meunier-Goddik L, Josephsen J, Nip WK, Stanfield PS. CRC Press. 2004.
3. Advances in Fermented Foods and Beverages. Holzapfel W. Woodhead Publishing. 2014.
4. A comprehensive dairy microbiology. Yadav JS, Grover, S and Batish VK. Metropolitan. 1993.
5. Industrial Microbiology. David B. Wilson, Hermann Sahn, Klaus-Peter Stahmann, Mattheos Koffas. Wiley. 2019
6. Ethnic Fermented Foods and Beverages of India: Science History and Culture. Jyoti Prakash Tamang. Springer Nature Singapore. 2020
7. Microbial Production of Fermented Foods. Nandkishor Jha.
Link: <https://www.biologydiscussion.com/foods/microbial-production-of-fermented-foods/10402>
8. Model Project Report on Fruit & Vegetable Processing Unit. National Bank for Agriculture and Rural Development. July, 2024



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Department of Microbiology

Course Type: DSC-III

Course Title: Basics of Microbiology and Biomolecules

Course Code: 101MIB2101

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. Understand structure of cell, cell organelles and their functions
- LO 2. Understand viral structure, replication and cultivation.
- LO 3. Understand glycoside linkage and structures of carbohydrates and lipids.
- LO 4. Understand structure and classification of proteins and nucleic acid, highlighting their biological significance.

Course Outcomes:

After completion of the course, students will be able to-

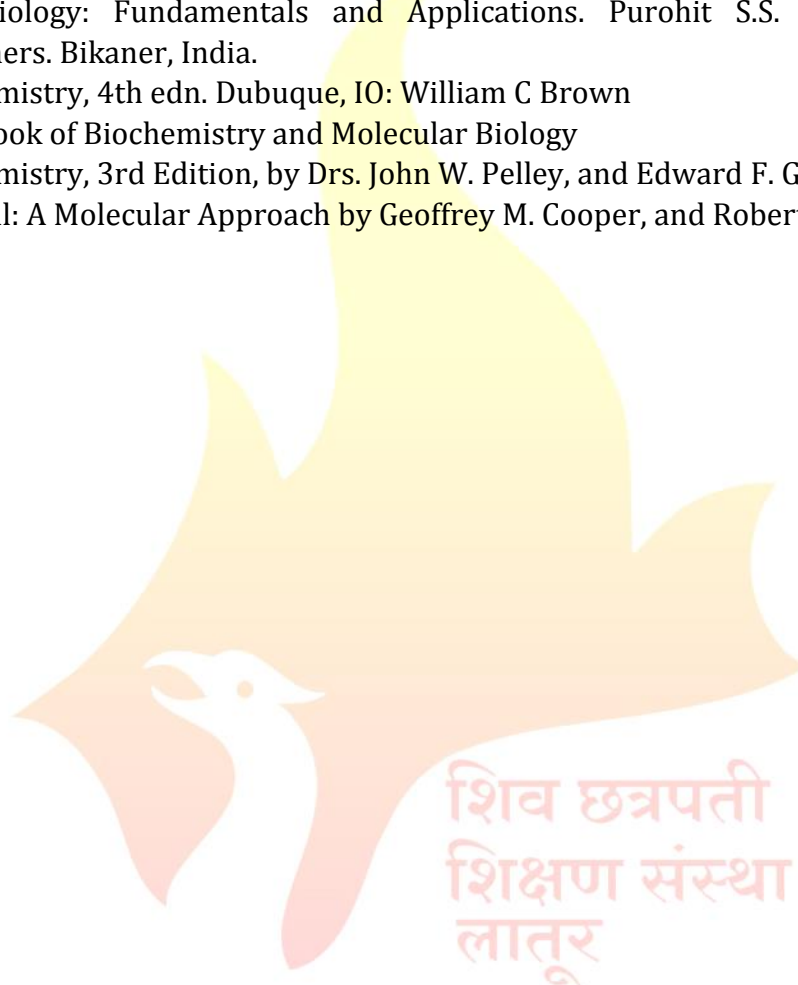
- CO 1. Analyze the structure, chemical composition, and functions of bacterial cellular components, including dormant forms.
- CO 2. Describe the historical development and general characteristics of viruses, including their distribution among bacterial, plant, and animal hosts
- CO 3. Explain the structures and classifications of carbohydrates and lipids, emphasizing their biological significance.
- CO 4. Describe the structures and functions of DNA and RNA, and their importance in genetic information.

Unit No.	Title of Unit & Contents	Hrs.
I	Ultra structure of bacterial cell	12
	Structure, Chemical composition and function of following:- <ol style="list-style-type: none">1. Capsule and slimes2. Cell wall and Cytoplasmic membranes3. Flagella and Motility, fimbriae and pili4. Nuclear material, Plasmids, Mesosomes, Ribosome5. Reserve materials and other cellular inclusions.6. Dormant forms of prokaryote: Endospore and cyst	
	Unit Outcomes: Students will be able to <ul style="list-style-type: none">UO 1. Differentiate between the capsule and slime layers, describing their respective structures and compositionsUO 2. Demonstrate comprehension of the structural characteristics of the cell wall and cytoplasmic membranes, linking them to their functions	

Unit No.	Title of Unit & Contents	Hrs.
II	The Viruses: Distribution and structure	12
	<ol style="list-style-type: none"> 1. Viruses: History 2. General characteristics of viruses 3. Bacterial, plant and animal viruses 4. Multiplication of Virulent phage: The lytic cycle 5. The development of temperate phages: Lysogeny 6. Cultivation of viruses 7. Viruses like agent :Viroids, Prion, Satellites 	
	Unit Outcome: Students will be able to UO 1. Understand the role of flagella in bacterial motility, as well as the functions of fimbriae and pili in attachment and biofilm formation	
III	Biomolecules	11
	<ol style="list-style-type: none"> 1. Carbohydrates: Definition and classification <ol style="list-style-type: none"> a) Monosaccharides Glucose, Galactose, Ribose, Xylose b) Disaccharides:- Glycoside linkage (Lactose, Maltose and Sucrose) c) Oligosaccharides:- Trisaccharides (Structure of Raffinose) d) Polysaccharides:- Homo and Heteropolysaccharides Structure (Starch, Cellulose,) 2. Lipids: Definition and classification, Biological significance 	
	Unit Outcomes: Students will be able to UO 1. Describe methods of microbial reproduction, their growth phases and measurement of growth UO 2. Explain the types of bacterial cultures and their significance	
IV	Functional and Informational Biomolecules	10
	<ol style="list-style-type: none"> 1. Proteins: Definition and Classification <ol style="list-style-type: none"> a) Peptide bond: Configurations of proteins b) Biological significance of proteins 2. Nucleic Acids: <ol style="list-style-type: none"> a) Nucleosides and Nucleotides. b) Structure and functions of DNA c) Structure, types and functions of RNA 	
	Unit Outcomes: Students will be able to UO 1. Explain types and importance of biomolecules in microbial life process	

Learning Resources:

1. Microbiology. Pelczar, Chan and Krieg. McGraw-Hill Inc.US
2. General Microbiology. Powar and Daginawala. Vol-I. Himalaya Publishing House
3. Elementary Microbiology (Fundamentals of Microbiology). Modi H.A.: Vol. II. Ekta Prakashan, Nadiad, Gujrat.
4. Biochemistry, Seventh Edition. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, W.H. Freeman & Company. 2010
5. Lehninger: Principles of Biochemistry. Albert L. Lehninger, Michael Cox and DavidL. Nelson (4 May 2004), W. H. Freeman.
6. Microbiology: Fundamentals and Applications. Purohit S.S. Agro-Botanical publishers. Bikaner, India.
7. Biochemistry, 4th edn. Dubuque, IO: William C Brown
8. Handbook of Biochemistry and Molecular Biology
9. Biochemistry, 3rd Edition, by Drs. John W. Pelley, and Edward F. Goljan.
10. The Cell: A Molecular Approach by Geoffrey M. Cooper, and Robert E. Hausman



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Department of Microbiology

Course Type: Lab Course

Course Title: Lab Course III (Based on DSC III)

Course Code: 101MIB2103

Credits: 01

Max. Marks: 50

Hours: 30

Learning Objectives:

LO 1 To study method for isolation of coliphages.

LO 2 To study qualitative and quantitative analysis of carbohydrates and proteins

LO 3 To study principles and procedure of qualitative analysis of nucleic acids

Course Outcomes:

After completion of the course, students will be able to -

CO 1 Demonstrate method for the presence of viruses.

CO 2 Perform qualitative and quantitative assay of carbohydrates and proteins

CO 3 Perform qualitative and quantitative assay of nucleic acids

Practical No.	Unit
1	Isolation of coliphages from sewage water.
2	Qualitative and quantitative analysis of Carbohydrates by Sumner's method
3	Qualitative and quantitative analysis of Protein by Biuret test
4	Qualitative and quantitative analysis of DNA by Diphenyl amine test
5	Qualitative and quantitative analysis of RNA by Orcinol test
6	Effect of physical agents on growth of bacteria: pH, Temperature U.V. rays(Demonstration)
7	Effect of chemical agents on bacterial growth: Antibiotic and Phenolic compounds.
8	Effect of Heavy metal ions (Oligodynamic Action)

Learning Resources: Learning Resources:

- 1) Handbook of media, stains and reagents in microbiology, A. M. Deshmukh, PAMA publication, Karad, 1997
- 2) Microbiology, Singh R.P., Kalyani Publication.
- 3) Practical Microbiology, Dubey, Maheshwari, S. Chand, 2022
- 4) Microbiology, Yadav Manju, Discovery Publishing House, New Delhi

- 5) Biochemical Methods, s. Sadasivam and A. Manickam, New age international publishers, 2008
- 6) Handbook of Microbiology, P. S. Bisen and Kavita Verma, CBS publishers and distributors, new Delhi, 2007
- 7) Modern Tools and Techniques to Understand Microbes, Ajit Varma, Arun Kumar Sharma, Springer International Publishing, 2017
- 15) Handbook of media, stains and reagents in microbiology, A. M. Deshmukh, PAMA publication, Karad, 1997
- 16) Microbiology, Singh R.P., Kalyani Publication.
- 17) Practical Microbiology, Dubey, Maheshwari, S. Chand, 2022
- 18) Microbiology, Yadav Manju, Discovery Publishing House, New Delhi
- 19) Biochemical Methods, s. Sadasivam and A. Manickam, New age international publishers, 2008
- 20) Handbook of Microbiology, P. S. Bisen and Kavita Verma, CBS publishers and distributors, new Delhi, 2007
- 21) Modern Tools and Techniques to Understand Microbes, Ajit Varma, Arun Kumar Sharma, Springer International Publishing, 2017



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Rajarshi Shahu Mahavidyalaya,
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Department of Microbiology

Course Type: DSC-IV

Course Title: Microbial Nutrition and Growth

Course Code: 101MIB2102

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- L01 To understand the properties, preparation of different types of culture media and Bacterial cultivation techniques'
- L02 To understand the nutritional requirements of bacteria and transport mechanisms
- L03 To understand the bacterial growth pattern and measurement of growth
- L04 To acquire knowledge of important biomolecule and their significance in microbial life

Course Outcomes:

After completion of the course, students will be able to-

- C01 Describe the significance of cultivation media and pure culture techniques
- C02 Explain the necessary nutritional elements and their transport mechanisms
- C03 Explain the phases of microbial growth and methods of growth measurement
- C04 Describe the importance microbial cell growth

Unit No.	Title of Unit & Contents	Hrs.
I	Cultivation media and Pure culture methods	12
	<ol style="list-style-type: none">1. Definitions - pure culture, mixed culture, consortium, axenic culture, contamination.2. Properties of a good culture medium.3. General ingredients of culture media and their role4. Definition, Concept, Use and Types of different culture media – Living and Nonliving media, Synthetic, Non-synthetic, Natural, Selective, Differential, Enriched, Enrichment, Assay, Minimal, Maintenance and Transport Medium.5. Buffers in culture medium6. Isolation and Cultivation of bacteria: Principle and method of isolation-streak plate, pour plate, spread plate, single cell isolation, Anaerobic bacteria	
	Unit Outcomes: Students will be able to UO 1. Describe the role of general ingredients of culture media UO 2. Describe the various types of culture media and techniques of isolation and cultivation of bacteria	
II	Microbial Nutrition and nutrient transport	12
	<ol style="list-style-type: none">1. Major bio-elements, Minor bio-elements, Growth factors	

Unit No.	Title of Unit & Contents	Hrs.
	2. Nutritional categories of microorganisms on the basis of carbon and energy source 3. Nutrient transport and membrane function: Modes of nutrition, primary and secondary transport, porins, OMP, carrier proteins 4. Passive and Facilitated diffusion 5. Group translocation and Active transport mechanisms Unit Outcome: UO 1. Describe the nutritional essentials for microbial growth and their transport mechanisms	
III	Microbial Transport	11
	1. Modes of nutrition: osmotrophic, phagotrophic 2. Nutrient transport and membrane function: primary and secondary transport, porins, OMP, carrier proteins 3. Passive diffusion Measurement of growth: cell number, cell mass, cell activity 4. Facilitated diffusion 5. Active transport mechanism 6. Group translocation Unit Outcomes: Students will be able to UO 1. Describe methods of microbial Nutrition UO 2. Explain the Active & Passive transport in microorganism	
IV	Microbial Growth	10
	1. Microbial Growth – Binary fission, Budding, fragmentation and formation of conidiophores 2. Mathematical expression of growth 3. Growth curve and diauxic growth 4. Measurement of growth: cell number, cell mass and cell activity 5. Different types of bacterial cultures -Batch culture, continuous culture, synchronous culture UO 1. Explain the bacterial growth pattern and measurement of growth	

Learning Resources:

1. Microbiology. Pelczar, Chan and Krieg. McGraw-Hill Inc.US
2. General Microbiology. Powar and Daginawala. Vol-I. Himalaya Publishing House
3. Elementary Microbiology (Fundamentals of Microbiology). Modi H.A.: Vol. II. Ekta Prakashan, Nadiad, Gujrat.
4. Biochemistry, Seventh Edition. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, W.H. Freeman & Company. 2010
5. Lehninger: Principles of Biochemistry. Albert L. Lehninger, Michael Cox and DavidL. Nelson (4 May 2004), W. H. Freeman.

6. Microbiology: Fundamentals and Applications. Purohit S.S. Agro-Botanical publishers. Bikaner, India.



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Department of Microbiology

Course Type: Lab Course

Course Title: Lab Course IV (Based on DSC IV)

Course Code: 101MIB2104

Credits: 01

Max. Marks: 50

Hours: 30

Learning Objectives:

LO 1 To study microbial techniques for isolation of microorganisms in pure culture.

LO 2 To gain knowledge related to cultivation of anaerobic spore formers

LO 3 To understand SOP for disposal of microbial culture.

LO 4 To understand methods of stock culture maintenance.

Course Outcomes:

After completion of course the student will be able to-

CO 1 Perform isolation of bacterial cultures.

CO 2 Carry out cultivation of anaerobic spore formers, fungi and algae .

CO3. Execute SOP for disposal of microbial culture.

CO 4. Maintain stock cultures of microorganisms.

Practical No.	Unit
1	To study Streak plate method methods for Isolation of bacteria
2	To study spread plate method for Isolation of bacteria
3	To study Pour plate method for enumeration of microorganisms from soil sample.
4	Cultivation of anaerobic spore forming bacteria from cow dung or agriculture waste
5	To perform isolation of fungi from rotten vegetables
6	To perform cultivation of blue green algae
7	Study of bacterial growth curve (Demonstration)
8	To study stock culture maintenance methods : Serial sub culturing, soil stocks and refrigeration.

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Department of Microbiology

Course Type: VSC-II

Course Title: Bio pesticide production

Course Code:

Credits: 02

Max. Marks: 50

Lectures: 30 Hrs.

Learning Objectives:

- LO 1. To study impact of pesticide on environment and Human health.
- LO 2. To study application of microbes as bio controlling agents
- LO 3. Understand technology of biopesticides production
- LO 4. Determine impact of bio pesticide in field

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Identify specific adverse effects on non-target species, leading to informed measures for sustainable pesticide use.
- CO 2. Identify of specific microorganisms effective as biocontrolling agents, contributing to the development of environmentally friendly and sustainable pest management strategies
- CO 3. Acquired a comprehensive understanding of biopesticide production technology empowers students to actively contribute to sustainable agriculture practices, promoting environmentally friendly alternatives for pest management.
- CO4 . Gain practical insights for effective and sustainable pest management practices.

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction : Pesticides and Bio pesticides	8
	<ol style="list-style-type: none">1. Classification of pesticides Types of Pest and pesticides2. Mechanism of toxicity, use in agriculture and house hold practices3. Biodegradable and non-biodegradable pesticides4. Impact of pesticides on environment and human health, opportunities and challenges	
	Unit Outcomes: UO 1. Students able to explain impact of pesticide UO 2. Students able to observe and recognize different types of microorganisms involved in Biopesticide production.	
II	Microbes as bio controlling agent.	7
	<ol style="list-style-type: none">1. Pests and Bio pesticides2. Bio control potential of : <i>Bacillus sp. Pseudomonas,</i>	

	<i>Trichoderma</i>	
	Unit Outcomes: UO 1. Students able to explain different types of Microorganisms involved in Bio pesticides production	
III	Production of bio pesticides	8
	1. Screening of Bio control agent 2. Isolation , cultivation and mass production 3. Formulation and testing in-vitro	
	Unit Outcome: UO 1. Students able to explain Screening procedure for biopesticides UO 2. Students will prepare biopesticides.	
IV	Field Study	7
	1. Application of Formulation in the field 2. Preparation of Report	
	Unit Outcomes: UO 1. Students able to explain different application of biopesticides production .	
V	Practicals (Included in above 04 units)	
	1. To isolate plant pathogens from infected plants 2. To isolate Bacillus sp from soil 3. To isolate Pseudomonas sps from soil 4 . To isolate Actinomycetes strains from soil 5. To determine biocontrol potential of isolates 6 . formulation of biopesticides 7. Application of biopesticides in field	

Learning Resources:

1. Opender Koul, Gadi V. P. Reddy, George W. Cuperus, "Biopesticides: State of the Art and Future Opportunities" CRC Press, 2019
2. Philip W. C. Green "Bio pesticides Handbook", Wiley-Blackwell 2015.
3. Fereti A. Kyerematen "Bio pesticides: Use and Delivery", Humana Press, 2020
4. Rajeev K. Upadhyay, Narendra K. Dubey, Ashok K. Upadhyaya "Biopesticides: Production and Application" CABI, 2018
5. Rachana Singh, Rudra Deo Tripathi, Vivek K. Singh "Biopesticides in Sustainable Agriculture", Springer 2014.



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UG First Year

Basket I: Generic/Open Elective (GE/OE)

(GEs offered to the Science & Technology students in Sem.-I)

Sr. No.	BoS Proposing GE/OE	Code	Course Title	Credits	Hrs.
1	Commerce	101ENG1401	Mutual Fund Management	04	60
2	Commerce	101COS1401	Fundamentals of Statistics	04	60
3	English	101COA1401	English for Science and Technology	04	60
4	Geography	101MAR1401	General Geography	04	60
5	Commerce	101MAT1401	Personal Financial Management	04	60
6	Marathi	101POL1401	स्पर्धा परीक्षा आणि मराठी भाषा	04	60
7	Political Science	101BIO1401	Human Rights	04	60
8	Biotechnology	101COM1401	Nutrition, Health and Hygiene	04	60
9	Music	101MUS1401	Indian Vocal Classical & Light Music	04	60
10	NCC Studies	101NCC1401	Introduction to NCC	04	60
11	Sports	101SPO1401	Counseling and Psychotherapy	04	60

Note: Student can choose any one GE from the basket.

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Basket II: Skill Enhancement Courses (SEC)

(SEC offered to the Science & Technology students in Sem.-I)

Sr. No.	BoS Proposing SEC	Code	Course Title	Credits	Hrs.
1	Chemistry	101MAE1601	Pesticides and Green Chemistry	02	30-45
2	Information Technology	101COS1601	Basics of Python Programming	02	30-45
3	Physics	101ENG1601	Physics Workshop Skills	02	30-45
4	Biotechnology	101ENG1602	Food Processing Technology	02	30-45
5	Botany	101GEO1601	Mushroom Cultivation Technology	02	30-45
6	English	101COA1601	Proof Reading and Editing	02	30
7	Information Technology	101MAR1601	PC Assemble and Installation	02	30-45
8	Marathi	101ENG1603	कथा/पटकथालेखन	02	30
9	Zoology	101ZOO1601	Bee Keeping	02	30-45

Note: Student can choose any one SEC from the basket.

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Basket III: Ability Enhancement Courses (AEC)

(AEC offered to the Science & Technology students in Sem.-I)

Sr. No.	BoS Proposing AEC	Code	Course Title	Credits	Hrs.
1	Marathi	101MAR7101	भाषिक कौशल्य भाग - १	02	30
2	Hindi	101HIN7101	हिंदी भाषा शिक्षण भाग - १	02	30
3	Sanskrit	101SAN7101	व्यावहारीक व्याकरण व नितिसुभाषिते	02	30
4	Pali	101PAL7101	उपयोजित व्याकरण	02	30

Note: Student can choose any one AEC from the basket.



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UG First Year

Extra Credit Activities

Sr. No.	Course Title	Credits	Hours T/P
1	MOOCs	Min. of 02 credits	Min. of 30 Hrs.
2	Certificate Courses	Min. of 02 credits	Min. of 30 Hrs.
3	IIT Spoken English Courses	Min. of 02 credits	Min. of 30 Hrs.

Guidelines:

Extra -academic activities

1. All extra credits claimed under this heading will require sufficient academic input/ contribution from the students concerned.
2. Maximum 04 extra credits in each academic year will be allotted.
3. These extra academic activity credits will not be considered for calculation of SGPA/CGPA but will be indicated on the grade card.

Additional Credits for Online Courses:

1. Courses only from SWAYAM and NPTEL platform are eligible for claiming credits.
2. Students should get the consent from the concerned subject Teacher/Mentor/Vice Principal and Principal prior to starting of the course.
3. Students who complete such online courses for additional credits will be examined/verified by the concerned mentor/internal faculty member before awarding credits.
4. Credit allotted to the course by SWAYAM and NPTEL platform will be considered as it is.

Additional Credits for Other Academic Activities:

1. One credit for presentation and publication of paper in International/National/State level seminars/workshops.
2. One credit for measurable research work undertaken and field trips amounting to 30 hours of recorded work.
3. One credit for creating models in sponsored exhibitions/other exhibits, which are approved by the concerned department.
4. One credit for any voluntary social service/Nation building exercise which is in collaboration with the outreach center, equivalent to 30 hours
5. All these credits must be approved by the College Committee.

Additional Credits for Certificate Courses:

1. Students can get additional credits (number of credits will depend on the course duration) from certificate courses offered by the college.
2. The student must successfully complete the course. These credits must be approved by the Course Coordinators.
3. Students who undertake summer projects/ internships/ training in institutions of repute through a national selection process, will get 2 credits for each such activity. This must be done under the supervision of the concerned faculty/mentor.

Note:

1. The respective documents should be submitted within 10 days after completion of Semester End Examination.
2. No credits can be granted for organizing or for serving as office bearers/ volunteers for Inter-Class / Associations / Sports / Social Service activities.
3. The office bearers and volunteers may be given a letter of appreciation by the respective staff coordinators. Besides, no credits can be claimed for any services/activities conducted or attended within the college.
4. All claims for the credits by the students should be made and approved by the mentor in the same academic year of completing the activity.
5. Any grievances of denial/rejection of credits should be addressed to Additional Credits Coordinator in the same academic year.
6. Students having a shortage of additional credits at the end of the third year can meet the Additional Credits Coordinator, who will provide the right advice on the activities that can help them earn credits required for graduation.

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Examination Framework

Theory:

40% Continuous Assessment Tests (CATs) and 60% Semester End Examination (SEE)

Practical:

50% Continuous Assessment Tests (CATs) and 50% Semester End Examination (SEE)

Course	Marks	CAT & Mid Term Theory				CAT Practical		Best Scored CAT & Mid Term	SEE	Total
		Att.	CAT I	Mid Term	CAT II	Att.	CAT			
1	2	3				4		5	6	5 + 6
DSC/DSE/GE/OE/Minor	100	10	10	20	10	-	-	40	60	100
DSC	75	05	10	15	10	-	-	30	45	75
Lab Course/AIPC/OJT/FP	50	-	-	-	-	05	20	-	25	50
VSC/SEC/AEC/VEC/CC	50	05	05	10	05	-	-	20	30	50

Note:

1. All Internal Exams are compulsory
2. Out of 02 CATs best score will be considered
3. Mid Term Exam will be conducted by the Exam Section
4. Mid Term Exam is of Objective nature (MCQ)
5. Semester End Exam is of descriptive in nature (Long & Short Answer)
6. CAT Practical (20 Marks): Lab Journal (Record Book) 10 Marks, Overall Performance 10 Marks.

॥ आर्योह तमसो ज्योतिः ॥

Rajarshi Shahu Mahavidyalaya,
Latur (Autonomous)