

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)

w.e.f. June, 2023
(In Accordance with NEP-2020)

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

(Autonomous)



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

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 (Autonomous), Latur | 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 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 |

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.



(Dr. K. G. Maske)
Chairperson
Board of Studies in Microbiology



Rajarshi Shahu Mahavidyalaya, Latur

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Index

| Sr. No. | Content | Page No. |
|---------|--|----------|
| 1 | Structure for Four Year Multidisciplinary UG Programme | 1 |
| 2 | Abbreviations | 2 |
| 3 | Courses and Credits | 3 |
| 4 | UG Program Outcomes | 4 |
| 5 | Programme Specific Outcomes | 5 |
| 6 | Curriculum: Semester-I | 6 – 15 |
| 7 | Basket I: Generic/Open Elective (GE/OE) | 16 |
| 8 | Basket II: Skill Enhancement Courses (SEC) | 17 |
| 9 | Basket III: Ability Enhancement Courses (AEC) | 18 |
| 10 | Extra Credit Activities | 19-20 |
| 11 | Examination Framework | 21 |



Rajarshi Shahu Mahavidyalaya, Latur

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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 | DSCIII: 04 Cr. DSC IV: 04 Cr. (IKS) | NA | NA | GE-II: 04 Cr. | VSC-II: 02 Cr. SEC-II: 02 Cr. | AEC- II MIL: 02 Cr. VEC- II: 02 Cr. | CC-II: 02 Cr. (NSS, NCC, Sports, Cultural)/ CEP-II: 02 Cr. (SES-II)/ OJT: 02 Cr. / Mini Project: 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**



Rajarshi Shahu Mahavidyalaya, Latur

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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 | | 02 | 60 | |
| | Total Credits | | | | 22 | |
| | II | 101MIB2105 (DSC-III) | Basics of Microbiology and Biomolecules | 03 | 45 | |
| | | 101MIB2107 | Lab Course-III | 01 | 30 | |
| | | 101MIB2106 (DSC-IV) IKS | Traditional Microbiology | 03 | 45 | |
| | | 101MIB2108 | Lab Course-IV | 01 | 30 | |
| | | GE-II | From Basket | 04 | 60 | |
| | | 101MIB2502 (VSC-II) | Introduction to Industrial Microbiology | 02 | 45 | |
| | | (SEC-II) | From Basket | 02 | 30 | |
| | | (AEC-II) | From Basket | 02 | 30 | |
| | | (VEC-II) | FSRCE (CBPR) | 02 | 30 | |
| | | AIPC/OJT-II | | 02 | 60 | |
| | Total Credits | | | | 22 | |
| Total Credits (Semester I & II) | | | | 44 | | |



Rajarshi Shahu Mahavidyalaya, Latur

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Faculty of Science & Technology

| Programme Outcomes (POs) for B.Sc. Programme | |
|--|--|
| PO 1 | |
| PO 2 | |
| PO 3 | |
| PO 4 | |
| PO 5 | |
| PO 6 | |
| PO 7 | |



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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 | Understand and use methods of visualizing microorganisms, controlling growth of microorganisms, isolation of microorganisms from different sources and their maintenance. |
| PSO 2 | Describe the importance of existence, beneficial and harmful role of microorganisms in air, water, food and waste. |
| PSO 3 | Understand, describe and apply various methods of microbiological analysis and controlling microbial growth and activities for making these life governing factors safe. |
| PSO 4 | Describe the immunological concepts with reference to infection, immunity, immunological reactions, diagnostic methods. |
| PSO 5 | Demonstrate that microorganisms have an indispensable role in the - environment, including elemental cycles, environmental cleanup, etc. and the role of microorganisms in plant growth promotion and disease management. |
| PSO 6 | Describe the basic concepts of bacterial mutations, damage of DNA and its repair mechanisms, the recombination, transposition and genetic exchange processes. |
| PSO 7 | Describe the gene and its expression, exploit the highly advanced molecular and gene cloning techniques. |
| PSO 8 | Cite examples of the crucial role of microorganisms in agriculture, biotechnology, fermentation, medicine, and other industries important to human wellbeing. |
| PSO 9 | Demonstrate entrepreneurship abilities, innovative thinking, planning, and setting up small-scale enterprises. |
| PSO 10 | Demonstrate the ability to identify key questions in microbiological research optimize research methods, and analyze outcomes by adopting scientific methods |



Rajarshi Shahu Mahavidyalaya, Latur

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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 course the student 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 |

| Unit No. | Title of Unit & Contents | Hrs. |
|------------|--|-----------|
| | <ol style="list-style-type: none"> 1. Discovery of microbial world: Contribution of Antony van Leeuwenhoek 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: UO 1. Student will be able to perform experiments used to study role of microbes by scientists. 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: UO 1. Student will be able to describe Eukaryotic and Prokaryotic cell 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.



Rajarshi Shahu Mahavidyalaya, Latur

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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

LO 1. To learn good laboratory practices and bio safety measures.

LO 2. To understand principles involved in working of light microscope.

LO 3. To study principle and working of laboratory instruments.

LO 4. To learn staining techniques for observation of microbial morphology

LO 5. To understand SOP for handling and disposal of microbial cultures.

Course outcomes

After completion of course the student 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 Practicals from above.



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

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 course the student 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 | 45 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. <p>Comparative study of compound and electron microscope.</p> <p>Unit Outcome:</p> <p>UO 1. Student will explain design and working of microscope.</p> <p>UO 2. Student can observe microorganisms using microscope</p> | |
| II | Microbial Staining Techniques | 12 |
| | <ol style="list-style-type: none">1. Definitions: Stain, Dye, Mordant, Chromogen, Leuco compound, Flurochrome, Decolorizing agent and Counter stain. | |

| Unit No. | Title of Unit & Contents | 45 Hrs. |
|------------|---|-----------|
| | <ol style="list-style-type: none"> 2. Types of stains: Auxochrome, chromophore, Acidic stain, Basic stain, Neutral stain, Chromogen. 3. Theories of Staining: Physical and chemical. 4. Simple staining: Monochrome & Negative staining (Principles, Mechanism, Procedure and Observation). 5. Differential staining: Gram's and Acid Fast staining (Principles, Mechanism, Procedure and Observation). 6. 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"> 1. Definition of Sterilization, Disinfection, Antiseptic, Germicide, Sanitizer, Fungicide, Vermicide, Bacteriostatic and Bactericidal agent. 2. 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 3. Chemical Disinfectants -Characteristics of an ideal disinfectant, Evaluation of Disinfectant by Phenol Coefficient method. 4. Chemical Agents: Phenol and Phenolic compounds, Alcohols, Halogens. 5. 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"> 1. Effect of Temperature on Growth 2. Effect of pH (Acidic environment) on Growth. 3. Effect of Osmotic pressure (Saline environment) on Growth. 4. Effect of Oxygen on Growth. 5. Effect of Hydrostatic pressure on Growth. 6. 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 environmental factors on microbial growth. UO 2. Student will be able to apply this concept for controlling microbial growth</p> | |

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 |

N.B.: Any Ten Practicals from above.



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 course the student 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, conditions of fermentation, Design of fermenter. Fermented Foods and Products - 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.
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7. Microbial Production of Fermented Foods. Nandkishor Jha.
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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 | 101AAF1401 | Mutual Fund Management | 04 | 60 |
| 2 | Commerce | 101MAE1401 | Fundamentals of Statistics | 04 | 60 |
| 3 | English | 101ENG1402 | English for Science and Technology | 04 | 60 |
| 4 | Geography | 101GEO1401 | General Geography | 04 | 60 |
| 5 | Commerce | 101BAI1401 | Personal Financial Management | 04 | 60 |
| 6 | Marathi | 101MAR1401 | स्पर्धा परीक्षा आणि मराठी भाषा | 04 | 60 |
| 7 | Political Science | 101POL1401 | Human Rights | 04 | 60 |
| 8 | Biotechnology | 101BIO1401 | 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



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

UG First Year

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 | 101CHE1601 | Pesticides and Green Chemistry | 02 | 30-45 |
| 2 | Information Technology | 101COM1601 | Basics of Python Programming | 02 | 30-45 |
| 3 | Physics | 101PHY1601 | Physics Workshop Skills | 02 | 30-45 |
| 4 | Biotechnology | 101BIO1601 | Food Processing Technology | 02 | 30-45 |
| 5 | Botany | 101BOT1601 | Mushroom Cultivation Technology | 02 | 30-45 |
| 6 | English | 101ENG1601 | Proof Reading and Editing | 02 | 30 |
| 7 | Information Technology | 101COA1601 | PC Assemble and Installation | 02 | 30-45 |
| 8 | Marathi | 101MAR1601 | कथा/पटकथालेखन | 02 | 30 |
| 9 | Zoology | 101ZOO1601 | Bee Keeping | 02 | 30-45 |

Note: Student can choose any one SEC from the basket



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

UG First Year

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 | व्यावहारिक व्याकरण व नितिसुभाषिते | 02 | 30 |
| 4 | Pali | 101PAL7101 | उपयोजित व्याकरण | 02 | 30 |

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



Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

UG First Year

Extra Credit Activities

| Sr. No. | Course Title | Course Code | 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 |
|------------------------|-------|-----------------------|-------|----------|--------|---------------|-----|----------------------------|-----|-------|
| | | 3 | | | | 4 | | | | |
| 1 | 2 | Att. | CAT I | Mid Term | CAT II | Att. | CAT | 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.