Re-Accredited 'B++' 2.88 CGPA by NAAC
VEER NARMAD SOUTH GUJARAT UNIVERSITY
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વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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સંદર્ભ: યુનિવર્સિટી કાર્યાલયના તા.૧૨–૦૭–૨૦૨૩, ક્રમાંક : એસ./સાયન્સ/પરિપત્ર/૧૭૬૫૩/૨૦૨૩

–: પરિપત્ર :–

વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન તમામ કોલેજોનાં આચાર્યશ્રીઓને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવનાર શિક્ષણ વિભાગના રાજયની તમામ ઉચ્ચ શૈક્ષણિક સંસ્થાઓ માટે રાષ્ટ્રીય શિક્ષણ નીતિ ૨૦૨૦ અંતર્ગત કોમન કરીકયુલમ એન્ડ ક્રેડિટ ફ્રેમવર્ક હેઠળ ક્રેડિટ માળખું અમલીકરણ માટે નિયત કરવા બાબત અંગેના તા.૧૧/૦૭/૨૦૨૩, ઠરાવ ક્રમાંક: KCG/admin/2023-24/0607 /kh.1 અનુસાર તથા વિજ્ઞાન વિદ્યાશાખાનાં સ્ટ્રકચર મુજબ શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવનાર B.Sc. Microbiology Sem-1 & 2 નો Major, Minor, Multidisciplinary અને SEC નો અભ્યાસક્રમ માઈક્રોબાયોલોજી વિષયની અભ્યાસ સમિતિ વતી અભ્યાસ સમિતિનાં ચેરમેનશ્રીએ અને વિજ્ઞાન વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિજ્ઞાન વિદ્યાશાખા વતી વિજ્ઞાન વિદ્યાશાખાનાં અધ્યક્ષશ્રીએ મંજૂર કરી - એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૧૭/૦૮/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંક:૧૨ થી મંજૂર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

એકેડેમિક કાઉન્સિલની તા.૧૭/૦૮/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંક:૧૨

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવનાર B.Sc.Microbiology Sem-1 & 2 નો Major, Minor, Multi- disciplinary અને SEC નો અભ્યાસક્રમ માઈક્રોબાયોલોજી વિષયની અભ્યાસ સમિતિ વતી અભ્યાસ સમિતિનાં ચેરમેનશ્રીએ અને વિજ્ઞાન વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિજ્ઞાન વિદ્યાશાખા વતી વિજ્ઞાન વિદ્યાશાખાનાં અધ્યક્ષશ્રીએ મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણનો સ્વીકાર કરી મંજૂર કરવામાં આવે છે.

(બિડાણ: ઉપર મુજબ)

ક્રમાંક : એસ./સાયન્સ/પરિપત્ર/૨૧૫૫૩/૨૦૨૩
તા.૧૮–૦૮–૨૦૨૩

કુલસચિવ વતી

પ્રતિ,
૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન તમામ કોલેજોનાં આચાર્યશ્રીઓ/વિભાગીય વડાશ્રીઓ.
..... આપશ્રીની કોલેજ/વિભાગના સંબંધિત શિક્ષકોને જાણ કરી અમલ કરવા સારૂ.
૨) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા.
૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

.....તરફ જાણ તેમજ અમલ સારૂ.

Veer Narmad South Gujarat University, Surat

B.Sc. (Microbiology) Syllabus
NEP 2023

(Effective from July, 2023)

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

B. Sc. MICROBIOLOGY

NEP 2023

B. Sc. in Microbiology is a three-year Bachelor degree course which can be pursued after passing 12th Science. The subject includes the study of different forms of microorganisms and the development of microbiology. It mainly focuses on the understanding of the versatile metabolism of the varied microorganisms and the wide applicability of these life forms in environmental remediation, health and diseases, food and dairy as well as applying them for industrial and commercial utility. The course includes the study of allied subjects for the better understanding and use of microorganisms.

Program Outcome:

- Students shall learn various aspects of microbiology such as bacteriology, virology, algology, microbial physiology, bacterial genetics, immunology, biochemistry, rDNA technology.
- Students shall gain knowledge of applied microbiology such as industrial microbiology, environmental microbiology, industrial microbiology, food and dairy microbiology.
- Students shall learn about the presence of microorganisms in air, water, soil and its role in developing a sustainable environment.
- Students shall acquire the awareness regarding the importance of microorganisms in plant, animal, human health and diseases.
- Students shall gain knowledge of microbial technology and its applications in the production of industrially important microbial products.
- Students shall become aware of the role of microbes in the development of molecular biology and the advancements in genetic modifications technologies.
- Generate skilled manpower ready to use by industries in various sectors.

Program specific outcome:

- Students will develop the skill to observe, isolate, identify and cultivate microorganisms.
- Students will acquire and demonstrate proficiency in good laboratory practices in microbiology laboratories.
- Students will develop practical skills of tools and techniques used to study microbiology.
- Students will develop oral and written communication skills, effective presentation skills and interpretation skills from observed results.
- Students will be graduates in microbiology who shall understand the societal problems and play a vital role by providing microbial solutions.
- Students will be able to build their careers in public and global health, environmental organizations, food, pharmaceuticals and fermentation industries.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

B. Sc. MICROBIOLOGY

Teaching & Evaluation Scheme

F. Y. B. Sc. Semester – I

MAJOR (MJ) COURSE: Credit 04 (03 Theory + 01 Practical)

Course code	Course Title	Course credit	Teaching schedule Hrs./ week	Internal marks (CEE)	External marks (SEE)	Total marks (CCE+SEE)	Duration of external exams (Hr.)
MB-MJ-101	Fundamentals of Microbiology	03	03	35	35	70	02
MB-MJ-102	Microscopy and Staining Techniques	03	03	35	35	70	02
MBP MJ 1	Practicals	02	04	30	30	60	04
Total				100	100	200	

MINOR (ME)-DOMAIN SPECIFIC / ELECTIVE COURSE: Credit 04 (02 Theory+02 Practical)

Course code	Course Title	Course credit	Teaching schedule Hrs./ week	Internal marks (CEE)	External marks (SEE)	Total marks (CCE+SEE)	Duration of external exams (Hr.)
MB-ME-101	Eukaryotic Cell Structure	02	02	25	25	50	01
MBP-ME-1	Practicals	02	04	25	25	50	04
				50	50	100	

OR

Course code	Course Title	Course credit	Teaching schedule Hrs./ week	Internal marks (CEE)	External marks (SEE)	Total marks (CCE+SEE)	Duration Duration of external exams (Hr.)
Course code	**Course Title**	**Course credit**	**Teaching schedule Hrs./ week**	**Internal marks (CEE)**	**External marks (SEE)**	**Total marks (CCE+SEE)**	**of external exams (Hr.)**
MB-ME-102	Essentials of Biochemistry	02	02	25	25	50	01
MBP-ME-1	Practicals	02	04	25	25	50	04
				50	50	100	

MULTIDISCIPLINARY COURSE (MDC): CREDIT 04 (THEORY)

Course code	Course Title	Course credit	Teaching schedule Hrs./ week	Internal marks (CEE)	External marks (SEE)	Total marks (CCE+ SEE)	Duration of external exams (Hr.)
MB-MDC-101	Environment Studies	04	04	50	50	100	02

OR

							external exams (Hr.)
MB-MDC-102	Microbes in our Life	02	02	25	25	50	01
MB-MDC-102 /Practicals		02	04	25	25	50	04
				50	50	100	

MULTIDISCIPLINARY COURSE (MDC): CREDIT 04 (02 THEORY + 02 PRACTICALS)

SKILL ENHANCEMENT COURSE (SEC): CREDIT 02 (01 THEORY + 01 PRACTICALS)

Course code	**Course Title**	**Course credit**	**Teaching schedule Hrs./ week**	**Internal marks (CEE)**	**External marks (SEE)**	**Total marks (CCE+ SEE)**	**Duration of external exams (Hr.)**
MB-SEC-101	Basics of Microbiology Laboratory	01	01	13	13	26	01
MB-SEC-101 /Practicals	Basics of Microbiology Laboratory	01	02	12	12	24	02
				25	25	50	

F. Y. B. Sc. MICROBIOLOGY

Semester – I

FUNDAMENTALS OF MICROBIOLOGY
MB-MJ-101

1. Course description

Course Code: MB-MJ-101

Course title: Fundamentals of Microbiology

Course type: Major

Course Credits: 03

2. Course Overview and Course objectives

Microbiology is one of the youngest biological sciences. This course introduces the students with Microbiology as a multifaceted science, history of inventions related to microbiology and microbes as well as development in microbiology. It also deals with a detailed explanation of the scope of microbiology.

Course Objectives:

- To introduce microbiology as a subject to first year students
- To describe position and importance of microorganisms in the living world
- To introduce various groups of microorganisms and to learn their distribution in nature
- To learn microbial discovery and its role in disease development
- To study development of pure culture, immunology, agricultural microbiology, chemotherapy, virology etc. along with the growth of microbiology

3. Course Content

UNIT 1	INTRODUCTION TO MICROBIOLOGY
1.1	An Introduction to Microbiology
1.2	Microbiology: A Multifaceted Science
1.3	Position of Microorganisms in living world
1.4	Major Group of Microorganisms
1.5	Distribution of Microorganisms in Nature

UNIT 2	HISTORY & SCOPE OF MICROBIOLOGY

2.1	The discovery of Microbial World and Microscope
2.2	The Spontaneous Generation Controversy
2.3	Discovery of Microbial Effect on Organic Matter
2.4	Discovery of the role of Microbes in Causation of Disease
2.5	History of Virology
2.6	Applied areas of Microbiology

UNIT 3	**DEVELOPMENT IN MICROBIOLOGY**
3.1	Pure Culture Techniques
3.2	Immunology
3.4	Agricultural Microbiology
3.5	Chemotherapy
3.6	Virology
3.7	Modern Immunology
3.8	Molecular biology and biotechnology

4. <u>Student Learning Outcomes:</u>

- After studying this course student will be able to understand the basics of Microbiology and microorganisms.
- They will learn about various areas of microbiology along with their scope and significance.
- They will come to know about the discovery of microbes, how they cause diseases, their role in ecology, recycling of organic and inorganic matter etc.
- Moreover, students will also learn about development of various fields along with progress in microbiology.

<u>Recommended Learning Resources</u>:

- Modi H. A., (2014), A Handbook of Elementary Microbiology, Shanti Prakashan, (ISBN: 978-93-5070-1010)
- Willey J., Sandman K. and Wood D., (2020), Prescott's Microbiology, 11th Edition, McGraw Hill, (978-1-260-57002-1)

F. Y. B. Sc. MICROBIOLOGY

Semester – I

MICROSCOPY AND STAINING TECHNIQUES
MB-MJ-102

1. Course description

Course Code: MB-MJ-102

Course title: Microscopy and staining techniques

Course type: Major

Course Credits: 03

2. Course overview and Course Objectives:

The main aspect of this paper is to study and understand the Basic principle of microscopy. It focused on different typesof fundamental and advanced microscopy techniques. The course also includes the basics of stains and staining techniques.

Course Objectives:

- To study the principle of light and its optics
- To gain an understanding of numerical aperture and resolving power and the working of condensers and oculars.
- To acquire knowledge of different types of microscopy and its working principle
- To learn about types of dyes and principle of staining

3. Course Content

UNIT 1	BASIC PRINCIPLES OF MICROSCOPY AND DYES
1.1	General Principles of optics & Structure of light
1.2	Objectives – Numerical Aperture, Resolving power
1.3	Immersion objectives - Depth of focus, Equivalent focus, working distance of uncovered objects & covered objects, Chromatic aberrations in objectives
1.4	Oculars – Huygens, Compensating, Flat field Condenser
1.5	Dyes: Acidic & basic dyes, chromophore
1.6	Staining solutions: Intensifier, mordant

UNIT 2	LIGHT MICROSCOPY

2.1	Bright field microscope
2.2	Dark field microscope
2.3	Phase contrast microscope
2.4	Differential Interference Contrast Microscope
2.5	Fluorescence microscope
2.6	Confocal microscopy
2.7	Theories of staining
2.8	Preparation and staining of specimens
2.9	Staining of bacteria: simple, differential, microchemical, cytological

UNIT 3	**ELECTRON MICROSCOPY**
3.1	Transmission Electron microscope
3.2	Scanning Electron microscope
3.3	Electron Cryotomography
3.4	Scanning probe microscopy
	3.4.1 Scanning tunnelling microscope
	3.4.2 Atomic force microscope

4. <u>Student Learning Outcomes:</u>

- Students shall gain an understanding of the relevance of resolving power and numerical aperture in microscopy
- Students shall learn different types of microscopy and its uses
- Students shall understand the types of electron microscopy and its applications in microbiology
- Students shall gain an insight regarding stains and dyes
- Students shall develop skill of different staining techniques

<u>Recommended Learning Resources</u>:

- Willey J.M., Sherwood L.M. and Woolverton C.J., (2017) Prescott's Microbiology, 9th and 10thEdition McGraw - Hill Education (ISBN: 978-981-3151-26-0)
- Salle A. J., (1984) Fundamental Principles of Bacteriology, 7th Edition, Tata McGraw – Hill, (ISBN:0-07-099-562-1)
- Pelczar, Chan and Krieg, (2001), Microbiology-Concepts and Application, 5th Edition, McGraw-Hill, (ISBN: 9780074623206)

MBP-MJ-1 PRACTICALS

1. Study of bright field compound microscope: Components, use and care.
2. Microscopic examination of living microorganisms:
   (a) Observation of hay infusion by Wet Mount Technique.
   (b) Observation of bacterial Motility by Hanging Drop technique
3. Introduction to common instruments/ equipment in microbiology laboratory: Autoclave, Incubator, Hot air oven, Laminar air flow, Centrifuge, Bacteriological Filter, pH meter, Colorimeter, Anaerobic jar, Colony counter.
4. Observation of morphological characteristics of Yeast / Fungi / Protozoa by Dark Field and Phase Contrast Microscopy.
5. pH measurement and adjustment
6. Preparation of bacteriological and mycological broth / agar medium
7. Monochrome staining by Acidic and Basic dye.
8. Differential Gram staining.
9. Acid fast staining.
10. Spirochaete staining: Negative staining and direct.
11. Microchemical staining: metachromatic granules

Recommended Learning Resources:

- Patel R.J. and Patel R.K. (2016) Experimental microbiology Volume I, 9th Edition.Aditya,
- Patel R.J. and Patel R.K. (2017) Experimental microbiology Volume II, 9th Edition. Aditya,
- Cappuccino J.G. (2016) Microbiology; A Laboratory Manual, 11th Edition**.** Pearson Education (Singapore) Pvt. Ltd., (ISBN: 978-9332535190)
- Aneja K.R. (2001) Experiments in Microbiology, Plant Pathology, Tissue culture and Mushroom production technology, 3rd Edition. New Age International Publishers, (ISBN: 978-9386418302)

F. Y. B. Sc. MICROBIOLOGY

Semester – I

EUKARYOTIC CELL STRUCTURE
MB- ME-101

1. Course description

Course Code: MB- ME-101

Course title: Eukaryotic cell structure

Course type: Minor- Elective

Course Credits: 02 + 02

2. Course Overview and Course objectives

The course includes the study of eukaryotic cell structure and the components of eukaryotic cells. It includes the detailed study of the structure and function of cell wall and cell membrane. The course includes the understanding of various cell organelles and their importance.

Course Objectives:

- To introduce the students to the basics of cell.
- To describe the structure and function of the cell wall and cytoplasmic membrane.
- To introduce students to the varied cell organelle's structure and their functions.

3. Course Content

UNIT 1	EUKARYOTIC CELL STRUCTURE
1.1	An overview of eukaryotic cell structure
1.2	Cell wall
1.3	Cytoplasmic membrane
1.4	Cytoplasm
1.5	Nucleus

UNIT 2	CELL ORGANELLES
2.1	Endoplasmic reticulum
2.2	Eukaryotic ribosomes
2.3	Mitochondria
2.4	Chloroplast
2.5	Golgi apparatus
2.6	Lysosomes
2.7	Vacuoles
2.8	Centrioles
2.9	Flagella

4. Student Learning Outcomes:

- The students shall learn the structure and functions of cell wall and cell membrane as well as cytoplasm and nucleus.
- They will learn the structure and functions of varied cell organelles.

MB- ME-101 PRACTICALS

1. Observation and examination of yeast cell
2. Observation and examination of fungal cell
3. Observation and examinationof algal cell
4. Observation and examinationof protozoa.
5. Observation of different eukaryotic cells (permanent slides).
6. Staining of nuclear material.
7. Examination of cell organelles in paramecium.

Recommended Learning Resources:

- Modi H. A., (2014), A Handbook of Elementary Microbiology, Shanti Prakashan, (ISBN: 978-93-5070-1010)
- Willey J., Sandman K. and Wood D., (2020), Prescott's Microbiology, 11th Edition, Mc Graw Hill, (978-1-260-57002-1)

F. Y. B. Sc. MICROBIOLOGY
Semester – I

ESSENTIAL OF BIOCHEMISTRY
MB-ME-102

1. Course description

Course Code: MB- ME-102

Course title: Essential of Biochemistry

Course type: MinorElective

Course Credits: 02 + 02

2. Course Overview and Course objectives

The course includes the study of atoms and molecules and the solubility of compounds in the solution. It also covers the knowledge of acids and bases and the maintenance of pH. The course includes the understanding of biological compounds and the chemical reactions.

Course Objectives:

- To learn the fundamentals of atoms and molecules
- To study the solubility of compounds and its presence in solutions
- To understand acid and base and its role in pH maintenance
- To introduce biological compounds and its role in chemical reactions

3. Course Content

UNIT 1	**BIOCHEMISTRY FOR MICROBIOLOGY**
1.1	Atoms and molecules
1.2	Solubility of compounds
1.3	Concentration of compounds in solution
1.4	Acids, Bases and pH

UNIT 2	**BIOCHEMICAL COMPOUNDS AND CHEMICAL REACTIONS**
2.1	Important biological compounds
2.2	Introduction to chemical reactions
2.3	Ionization of water
2.4	Buffering against pH changes in biological systems
2.5	Water as reactant

4. Student Learning Outcomes:

- Students shall acquire knowledge of atoms and molecules, solubility of compounds and pH
- They shall learn about important biological compounds and chemical reactions as well as the role of water as reactants

References:

- Pelczar M. J., Chan E.C.S Chan, Krieg N. R., (2011), Microbiology: An application based approach, Tata McGraw Hill Education Private Limited.
- Rodwell V. W., Bender D. A., Botham K. M., Kennelly P. J., Weil P. A., Harper's Biochemistry, McGraw Hill Education.

MB-ME-102 PRACTICALS

1. Preparation of standard solutions.
2. Preparation of buffer solutions.
3. Adjustment of pH.
4. Preparation of molar solution
5. Preparation of molal solution
6. Preparation of normal solution.
7. Solubility test of compound (Starch, gelatin, lipid).

Recommended Learning Resources:

- Aneja K. R., (2007), Experiments in Microbiology, Plant Pathology and Biotechnology, New age International
- Godkar P. B., And Godkar P. D., (2003), Textbook of Medical Laboratory Technology, Bhalani Publishing House, Mumbai, India
- Mukherjee K. L., (1962), Medical Laboratory Technology- A procedure manual for routine diagnostic tests. McGraw Hill Education Pvt. Ltd. New Delhi.

F. Y. B. Sc. MICROBIOLOGY

Semester – I

MULTIDISCIPLINARY COURSE (MDC)

ENVIRONMENT STUDIES

MB-MDC-101

1. COURSE DESCRIPTION:

Course Code: MB-MDC-101
Course title: Environment Studies
Course type: Multidisciplinary
Course Credits: 04

2. Course Overview and Course objectives:

The Environmental Studies course explores the environment, natural resources, ecosystems, biodiversity, and environmental pollution. Students gain an understanding of sustainable practices, conservation strategies, and the impact of human activities on the environment, fostering a holistic approach to environmental stewardship. Critical thinking, problem-solving, and communication skills are developed to address environmental challenges effectively.

Course Objectives:

- To gain knowledge regarding natural resources and their conservation
- To understand basic aspects of biodiversity
- To learn about ecosystem and energy flow
- To sensitize about different types of pollution.

3. Course Content:

UNIT 1	IMPORTANCE OF ENVIRONMENTAL STUDIES AND NATURAL RESOURCES
1.1 1.2 1.3 1.4 1.5	Definition, Scope, and Importance of Environmental Studies Introduction to Natural Resources Renewable and Non-renewable Resources Energy Conservation Role of Individual in Conservation of Resources

UNIT 2	ECOSYSTEMS
2.1 2.2 2.3 2.4	Concept of Ecosystem Structure and Function of Ecosystem: Producer, Consumer and Decomposer Energy Flow in the Ecosystem Food chains, Food webs and Ecological pyramids

UNIT 3	BIODIVERSITY
3.1	Introduction to Ecosystem Diversity
3.2	Biogeographic Classification of India
3.3	Value of Biodiversity
3.4	Hotspots of Biodiversity

UNIT 4	ENVIRONMENTAL POLLUTION
4.1	Definition and Classification of Pollutants
4.2	Sources, Effect and Control of: 4.2.1 Air Pollution 4.2.2 Water Pollution 4.2.3 Soil Pollution 4.2.4 Marine Pollution 4.2.5 Noise pollution 4.2.6 Thermal Pollution
4.3	Solid Waste Management
4.4	Disaster Management

4. <u>Students Learning Outcomes:</u>

- Students will learn about Environment and its importance and how it is being polluted by humans and also steps to reduce pollution.
- Students will understand how natural resources are misused and its prevention, difference between renewable source and non-renewable sources and various conservation methods to conserve nature and its resources.
- Students gain ideas regarding construction of food chain and food web by primary producers to consumers and also role of decomposers in it.
- Even students will have an idea of waste management collected from domestic waste, industrial waste, etc. and how to manage situations during any kind of disaster caused by nature.

<u>Recommended Learning Resources</u>:

- Bharucha, E. (2005). *Textbook of Environmental Studies for Undergraduate Courses*. University Press.
- Singh, Y. K. (2006). *Environmental Science*. New Age International.
- Aneja K.R. (2001) Experiments in Microbiology, Plant Pathology, Tissue culture and Mushroom production technology, 3rd Edition. New Age International Publishers, (ISBN: 978-9386418302)
- Dubey R. C. and Maheshwari D. K., (2002), Practical Microbiology, S. Chand & company.
- Benson H. J., (2002), Microbiological Applications: Laboratory Manual in General Microbiology, McGraw Hill.

F. Y. B. Sc. MICROBIOLOGY

Semester – I

MULTIDISCIPLINARY COURSE (MDC)

MICROBES IN OUR LIFE

MB-MDC-102

1. Course description

Course Code: MB-MDC-102

Course title: Microbes in our Life

Course type: Multidisciplinary

Course Credits: 2 + 2

2. Course Overview and Course objectives

The course includes the study of the usefulness of microorganisms as well as the harmful aspects of living microbial entities. The course shall envisage the applications of microorganisms in routine life activities.

Course Objectives:

- To give basic idea to the students regarding beneficial activities and role of microbes in our day to day life and research as well
- To understand how microbes are harmful to humans as well as other industrially important materials.

3. Course Content

UNIT 1	BENEFICIAL MICROBES
1.1	Beneficial activities of microbes
1.2	Microorganisms as source of food
1.3	Microbes in industry, enzymes production, leaching, fat production, retting of fibres, dairy industry, medicine, agriculture
1.4	Microbes as tools for biological research

UNIT 2	DETRIMENTAL MICROBES
2.1	Harmful activities of microorganisms
2.2	Microbes in water supply
2.3	Microbes in Textile, paper, leather and rubber, optical instruments and wood deterioration
2.4	Microorganisms and diseases in man: basic concepts

4. Student learning outcome:

- Students will learn about the benefits of microorganisms in day to day life and how microbes can be used as food or in making food products.
- Students will learn about microbes which harm humans by causing various diseases.
- Students will gain ideas regarding microorganisms causing deterioration and degradation on some natural or manmade products.

Recommended Learning Resources:

- Modi. H. A. (2014) A Handbook of Elementary Microbiology, Shanti Prakashan, (ISBN: 978-93-5070-1010)
- Purohit S.S. Microbiology Fundamentals and applications, 7th Ed, (2019) Agrobios.

MB-MDC-102: PRACTICALS

1. Observation of bacteria from curd.
2. Grading the quality of milk by MBRT test.
3. Direct microscopic observation of Microorganisms in polluted water (hanging drop method).
4. Observation of stained bacteria in spoiled food/ vegetables.
5. Observation of stained fungi in spoiled food/ vegetables.

Recommended Learning Resources:

- Patel R.J. and Patel R.K. (2016) Experimental microbiology, 9th Edition.Aditya Publication,
- Aneja K.R. (2001) Experiments in Microbiology, Plant Pathology, Tissue culture and Mushroom production technology, 3rd Edition. New Age International Publishers,
- Dubey R. C. and Maheshwari D. K., (2002), Practical Microbiology, S. Chand & company.
- Benson H. J., (2002), Microbiological Applications: Laboratory Manual in General Microbiology, McGraw Hill.

F. Y. B. Sc. MICROBIOLOGY

Semester – I

SKILL ENHANCEMENT COURSE
Basics of Microbiology Laboratory
MB-SEC-101

1. Course Code & Title

Course code: MB-SEC-101
Course title: Basics of Microbiology laboratory
Course type: Skill based
Course credits: 01 + 01

2. Course overview and Course Objectives

Course Overview:

This course will offer greater understanding to microbiology students about prerequisites of microbiology experiments. It will help students to understand about various labware, how to handle them, clean them, sterilize them etc. Students will also gain fundamental knowledge regarding how to grow microbes on suitable media as well.

Course Objectives:

- The main objective is to provide knowledge and basic concepts of techniques used in microbiology laboratories.
- Students will get acquainted with glassware and plastic ware used in the laboratory, even how to clean and sterilize them, inoculation, handling of Petri dishes, etc.
- Disposal also plays an important role in laboratories as it may be risky if not handled properly.
- Students will learn how to prepare Medias as well as adjusting the pH of media according to type of microorganisms.

3. Course Content

UNIT 1	**LABORATORY GLASSWARES**
1.1	Laboratory glassware and accessories 1. Laboratory glassware 2. Laboratory plastic ware 3. Other accessories 4. Miscellaneous glassware and accessories
1.2 1.3	Cleaning and sterilization of glassware Disposal of laboratory wastes and cultures

UNIT 2	MICROBE HANDLING TECHNIQUES
2.1	The need for proper techniques
2.2	Importance of Aseptic techniques
2.3	Sterilizing inoculating wire loops and needles
2.4	Preparation of suspension
2.5	Inoculation and Transfer of culture
2.6	Handling a Petri dish
2.7	Streaking and spreading of suspension on Petri dish
2.8	Incubation of Petri dish, slant and broth tubes
2.9	Preparation and staining of smear

4. Student learning outcome:

- Students will learn about how to clean and use laboratory glassware and plastiware. Students will also learn how to dispose used media and cultures so as no environmental contamination occurs.
- Students will learn about handling and sterilization of wire loops, media handling, and preparation of smear for staining, serial dilution for isolation of microorganisms.
- Students will learn to prepare media by weighing, autoclaving and adjusting pH of medium, etc.

PRACTICALS

1. Rules and safety in microbiology laboratory.
2. Preparation of temporary and permanent cotton plugs.
3. Preparation of chromic acid.
4. Washing and packaging of glassware for sterilization.
5. Preparation and staining of smear.
6. Disposal of laboratory waste.

Recommended Learning Resources:

- Patel R. J. & Patel K. R. (2016). Elementary Microbiology Vol I, 9th Ed., Aditya Publications, Ahmedabad.
- Aneja K. R., (2007), Experiments in Microbiology, Plant Pathology and Biotechnology, New age International.