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<td>B.Voc. (Web Printing Technology)</td>
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The courses are offered under the Choice Based Credit System (CBCS) pattern. The details can be found on the website: www.srtmun.ac.in
### Swami Ramanand Teerth Marathwada University Nanded

**Choice Based Credit System (CBCS) Course Structure (New scheme)**

**Faculty of Science and Technology**

**Subject: Microbiology**

**B. Sc. First Year (Semester – I & II)**

Semester Pattern effective from June – 2019

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<tr>
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<th>Name of the Course</th>
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**Total credits semester I and II: 12**

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Outline and Salient Feature:

B. Sc. Microbiology syllabus is crafted to serve the need of choice based credit system course structure to orient and practically train students in the field of Microbiology. The course is specifically bringing core courses, skilled enhanced and discipline elective courses together dealing additional domain of knowledge in this field of study where in Core Course includes Introductory and basic microbiology, microbial physiology and biochemistry, applied microbiology, immunology and medical microbiology.

Skill enhanced courses includes public health, diagnostic microbiology, medical laboratory technology and microbial biofertilizers, and also on enzyme, bioprocess technology, GMP and molecular biology techniques is well suited to understand application of scientific and engineering skills to the processing of materials by microorganisms.

DSE course based on microbial genetics and molecular biology is concerned with genes, mutation, recombination, DNA replication, transcription, translation, associated phenomena and their manipulation and techniques of such manipulation. Another DSE course (with choice) provide an option to learn diverse metabolic events occurring in view of the particular microorganisms and its environment and agriculture and to relate this information to a biology as a whole. This course is giving emphasis on enzymology, microbial metabolism, nitrogen metabolism and also offer industrial microbiology or pharmaceutical Microbiology as DSE courses is an area of applied microbiology which deals production of various useful end products on large scale.

Utility:

The syllabus of B. Sc. microbiology course will orient and train the students in view of general microbiology, medical microbiology and laboratory technology, microbial genetics and molecular biology, occurrence of metabolic events and its relation to environment and agriculture, Industrial and Pharmaceutical Microbiology to understand and apply this knowledge for carrier orientation.

SE Course will provide additional opportunity for a student to develop skills of interest in this field of study.

Learning Objectives:

The learning or training objectives of SEC has been mentioned below the skill of the course.
**Prerequisite:**

The course is offered for a student registered for undergraduate programme in the faculty of Science and technology who had primary training in the field of biology at higher secondary school level evident in terms of certificate by CBSC/ ICSC/HSC for entry level core courses in microbiology optional subject. Whereas for SEC and DSE courses, student preferably needs training in microbial sciences and also likes to gain additional advanced knowledge in this field of science.
Choice Based Credit System (CBCS) Course Structure (New scheme)
Faculty of Science and Technology
B. Sc. First Year (Semester – I)
Subject: Microbiology
Paper Name: Introductory Microbiology (P-I) CCMB I (Section A)
Paper Number: I

Credits: 02 (Marks: 50) Periods: 45

Unit I: Scope of Microbiology

1.1 Definition and concept
1.2 Types of microorganisms
1.3 Distribution of microorganisms in nature
1.4 Beneficial & Harmful role of microorganisms in Agriculture, Human & Animal health, Industries and Genetic engineering with suitable examples

UNIT II: Historical Developments in Microbiology

2.1 Early observation of microorganisms
2.2 Controversy over spontaneous generation - Contribution of different scientists
2.3 Recognition of microbial role in diseases - Koch’s postulates and contribution of Louis Pasteur and Edward Jenner
2.4 Recognition of microbial role in fermentation
2.5 Discovery of pure culture concept
2.6 Aseptic surgery

UNIT III: General Characters of Microorganisms

3.1 The eukaryotic cell: Algae, Fungi and Lichens.
3.2 Prokaryotic cell: Archaeabacteria, Bacteria and Actinomycetes.
3.3 Difference between Eukaryotic and Prokaryotic cell.
3.4 General characters of viruses
3.5 General characters of Protozoa

UNIT IV: Taxonomy of Microbes

4.1 Microbial Classification and Nomenclature
   a. Taxonomic groups
   b. Goals of classification
4.2 General methods of classifying bacteria: Intuitive method, Numerical taxonomy and Genetic relatedness.
4.3 Nomenclature of bacteria
4.4 Introduction to Bergey’s Manual of Bacteriology (9th edition)

References:

5. General Virology by Luria
14. Microbiology- Fundamentals and applications by R.A. Atlas
19. Microbiology by Yadav Manju, Discovery Publishing House,
20. Introduction to Microbial Techniques by Gunasekaran
22. Practical Microbiology by Dubey and Maheshwari.
27. Fundamental Microbiology, First edition by B. M. Sandikar, Books and Allied (P) LTD. Kolkata.
UNIT I: Bioinstrumentation

1.1 Microscopy: Definition of Magnification, Resolving power, Depth of focus, Focal length, Angular aperture and Numerical aperture.
1.2 Objectives (Low, High, oil immersion) and oculars function.
1.3 Condensers: Abbes, Cardioids, Parabolic and their functions.
1.4 Principle, construction using ray diagram and applications of compound microscope:
1.5 Electron microscope (SEM and TEM).

UNIT II: Ultra Structure of Bacterial Cell

1.1 Basic concepts of shape, arrangement, and size of prokaryotes cells, Importance of cell shape, cell size in rods and cocci.
1.2 Structure, Chemical composition and function of following:
   a. Capsule and slimes
   b. Cell wall and cytoplasmic membranes
   c. Flagella and Motility, fimbriae and pili
   d. Nuclear material, Plasmids, Mesosomes and Ribosome
   e. Reserve materials and other cellular inclusions

UNIT III - Sterilization Techniques

3.1 Definition of Sterilization, Disinfection, Antiseptic, Germicide, Sanitizer, Fungicide, Viricide, Bacteriostatic and Bactericidal agent.
3.3 Evaluation of disinfectant (Phenol coefficient).
3.4 Sterilization by Physical Agent a) Moist Heat: Boiling, Tyndallization, Pasteurization and Steam under pressure (Autoclave). Dry heat: Flaming, Incineration and Hot air oven. b) Radiation: Ionizing and Non-Ionising radiations. c) Filtration and Types of filters (Concept with e.g. Seitz filter)

UNIT IV: Microbial Nutrition

1.1 Concept of microbial nutrition
1.2 The common nutrient requirements (Basic Nutritional requirements of Microorganisms /macronutrient and micronutrient)
1.3 Requirement for C, H, O and Electron with their significance
1.4 Requirements for N, P and S with their significance
1.5 Growth factors
1.6 Nutritional categories of microorganisms on the basis of carbon and energy source.
References:

5. General Virology by Luria
14. Microbiology- Fundamentals and applications by R.A. Atlas
19. Microbiology by Yadav Manju, Discovery Publishing House,
20. Introduction to Microbial Techniques by Gunasekaran
22. Practical Microbiology by Dubey and Maheshwari.
UNIT I: Microbial Staining Techniques

2.1 Definition: Stain, Dye, Acidic stain, Basic stain, Auxochrome, Chromophore, Mordent, Chromogen, Leuco compound, Natural stain, Fluorochrome, Decolouring agent and Counter stain.

2.2 Theories of Staining.

2.3 Principles, mechanism, procedure and observation of:
   a. Simple staining: Monochrome & Negative staining
   b. Differential staining: Gram’s & Acid fast staining
   c. Structural staining: Cell wall & PHB staining

UNIT II: The Viruses: Distribution and Structure

2.1 Viruses

2.2 Bacterial viruses (Bacteriophages)

2.3 Multiplication of Virulent phage: The lytic cycle

2.4 The development of temperate phages: Lysogeny

2.5 Classification of viruses (LHT system)

2.6 Distribution and structure of HIV

2.7 Enlist plant animal and human viral diseases with their causative agents

UNIT III: Biomolecules

3.1 Carbohydrates
   a. Definition and classification
   b. Triose, Pentose, Hexose (Examples)
   c. Disaccharides: Glycoside linkage (Lactose, Maltose and Sucrose)
   d. Oligosaccharides: Trisaccharides (Raffinose)
   e. Polysaccharides: Homo and Heteropolysaccharides
   f. Biological Significance of carbohydrates

3.2 Lipids
   a. Definition and Classification
   b. Types of lipids
      i. Simple lipids: Triglycerides
      ii. Conjugated lipids: Phosphatidic acid, Phospholipids and cholesterol
   c. Biological importance of lipids

UNIT IV: Informational and Functional Biomolecules

4.1 Nucleic acids
   a. Ribose and Deoxyribose sugars, Nitrogen bases, Nucleosides and Nucleotides
   b. DNA: Properties, Structure and Functions
c. RNA: Properties, Structure and Functions

4.2 Proteins
- Definition and classification
- Peptide bonds
- Enzymes
- Biological Significance of proteins

References:
5. General Virology by Luria
14. Microbiology- Fundamentals and applications by R.A. Atlas
19. Microbiology by Yadav Manju, Discovery Publishing House,
20. Introduction to Microbial Techniques by Gunasekaran
22. Practical Microbiology by Dubey and Maheshwari.
UNIT I: Bacterial Cultivation and Maintenances
4.1 Cultivation of Bacteria a) Media used, Properties of good culture media. b) Definition, Concept, use and different types of culture media: Synthetic, Non-synthetic, Natural, Selective, Differential, Enriched, Enrichment, Assay, Minimal, Maintenance and Transport Medium.
4.2 Buffers in culture medium.
4.3 Anaerobic cultivation: Media and methods of anaerobic cultivation
4.4 Pure culture Techniques. a) Definition and Significance of pure culture b) Methods of isolation of pure culture: Streak plate, Pour plate, Spread plate and Single cell isolation.

UNIT II: Permeation
2.1 Passive diffusion
2.2 Facilitated diffusion
2.3 Active transport mechanism
2.4 Group translocation
2.5 Uptake of amino acids and sugars (as examples)

UNIT III: Reproduction and Growth
3.1 Concept of growth
3.2 Microbial Reproduction: Binary fission, budding.
3.3 Bacterial growth: Definition, growth curve – Phases of growth, Growth Kinetics, Generation time, Methods of measurement of growth, different types of culture system: Batch culture system, Continuous culture system (Chemostat and Turbidostat)
3.4 Factors affecting growth-Temperature, pH, Osmotic pressure and Nutrients.

UNIT IV Bacterial Sporulation
3.1 Bacterial Sporulation- Structure of endospore, Endospore formation (Stages) in *Bacillus*, Spore germination, Significance of Ca-dipicolinate (DPA) and soluble Proteins (SASP)

References:
5. General Virology by Luria
14. Microbiology- Fundamentals and applications by R.A. Atlas
19. Microbiology by Yadav Manju, Discovery Publishing House,
20. Introduction to Microbial Techniques by Gunasekaran
22. Practical Microbiology by Dubey and Maheshwari.
1. Microscopy - Different parts of compound microscope. Use and care of compound microscope
   a. Autoclave
   b. Hot air oven
   c. Incubator
   d. pH meter
   e. High speed centrifuge
   f. Colorimeter/Spectrophotometer
   g. Anaerobic jar
   h. Bacterial filters
   i. Laminar air flow

2. Construction, Operation and utility of laboratory Equipments. (any Six)
   a. Autoclave
   b. Hot air oven
   c. Incubator
   d. pH meter
   e. High speed centrifuge
   f. Colorimeter/Spectrophotometer
   g. Anaerobic jar
   h. Bacterial filters
   i. Laminar air flow

3. Staining
   a. Simple staining: Monochrome, Negative
   b. Differential : Gram’s staining
   c. Structural staining:
      i. Cell wall staining (Chance’s method)
      ii. PHB staining (Burdon’s method)

4. Hanging drop technique.

5. Micrometry

6. Preparation of culture media
   a. Nutrient broth and Agar
   b. MacConkey’s Broth and Agar
   c. Sugar Media

7. Isolation of bacteria from mixed culture
   a. Streak plate method
   b. Spread plate method
   c. Pour plate method

8. Effect of physical and chemical agents on growth of bacteria
   a. pH
   b. Temperature
   c. U.V. rays
   d. Antibiotics

9. Qualitative tests for
   a. Carbohydrates: Benedict’s test
   b. Protein: Biuret test
   c. Nucleic acid: Diphenylamine test (DPA) for DNA and Orcinol test for RNA.


11. Study of Bacterial Growth curve.
### Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New scheme)
Faculty of Science and Technology
Subject: Microbiology
B. Sc. First Year (Semester – I & II)
Paper Name: Practical’s based on Section A & Section B of CCMB I & CCMB II (PV)
Paper Number: V

**PROFORMA FOR PRACTICAL EXAMINATION**

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**1. Isolation of Bacteria**

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<td>Viva Voce</td>
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**2. Staining (Any One)**

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**3. Hanging drop technique / Micrometry / Medium Preparation**

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4. a) Effect of pH/ Temperature/ U.V. Radiation/ Heavy metals  
   Approach - 04  
   Requirement - 02  
   Procedure - 02  
   Result and Observation Conclusion Viva - 02  

b) Biochemical tests  
   (Carbohydrate/ Protein/ NA)  
   Procedure - 03  
   Result and Observation Conclusion Viva - 02  

5. Spotting  
   i. Parts of microscope/ Instruments  
   ii. Stain  
   iii. Nutrient media  
   iv. Permanent slide of Algae/ Fungi/ Protozoa/ Actinomycetes  
   v. Technique