

S-25 March, 2013 AC after Circulars from Circular No.153 & onwards

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY
CIRCULAR NO.ACAD/NP/B.Sc.-Ist Yr./SEM.-I & II/157/2013

It is hereby notified for information of all concerned that, on the recommendations of the Boards of Studies, Ad-hoc Boards, and Faculty of Science, the Academic Council at its meeting held on 25-03-2013 has accepted the following revised syllabi for **B.Sc. First Year progressively under the Faculty of Science :-**

Sr. No.	Revised Syllabus	
[1]	B.Sc. [Physics]	Semester- I & II,
[2]	B.Sc. [Dairy Science & Technology]	Semester- I & II,
[3]	B.Sc. [Industrial Chemistry]	Semester- I & II,
[4]	B.Sc. [Geology]	Semester- I & II,
[5]	B.Sc. [Chemistry]	Semester- I & II,
[6]	B.Sc. [Botany]	Semester- I & II,
[7]	B.Sc. [Electronics] Science	Semester- I & II,
[8]	B.Sc. [Fisheries]	Semester- I & II,
[9]	B.Sc. [Microbiology]	Semester- I & II,
[10]	B.A. [Statistics]	Semester- I & II,
[11]	B.Sc. [Statistics]	Semester- I & II,
[12]	B.Sc. [Zoology]	Semester- I & II,
[13]	B.Sc. [Textile and Interior Decoration]	Semester- I & II,
[14]	B.Sc. [Home Science]	Semester- I & II,
[15]	B.A. / B.Sc. [Mathematics]	Semester- I & II.

This is effective from the **Academic Year 2013-2014** and onwards.

These syllabi are available on the University Website **www.bamu.net**

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
 Aurangabad-431 004.
 REF.NO.ACAD/NP/B.SC.-IST YEAR/
 Sem-I & II/2013/5132-541
A.C.S.A.I.No.327[9].

Date:- 08-05-2013.

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[Signature]
Director,
Board of College and
University Development.

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S-25 March, 2013 AC after Circulars from Circular No.153 & onwards

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Copy forwarded with compliments to :-

- 1] **The Principals, affiliated concerned Colleges,
Dr. Babasaheb Ambedkar Marathwada University.**
- 2] **The Director, University Network & Information Centre, UNIC, with
a request to upload the above all syllabi on University Website
[www.bamu.net].**

Copy to :-

- 1] The Controller of Examinations,
- 2] The Superintendent, [B.Sc. Unit],
- 3] The Superintendent, [B.A. Unit],
- 4] The Superintendent, [Eligibility Unit],
- 5] The Programmer [Computer Unit-1] Examinations,
- 6] The Programmer [Computer Unit-2] Examinations,
- 7] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter,
Dr. Babasaheb Ambedkar Marathwada University,
- 8] The Public Relation Officer,
- 9] The Record Keeper,
Dr. Babasaheb Ambedkar Marathwada University.

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**DR. BABASAHEB AMBEDKAR
MARATHWADA UNIVERSITY,
AURANGABAD.**



Revised Syllabus of

B.SC. IST YEAR

MICROBIOLOGY

SEMESTER-I & II

[Effective from 2013-14 & onwards]

**DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
AURANGBAD**

Course Structure

YEAR	SEMESTER	PAPER NUMBER	PAPER TITLE	Hours	MARKS
First	I	Paper – I	Fundamentals of Microbiology	45	50
		Paper - II	Microbiological Techniques & General Microbiology	45	50
		Paper - III	Practical [based on Paper- I & II]	45	50
	II	Paper – IV	Cytology and general Microbiology	45	50
		Paper – V	Basic Biochemistry	45	50
		Paper – VI	[based on Paper No.IV & V] Practical	45	50
				270	300

B.Sc. First Year Semester – I
Paper I .Fundamentals of Microbiology

Unit - 1**1 Scope & relevance of Microbiology**

- i) Definition & concepts
- ii) Types of microorganism
- iii) Distribution of microorganisms in nature

2. Development of Microbiology as a Scientific Discipline

- i) Early observation of microorganisms
- ii) Spontaneous generation conflict : Contribution of scientists
- iii) Recognition of the microbial role in diseases. Koch's postulates
- iv) Recognition of microbial role in fermentations.
- v) Discovery of microbial effects on organic and inorganic matter.
- vi) Pure culture concept.
- vii) Aseptic surgery

Unit – 2 General characteristics of microorganisms.**2.1 General principles (Bacteria)**

- i) Taxonomic rank
- ii) Classification system
- iii) Numerical taxonomy
- iv) Major characteristics used in taxonomy. Morphological, Physiological, Immunological, Metabolic, Etiological. Compositions of proteins, composition of nucleic acids, hybridization, nucleic acid sequencing, identification of organisms based on 16srRNA sequencing, 16S rDNA sequencing
- v) Bergey's manual of systematic Bacteriology, General characteristics enlisting all parts with major characters & examples. (Vol I to IV)

Unit – 3 General characteristics of Microorganisms

- 3.1 Structure, Reproduction (Lytic & Lysogenic cycle)classification of Viruses.(LHT system)**
- 3.1 General characters of Fungi (including yeasts)**
- 3.2 General characters of Actinomycetes**
- 3.3 General characters of Algae**
- 3.4 General characteristics of Mycoplasma and Rickettsia.**
- 3.5 General characteristics of Archaeobacteria**

Unit – 4**4.1 Microscopy**

- i) Definitions : Magnification, resolving power, depth of focus, focal length, numerical aperture.
- ii) Objectives Low , high & oil immersion.
- iii) Oculars : function, Huygenian, Ramsden, Hyperplane & compensating.
- iv) Condensers ; Abbe, variable focus cordiod, parabolic & their functions.
- v) Iris diaphragm.

4.2 Principles, construction using ray diagram, application and comparative study of :

- i) Compound Microscope
- ii) Electron Microscope – SEM, TEM

4.3 Principles, ray diagram & applications.

- i) Phase contrast microscope.
- ii) Dark field microscope.
- iii) Fluorescent microscope.
- iv) Advanced applications of microscopes.

Semester – I Paper II

Microbiological Techniques & General Microbiology

Unit – 1 Stains and dyes.

- i) Definition : stain, dye, chromogen, chromophore, auxochrome, acidic and basic stains, simple and differential staining. (Gram's and Acid fast staining) , natural stains, mordant, decolourizer, counter stains.
- ii) Physicochemical basis of staining.
- iii) Fixatives and fixation of smears.
- iv) Staining of Fungi.
- v) Principle, application and methodology of Negative, Monochrome and Grams Staining

Unit – 2 Cultivation of microorganisms.

- i) Properties of a good culture medium.
- ii) Definition, concept, use and types of different culture media . Synthetic, non synthetic, natural, selective, differential, enriched , enrichment, assay, minimal, maintenance, and transport media.
- iv) Role of Buffers in culture media.
- v) Media used for cultivation of bacteria , fungi, actinomycetes, yeasts, algae and photosynthetic bacteria. (at least two)

Cultivation of anaerobes

- i) Principle and examples.
- ii) Methods (at least 2)

Unit – 3 Microbiological Techniques

1. Pure culture techniques

- i) Development of pure culture
- ii) Aseptic techniques, streak, pour and spread plate methods, single cell isolation.
- iii) Significance

2. Sterilization techniques

- i) Pattern of Microbial death – concepts.
- ii) Sterilization by physical methods
 - High temperature, canning and pasteurization.
 - Low temperature.
 - Non ionizing and ionizing radiations.
 - Bacteriological filters.
- iii) Disinfection by chemical means;

Disinfectants and antiseptics:
Effectiveness, mode of action & application.
Phenolics, alcohols, halogens, heavy metals, quaternary ammonium compounds, aldehydes.
- iv) Sterilization using gases

sulfur dioxide, ethylene oxide, Beta propiolactone.

Unit – 4 Structural Organization of microorganisms.**A] Fundamental categories of microorganisms.**

- i) Prokaryotic & Eucaryotic cell concepts and differential account

B] Role of microorganisms:

- 1.1 In agriculture : As biofertilizers, bioinsecticides, in soil improvement (texture , water holding capacity) as geochemical agents, microbe plant interactions (phyllosphere, rhizosphere, mycorrhizal and nodule formation). Plant diseases : list of common plant diseases with their causative agents.
- 1.2 In human and animal health : list of common bacterial, rickettsial , fungal and viral diseases.(with causative agents) in human beings, role of normal flora of human body, antibiotics, vaccines and antisera.
- 1.3 In industries : list of microbial products (and producers) produced on industrial scale, role of contaminants.
- 1.4 In food processing : list of common fermented food & milk products with their representative organisms. Food spoilage, list of organisms causing changes in texture, colour, aroma, taste & nutritional value of the food products. List of food poisoning & food infection causing microorganisms.

B.Sc. First Year Semester I

Paper III .Practical [based on Paper- I & II]

- 1) Microscopy :
 - i) Different parts of a compound microscope.
 - ii) Use and care of compound microscope .
 - iii) Visit to see an electron microscope .
- 2) Construction , operation and utility of laboratory equipments
 - i) Autoclave
 - ii) Hot air oven
 - iii) Incubator
 - iv) pH meter
 - v) High speed centrifuge
 - vi) Colorimeter/ spectrophotometer
 - vii) Anaerobic jar
 - viii) Bacterial Filters
 - ix) Laminar air flow.
- 3) Demonstration of presence of bacteria from – soil/ water/ air/ milk
- 4) Demonstration of yeast, fungi, actinomycetes, algae, protozoa

- 5) Microscopic examination of bacteria:
 - i) Monochrome staining
 - ii) Negative Staining
 - iii) Gram's Staining
- 6) Hanging drop technique to demonstrate bacterial motility
- 7) Micrometry
- 8) Qualitative tests for:
 - i) Carbohydrates – Benedict's test.
 - ii) Protein – Biuret test.
 - iii) Nucleic acid – Diphenylamine(DNA) and orcinol (RNA)tests

**B.Sc. First Year
Semester II**

Paper-IV Cytology and general Microbiology

- Unit – 1 :**
1. **Bacterial morphology and ultra structure.**
 - 1.1 Cytology of a typical bacterial cell.
 - i) Morphology – size and arrangement of bacterial cells.
 - ii) Structure ,chemical compositions and functions of :
 1. Capsule and slime layer
 2. Cell wall : Gram positive and Gram negative bacteria
 3. Unit membrane
 4. Flagella : Arrangement, mechanism of flagellar movement, Chemotaxis, phototaxis, Magnetotaxis.
 5. Pili
 6. Ribosomes.
 7. Nuclear material, Mesosome
 8. Reserved food material: Poly beta hydroxy butyric acid granules, glycogen and polyphosphate granules.
 - 1.2 Bacterial cell division
 - i) Binary fission
- Unit – 2**
- Nutritional Requirements**
 - i) Concept.
 - ii) Common nutritional requirements – Energy sources, C, N, P, O,S, micronutrients, growth factors, water etc.
 - iii) Classification on the basis of carbon and energy
 - Bacterial growth**
 - i) Concept of Growth
 - ii) Definition
 - iii) Bacterial growth curve
 - iv) Phases of growth
 - v) Mathematics of growth
 - vi) Diauxy
 - vii) Factors influencing bacterial growth (temp, pH, oxygen and nutrients).
 - viii) Synchronous growth
 - ix) Continuous culture
 - x) Measurement of bacterial growth

Unit – 3 Microbial Physiology

1. Endospore – types, sporulating bacteria ,architecture of endospore, sporulation process , germination process.

2. Uptake of nutrients

- i) Passive diffusion
- ii) Facilitated diffusion
- iii) Active transport mechanism.
- iv) Group translocation
- vi) Uptake of amino acids and metals

3. Anaerobic respiration :

NO₃ , SO₄ and CO₂ as electron acceptors.

4. Bacterial photosynthesis :

- i) Photosynthetic bacteria,
- ii) Photopigments and associated carriers,
- iii) Photosynthetic apparatus and its mechanism
- iv) Cyclic and non cyclic photophosphorylation ,
- v) Calvin cycle, and reductive carboxylic acid cycle for CO₂ fixation.
- vi) Differences between bacterial and plant photosynthesis.

Unit – 4 Advances in Microbiology

- a) Genetic engineering.
- b) Bioinformatics
- c) Nano biotechnology
- d) Bioaugmentation
- e) Biostatistics
- f) Enzymes and cell immobilization

Semester II**Paper-V Basic Biochemistry****Unit – 1 Carbohydrates**

- i) Definition and classification.
- ii) Properties –optical and chemical.
- iii) Structure of glucose: ring structure, Haworth & fisher's projection, pyranoses , furanoses, isomers, mutarotation.
- iv) Triose, pentose, hexose, heptoses - examples & structures.
- v) Derived monosaccharides: glycosides, furano acids, sugar phosphates, uronic acids, sugar alcohol.
- vi) Disaccharides , glycoside linkage, lactose, maltose, sucrose.
- vii) Oligosaccharides – Trisaccharides, structure of raffinose.
- viii) Polysaccharides – Homo and heteropoly saccharides ,structures starch, cellulose, mucopolysacchrides.
- ix) Biological significance

Unit – 2**Lipids**

- i) Classification simple compounds.
- ii) Chemistry of fatty acids, unsaturated and saturated fatty acids, triglycerides, saponification alkyl ether phospho glycerides , sterols, cholesterol , protaglandins, glycol lipids.
- iii) Function of lipids.

Unit – 3**Proteins**

- i) Classification based on properties of solubility & heat. coagulability. Fibrous, globular proteins and functions.
- ii) Protein structures ; conformation & configuration ,primary structure determination, secondary structure π - helix & β - pleated sheet, tertiary & quaternary structure.
- iii) Classification of amino acids : based on acid – base properties.
- iv) Properties of amino acids – solubility, ampholyte, Zwitterions isoelectric pH .
- v) Peptide bonds – Concepts of biological peptide bond formation, types.
- vi) Enzymes – Concepts, definition, nature , active site, properties, physico-chemical factors contributing to catalytic efficiency of enzymes

Unit – 4

Nucleic acids

- i) Structure of nitrogen bases & base pairing.
 - ii) Structure of nucleosides & nucleotides, ribose, deoxyribose sugars.
 - iii) DNA : properties, forms , structure, function as genetic material.
Types of DNA
 - iv) RNA : Structure, function, types (r-RNA, m-RNA, t-RNA)
 - v) Comparative account of DNA & RNA.
- pH & buffers.** pH titration curve, P_K value.

B.Sc. First Year Semester II
Paper-VI Practical

[based on Paper No.IV & V]

1) Structural staining –

- ◆ Bacterial flagella by Patel, Kulkarni and Gaikwad method
- ◆ Capsule staining – Maneval’s method.
- ◆ Cell-Wall staining- Chance’s method.
- ◆ Spore staining – Schaefer & Fulton’s method.
- ◆ Lipid (PHB) granule staining- Burdon’s method.
- ◆ Metachromatic granule staining- Albert and Neusser’s method.
- ◆ Preparation of culture media.
 - i) Nutrient broth and agar
 - ii) MacConkeys broth and agar..
 - iii) Sugar media
 - iv) Potato dextrose agar
 - v) Blood agar
 - vi) Photosynthetic bacterial growth medium

2) Sterility checks for Autoclaving

3) Isolation of microorganisms from :

- i) Air
- ii) Water
- iii) Soil
- iv) Milk

4) Isolation of bacteria from mixed cultures (streak plate method)

5) Cultivation of Anaerobes

6) Effect of physical and chemical agents on growth of bacteria.

- i) pH
- ii) Temperature.
- iii) Heavy metal ions (oligodynamic action)
- iv) UV rays.
- v) Antibiotics.

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