



Solapur University,
Solapur

B.Sc. I Microbiology
CREDIT-GRADING SYSTEM
Syllabus- 2014

SOLAPUR UNIVERSITY, SOLAPUR
SYLLABUS FOR B.Sc – I (MICROBIOLOGY)
(CREDIT-GRADING)

SEMESTER I

PAPER –I (Fundamentals of Microbiology and Microbial Techniques)
(Total Credits: 5; Contact hrs: 75)

SECTION- I: Fundamentals of Microbiology

UNIT –I : History, Scope, Taxonomy and Cytology

Contact hrs: 22.5
Credit- 1.5

- A) History:** - (a) Controversy over abiogenesis/Spontaneous generation conflict
(b) Major Contributions of
- | | |
|---------------------------|------------------|
| 1) Antony Van Leeuwenhoek | 2) Louis Pasteur |
| 3) Edward Jenner | 4) Robert Koch |
| 5) Alexander Fleming | 6) John Tyndall |
| 7) Joseph Lister | |

B) Scope:-

1. Introduction to types of microorganisms: - Bacteria, Viruses, Algae, Fungi, Protozoa
2. Distribution of microorganisms in nature and their beneficial and harmful activities

C) Taxonomy, Morphology & Cytology of Bacteria

I) Bacterial Taxonomy:-

1. General principles of Bacterial nomenclature
2. Criteria for bacterial classification – Morphological, Cultural and Biochemical Characters

II) Difference between Prokaryotic & Eukaryotic cell.

D) Morphology and Cytology of Bacteria.

1. Size, Shape, arrangement of bacteria
2. Structure of typical Bacterial cell
3. Structure and function of Cell Wall, Cell Membrane, Capsule & Slime layer, Flagella, Pili, Nuclear material, Mesosomes, Ribosomes, Endospore

UNIT – II: Virology & Mycology

Contact Hrs: 15
Credit- 1

A) Virology:-

1. Structure of viruses,
2. General characteristics of viruses

B) Mycology:-

General characteristics and cultivation of Fungi

C) General Characteristics of various Microorganisms

- | | |
|---------------------|---------------|
| 1. Archaeobacteria. | 4. Mycoplasma |
| 2. Actinomycets. | 5. Chlamydia |
| 3. Rickettsia | |

SECTION-II: Microbial Techniques

UNIT – III: Microscopy, Staining and sterilization techniques in Microbiology

Contact hrs: 22.5

Credit- 1.5

A) Microscopy:-

1. General principles of light microscopy. Magnification, Numerical Aperture, Resolving power, working distance of light microscope.
2. Ray diagram, special features, applications of compound Microscope.

B) Staining Techniques

1. Definition of Dyes & Stains
2. Classification of stains – Acidic, Basic & Neutral with examples
3. Principle, procedure, mechanism and applications of following staining procedures
 - a) Simple
 - b) Negative
 - c) Differential: - Gram staining
4. Special staining methods
 - a) Cell wall: - Chance's Method
 - b) Capsule: - Maneval's method.

C) Sterilization Techniques

1. Definitions: - Sterilization, Disinfection, Antiseptic, Germicide, Microbiostasis, Sanitization
2. Sterilization by Physical agents - **a)** Temperature – Dry heat, moist heat, Desiccation **b)** Osmotic pressure. **c)** Radiation – U.V.Rays & γ ray **d)** Filtration – Asbestos membrane filtration
3. Sterilization by chemical agents - **a)** Phenol & Phenolic compounds **b)** Ethyl alcohol **c)** Halogens – Cl & I **d)** Heavy metals – Copper & Mercury, Formaldehyde **e)** Gaseous agents – Ethylene oxide, B-Propiolactone

UNIT – IV: Cultivation techniques of microorganisms

Contact hours-15

Credit- 1

A) Culture Media: -

1. In vivo Living – Embryonated Egg, Animal Tissue Culture
2. In vitro – Non living media Natural, Synthetic, Semi synthetic, Differential, Enriched, Selective

B) Methods of Pure culture techniques: -

1. Streak Plate
2. Serial dilution: - Spread Plate and Pour Plate

SEMESTER II
PAPER II
(Microbial Physiology & Applied Microbiology- I)
(Total Credits: 5; Contact hrs: 75)
SECTION- I: Microbial Physiology

UNIT: - I Microbial Enzymes & Metabolism

Contact hours 22.5
Credit- 1.5

A) Microbial Enzymes:-

- a) Definition, basic structure, cofactors & prosthetic groups & active site
- b) Types of Enzymes – Extra & Intracellular, Constitutive & Induced Enzymes – with example.

B) Microbial Metabolism:-

- a) Definition – Anabolism, Catabolism, Metabolism, and High energy compounds.
- b) Structure & energy content of ATP
- c) Catabolism of Glucose – EMP, TCA Cycle

UNIT: - II Basic Biochemistry, Growth and Nutrition of Microbes

Contact hours 15
Credit- 1

- 1) Structure & Functions of Macromolecules
 - a) Carbohydrates b) Proteins c) Lipids
2. Microbial Growth- Introduction, Definition and Growth phases of Bacteria
3. **Microbial Nutrition**
 - a) Nutritional requirements of microorganisms
 - b) Common components of media & their functions:-
Peptone, Meat extracts, NaCl, Vitamins, Sugar, Na taurocholate, Milk, Starch, Blood, Agar agar
 - c) Common indicators & their functions:-Andrade's, Neutral Red, Bromothymol Blue
 - d) Nutritional types of Microorganisms based on Carbon & Energy Source

SECTION- II: Applied Microbiology- I

UNIT – III Applied Microbiology

Contact hrs: 22.5
Credit- 1.5

A) Air Microbiology

- a) Sources of microorganisms in air
- b) Definition of infectious dust, droplets and droplet nuclei
- c) Microbial examination of air
 - i) Impaction – Solid (Sieve device)
 - ii) Impingement – Liquid (Bead bubbler device)

B) Water Microbiology

- i) Sources of microorganisms in water
- ii) Fecal pollution of water & its indicator
- iii) Routine bacteriological analysis of water
 - Tests for coliforms – Qualitative (Presumptive, Confirmed & Completed)
 - Differentiation of coliforms – IMViC & Eijkman test
 - Quantitative – MPN

iv) Municipal Water purification – Sedimentation, Filtration, Disinfection

C) Milk Microbiology

- a) Definition and Composition of Milk
- b) Sources of contamination
- c) Microbiological examination of Milk: - MBRT test

UNIT – IV: Medical Microbiology

Contact Hrs: 15

Credit- 1

A) Definitions:-

Infections, etiology, etiological agents, disease, pathogen, incubation period, fomite pathogenicity, virulence, morbidity rate, mortality rate, opportunistic pathogen, epidemiology, prophylaxis, carriers, host

B) Types of diseases:-

Epidemic, endemic, pandemic & sporadic

C) Types of infections:-

Primary, Secondary, acute, chronic, reinfection, cross infection, Mixed infection, congenital, local, and generalized

D) Methods of transmission of diseases –

1. Inoculation
2. Ingestion
3. Contact
4. Inhalation

B.Sc. – I (Practical Course)

Credits: 4
Marks: 100

1. Precautions and care in Microbiology laboratory
2. Use and Care of compound Microscope
3. Demonstration of principle, working and application of:
Incubator, Hot air oven, Autoclave, Centrifuge, Colorimeter, Colony counter,
Refrigerator and Seitz Filter
4. Staining Procedures
 - (a) Monochrome Staining
 - (b) Negative Staining
 - (c) Gram Staining
5. Special Staining Procedures
 - (a) Cell Wall Staining (Chance's Method)
 - (b) Capsule Staining (Maneval's Method)
 - (c) Volutin granule Staining (Albert's Method)
6. Preparation of Culture Media
Saline, Peptone Water, Nutrient Broth, Nutrient agar, MacConkey's agar, Starch Agar,
Milk agar, Sabouraud's agar
7. Demonstration of Inoculation techniques
 - (a) Broth Inoculation
 - (b) Butt Inoculation
 - (c) Slant Inoculation
 - (d) Plate Inoculation
 - (I) Streak Plate: - Spot, Zigzag and Four Quadrant Method
 - (II) Spread Plate
 - (III) Pour Plate
8. Isolation, Colony Characters, Gram Staining and Motility of
 - (a) *Bacillus Spp.*
 - (b) *Escherichia coli*
 - (c) *Staphylococcus aureus*
9. Enumeration of Microorganisms from air by solid impaction method
10. Cultivation and Mounting of Fungi
 - (a) *Aspergillus*
 - (b) *Rhizopus*
 - (c) *Penicillium*
 - (d) *Mucor*
11. Study of biochemical and enzymatic activity of microorganisms by
 - (a) IMViC Test.
 - (b) H₂S.
 - (c) Glucose fermentation.
 - (d) Amylase activity
 - (e) Caseinase activity
 - (f) MBRT Test

Solapur University, Solapur
Nature of Question Paper for Credit-Grading Semester Pattern
• Faculty of Science •
(w.e.f. June 2014)

Time: - 3.00 hrs. Total Marks- 70

Section - I

Q. No.1) Multiple choice questions (5)

1) -----

a) b) c) d)

2)

3)

4)

5)

Q.No.2) Answer any five of the following (10)

i)

ii)

iii)

iv)

v)

vi)

vii)

Q.No.3 A) Write short notes on any Two of the following (10)

i)

ii)

iii)

B) Answer any one of the following (10)

i)

ii)

Section - II

Q. No.1) Multiple choice questions. (5)

1) -----

a) b) c) d)

2)

3)

4)

5)

Q.No.2) Answer any five of the following (10)

i)

ii)

iii)

iv)

v)

vi)

vii)

Q.No.3 A) Write short notes on any Two of the following (10)

i)

ii)

iii)

B) Answer any one of the following (10)

i)

ii)

B.Sc.Part I Microbiology

Nature of Practical Question Paper

Total Marks: 70

	Marks
Q.1 Staining Cell wall/ Capsule/ Volutin granules	15
Q.2) Isolation, Colony Characters, Gram Staining and Motility of <i>Bacillus spp/E.coli/S.aureus</i>	20
Q.3) Biochemical Test/ Enzymatic activity Indol/ Methyl Red/ Voges proskauer/ Citrate Utilization/ H ₂ S/ Amylase/ Caseinase/ Glucose fermentation/MBRT	10
Q.4) Inoculation and cultivation of Microorganisms Slant Inoculation/ Spread Plate	10
Q.5) Spotting (A) Identify and give its Use (Microscope Part) (B) Identify and give Significance of Mounted Fungus (C) In which Staining Method it is used and give its significance (Stain) (D) In which Medium it is used and give its significance (Media Component) (E) In which Test it is used and give its significance (Indicator/Reagent)	10
Q.6) Journal	5

Note; The university practical examination will be conducted at the end of second semester and it shall be THREE hours per day for two consecutive days.