SHRI SHIVAJI SCIENCE AND ARTS COLLEGE, CHIKHLI (DIST. BULDANA)
DEPARTMENT OF MICROBIOLOGY
B.SC. FINAL (SEMESTER-V)

5 S MICROBIOLOGY

The examination shall comprise of two theory papers, one in each semester and one practical in each Semester. Each theory paper will be of 3 hours duration and carry 80 marks. The internal assessment will carry 20 marks. The following syllabi are prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper has been divided into 6 units. There shall be one question on each unit, will internal choice and for each of 12 marks and one compulsory question covering all the syllabus of semester - V (08 marks).

5S MICROBIOLOGY
(Paper -Environmental Microbiology and Bioinstrumentation)

Unit-I : Microbial Associations and Air Microbiology

A. Microbial Associations: Definition and examples of positive (Mutualism, Commensalism, Synergism), negative (Antagonism, Competition, Parasitism) and neutral association.

B. Air Microbiology

a) The atmosphere and its layers.
b Different types of microorganisms in air.
c) Techniques for microbiological analysis of air:
   i) Solid impingement devices
   ii) Liquid impingement devices.
d) Air borne diseases: Etiology, symptoms and prevention.
e) Control of microorganisms in air.

Unit-II : Microbiology of Soil.

a) Microorganisms in soil.
b) Rhizosphere.
c) Decomposition of plant and animal residues in soil.
d) Definition, formation, function and microbiology of humus and compost.
e) Biological Nitrogen fixation: Type of nitrogen fixing microorganisms, factors affecting and mechanism of symbiotic and non-symbiotic nitrogen fixation. Process of nodulation, nitrogenase complex, recombinant DNA and nitrogen fixation, legume inoculants.
f) Cycles of elements in nature :
   i) Carbon cycle: CO_2 fixation, organic carbon degradation.
   ii) Nitrogen cycle: Proteolysis, amino acid degradation, Nitrification Denitrification, Degradation of nucleic acids.

iii) Sulphur cycle
Iv) Phosphorus cycle.
v) Biofertilizers, biological pest control.

Unit III : Water Microbiology

- Planktons : Definition, types, factors affecting growth of planktons, methods of enumeration, beneficial and harmful activities of planktons.
- Control of plankton problems.
- Eutrophication and its control.

Unit IV: Assessment of Water Quality and Treatment

Bacteriological analysis of water:

- Significance of Bacteriological analysis of water.

ii) Collection and handling of water sample from various sources.
iii) Indictors if excretal pollution.
iv) Multiple tube dilution technique, MPN.
v) IMViC classification of coliforms.
vi) Membrane filter technique for coliform and faecal Streptococci.
vii) ICMR and WHO Bacteriological standards of drinking water.

Unit V: A) Water Treatment

- Self purification of water: Various zones and factors responsible for self purification.
- Treatment of water: Aeration, Coagulation, Flocculation, Sedimentation, and Filtration.
- Slow and Rapid sand filters: Construction, mechanism of filtration, differences.
- Methods of Chlorination: Plain, Super Chlorination, Ammonia Chlorine treatment, Break Point Chlorination.

B) Waste Water Treatment

a) Aims of Sewage treatment, composition of sewage.
b) Municipal sewage treatment plant.
c) Preliminary treatment (sieving and Grit chamber)
d) Primary treatment (Sedimentation)
e) Secondary treatment (Aerobic)
i) Trickling filter
ii) Activated Sludge process
iii) Oxidation pond
f) Anaerobic sludge digestion

g) Domestic sewage treatment by septic tank and Imhoff tank.

i) Outline of bio-gas production

Unit VI : Bio-Instrumentation

a) Spectroscopy- Definition, Principle, types (UV&IR) & its applications.

b) Electr ophoresis- Definition, Principle, types (Paper & Gel) & its applications.

c) Chromatography- Definition, Principle, types (Paper & TLC) & its applications.

- Isotopic Tracer Techniques - Definition, Principle & applications.

Practicals.
5S MICROBIOLOGY

1. Bacteriological analysis of water and Waste Water.

a) Standard plate Count.
b) Multiple tube dilution technique (MPN for Coliform)
   i) Presumptive test ii) Confirmatory test iii) Completed test.
c) IMViC test for coliform
d) Multiple tube dilution technique for faecal strepto cocci.
e) Membrane filter technique for coliforms & faecal streptococci.
f) BOD estimation.
g) Isolation of Bacteriophage from Sewage.
h) Determination of Chlorine demand and residual chlorine.

2. Study of Soil Microbiology

a) Enumeration of Soil microorganisms.
b) Isolation of Azotobacter from Soil.
c) Isolation of Rhizobium from Soil
d) Isolation of Antibiotic producers from soil

3. Effect of Ultra-violet/Filtration on micro-organism present in water

4. Separation of amino acids and sugars by paper chromatography.

Distribution of marks for Microbiology practical Examination:

1. Major Experiment - 15 marks
2. Minor Experiment - 10 Marks
3. Viva Voce - 10 Marks

4. Spotting - 10 Marks
5. Laboratory Journals - 05 Marks

Total- 50 Marks