PG DIPLOMA IN INDUSTRIAL MICROBIOLOGY

(Non-Semester)

(With effect from the academic year 2013-14)

Eligibility for the Course

Candidates for admission to PG Diploma In Industrial Microbiology could possess a Bachelors degree in Zoology, Botany, Chemistry, Biochemistry, Microbiology Biotechnology/Environmental/ Animal/plant Food sciences, Dietetics & Nutrition, Bioinformatics, BE in Chemical Engineering & Biotechnology; B.Tech in Biotechnology & Bioinformatics/Nanotechnology; BDS; MBBS; B.Sc in Agri/Agri Biotechnology; B.V.Sc., B.F.Sc., Pharm and BPT.

Duration of the Course

One year PG Diploma In Industrial Microbiology course non-semester for One Year duration

Examination

All the theory paper are of 3hours duration each for maximum of 100 marks with passing minimum of 50 marks

Practical examinations are also for 3 hours duration for a maximum of 100 marks and passing minimum of 50 marks.

Question Paper Pattern

Maximum marks: 100

Time: 3 hours

Part A (5 x 3 = 15)

Five short answer questions (One question from each unit)

Part B (5 x 8 = 40)

Paragraph questions (Total questions 8, out of which answers are to be given for any five questions;

Part C (3x 15 = 45)

Total questions 5, out of which answers are to be given for any Three questions;
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<thead>
<tr>
<th>S.No</th>
<th>Theory &amp; Practicals</th>
<th>Maximum Marks</th>
<th>Minimum Marks</th>
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<tr>
<td>1.</td>
<td>Fundamentals Of Microbiology</td>
<td>100</td>
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<td>2.</td>
<td>Microbial Technology</td>
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<td>3.</td>
<td>Microbial Fermentation Technology</td>
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<td>4.</td>
<td>Industrial Microbiology</td>
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<td>P1</td>
<td>Practical - I General Microbiology</td>
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<td>50</td>
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<td>P2</td>
<td>Practical – II Industrial Microbiology</td>
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**Paper-1 Fundamentals of Microbiology**

**UNIT- I:**
Definition and Scope of Microbiology - History and Development of Microbiology (contribution of pioneers) - Golden Era of Microbiology - sample-Pour plate-Streak plate-Spread plate and special methods- Safety procedure in microbiology-GLP.

**Unit 2:** Diversity of Microbial World - Prokaryotic cell - Structure of Bacterial cell-Archaebacteria and Eubacteria - Structure and function of Plasma membrane - cell wall - capsule, flagella – nucleoid - plasmid - Gram positive and Gram negative bacteria.

**Unit 3:** Microbial Nutrition and Growth- Carbon requirements- Growth factors-Growth curve-Synchronous growth- Continuous culture – Measurement of Microbial growth - Mechanism of nutrients uptake- Bath culture- Influence of environmental factors on microbial growth.

**Unit 4:** Scope & Methods for studying microorganisms - pure culture techniques - methods of sterilization - physical and chemical types of media and preservation techniques.

**Unit 5:** Microbial metabolism- Generation of ATP- Enzymes- Metabolism rate- Stages of metabolism- Diversity of catabolic pathway- ATP Generating pathway- Fermentation pathway-Breakdown of Glucose to Pyruvate- Aerobic and an aerobic repiration.

**Book.**

**References**
Paper-2. Microbial Technology


Unit 2: Biosynthesis of bacterial cell wall - transport across membrane - effect of temperature - salinity and oxygen on growth - Anaerobic bacteria, adaptations in extreme conditions.

Unit 3: Microorganism in surface soil- Phyllosphere and rhizosphere microorganism - assoction with plants - Biogeochemical cycles- Carbon- Nitrogen - Sulphur.


Unit 5: Microbial Biofertilizers and Biopesticides: Types of Biofertilizer and Method of application - Birth and tactics of biological control - Microbial pesticides - Insecticides-Nematicides - Herbicides in Industrial level production - applications.

Book


References:


Paper-3. MICROBIAL FERMENTATION TECHNOLOGY


UNITII: Bioreactors: Basic concepts of bioreactors/fermenters, design and operation of Fermenters, different types of bioreactors: Packed bed reactor, Fluidized bed reactor, Trickle bed reactor, Bubble column reactor etc. Scale up of fermentation processes

UNIT III: Microbial kinetics and downstream processing: Basic concepts in microbial kinetics, growth curve, growth pattern of microbes in bioreactors: Batch, fed batch and synchronous growth; Introduction to down Stream processing. Principles, methodology and applications of techniques for isolation, purification, characterization, formulation, packing and preservation of fermentation products; Bioprocess economics.

Unit IV: Industrial Fermentation Technology: Substrates for fermentation industry, inoculum development; fermentation types- Single cell proteins for food and feed, Alcoholic beverages and vinegar, Biopesticides, Biofertilizers, Organic acids, Food additives, Vitamins, Microbial polysaccharides etc. Biotransformation; Pharmaceutical products; Vaccines; By-product utilization in fermentation industry; Genetic Engineering in fermentation Technology


Book

References
Paper-4 Industrial Microbiology

Unit 1. Exploitation of microorganisms and their products, screening, strain development strategies, immobilization methods, fermentation media, raw material used in media production, antifoaming agents, buffers, downstream processing.

Unit 2. Fermentation equipment and its uses - fermentor design - Types of fermentors and fermentations- single, batch, continuous, multiple, surface, submerged and solid state.


Unit 4. Production of alcoholic beverages – Production petroleum from Bacteria and Yeat – Production of beer and wine, biofuels: ethanol, methane, biogas- Recombinant DNA Technology and Immobilization of enzymes in industrial microbiology.


References:
1. Book

References:
Practical-I: General Microbiology

1. Preparation of culture media (agar/broth).
2. Learning the techniques of sterilization.
3. Isolation of E. coli plasmid.
4. Transformation in E. coli.
5. Isolation of DNA from bacteria.
8. Enumeration of microorganisms from air.
9. Isolation of bacteria from rhizosphere and RFLP and RAPD

Reference


Practicals- II. Industrial Microbiology

1. Isolation of pure culture.
2. Enumeration of microbial population.
4. Production protein by Upstream and downstream Demonstration
5. Estimation of glucose.
6. Thin Layer Chromatography
7. Demonstration of Secondary metabolites Production
9. Production Bio-Fertilizer in Industrial level
10. Enzyme assays – amylase, gelatinase, catalase etc.

Reference