DEGREE OF MASTER OF SCIENCE
CHOICE BASED CREDIT SYSTEM

M.Sc. MICRO BIOLOGY SYLLABUS
CHOICE BASED CREDIT SYSTEM 2021-2022
OBJECTIVE OF THE SYLLABUS 2021-2022

1. Internship training for 15 days is included
2. MOOC’S / SWAYAM online test is Compulsory are added
3. Pattern of theory examination were changed
4. CSIR Portions are framed as two papers included as Elective subjects is Compulsory
5. Contents of the syllabus were included and excluded in some papers.
6. Some Papers contents were fully changed and updated
7. EDC Papers not changed
8. New Subject Codes were given
9. Subject wise course objective and Course outcomes are given
10. Credits were given for Training and Online test
SYLLABUS FOR
M.SC -MICROBIOLOGY
(SEMESTER PATTERN)
(For Candidates admitted in the Colleges affiliated to Periyar University from 2021-2022 onwards)

REGULATIONS

1. CONDITIONS FOR ADMISSION

A. ELIGIBILITY CONDITIONS FOR ADMISSION

Candidate who has passed the B.Sc. degree in any Life Sciences[ Microbiology / Applied Microbiology/Industrial Microbiology/ Botany/Plant Sciences and Plant biotechnology/Zoology/Animal Science/ Applied Animal Science and Animal Biotechnology/Biochemistry/Bioinformatics/Biology/Food Science & Nutrition/ /B.Sc Medical Lab Technology/BSMS/BAMS/BUMS/BHMS/Chemistry with Botany/Zoology]as Allied Subjects of this University or an Examination of any other University accepted by the Syndicate as equivalent there to shall be eligible for admission to M.Sc. Degree Course in Applied Microbiology.

Candidate shall be admitted to the examination only if he/she has taken the qualifying degree in Science/Medical subjects as mentioned after having completed the prescribed courses consisting of twelve years of study and has passed the qualifying examination.

B. METHOD OF SELECTION

Candidates have to appear for an entrance examination in the respective subjects to be conducted by the respective departments and thereafter an interview. The date, venue and time of the entrance examination and interview will be notified to the applicants separately as soon as it is fixed.
2. **ELIGIBILITY FOR THE AWARD OF DEGREE**

A candidate shall be eligible for the award of the degree only if he / she has undergone the prescribed course of study in a college affiliated to the University for a period of not less than two academic years, passed the examination of all the four semesters prescribed earning 90 credits (plus 2 credits for Human Rights) and fulfilled such conditions as have been prescribed therefore.

3. **DURATION OF THE COURSE**

The duration of the course is for two academic years consisting of four semesters.

4. **EXAMINATIONS**

There shall be four semester examinations: first semester examinations at the middle of the first academic year and the second semester examination at the end of the first academic year. Similarly, the third and fourth semester examinations shall be held at the middle and the end of the second academic year, respectively.
1. **COURSE OF STUDY AND SCHEME OF EXAMINATIONS**

**NAME OF THE COURSES**

**Semester – I**
- Core–I - General Microbiology
- Core–II - Immunology and Immuno technology
- Core–III - Cell and Molecular Biology
- Elective –I - Inheritance Biology(Compulsory)
- Practical – I &II

**Semester – II**
- Core–IV - Medical Bacteriology and Mycology
- Core–V - Industrial and Pharmaceutical Microbiology
- Core–VI - Genetic engineering and Advances in Biotechnology
- EDC
- Practical – III &IV
- Internship Training for 15 days

**Semester – III**
- Core–VII - Medical Virology and Parasitology
- Core–VIII - Food, Dairy and Environmental Microbiology
- Core–IX - Soil, Agricultural Microbiology and Bio degradation
- Elective –II - Methods in Biology(Compulsory)
- Practical – V &VI
- Internship Training project submission

**Semester – IV**
- Core–IX - Research Methodology, Biostatistics and Bioinformatics
- Elective –III
- Project
- Online Test Certificates should be submitted

**Elective Courses – Major (Choose Any Three)**
1. Inheritance Biology(Compulsory From CSIR - NET)
2. Methods in Biology(Compulsory From CSIR - NET)
3. Plant Phyiology and Plant Tissue Culture
4. Bio Instrumentation and Biological Techniques
5. Nanotechnology
6. Basics of Phytochemistry

EDC (Extra Disciplinary Courses) for other department
1. Entrepreneurial Microbiology
2. Microbial Nanotechnology
3. Basics of Microbiology
4. Human Infectious Diseases and Diagnostics
SCHEME OF EXAMINATIONS

The scheme of examinations for different semesters shall be as follows:

**THEORY:**

- **Time:** 3hrs.
- **Maximum marks:** 75 Marks:
  - **Part A** – 15 Marks (15 Questions) and
  - **Part B** – 2x5=10 Marks (2 Questions)
  - **Part C** – 5x10=50 Marks (5 Questions)

- **Internal marks** - 25
- **External marks** - 75
- **Total marks** - 100.

The following procedure will be followed for Internal Marks:

**Internal Marks**

**Theory Papers:**

- Best Two tests out of 3-10 marks
- Attendance - 5 marks
- Seminar - 5 marks
- Assignment - 25 Marks

25 Marks
Practical:

❖ Attendance - 5 marks
❖ Practical Test Best 2 out of 3 - 30 marks
❖ Record - 5 marks

I 40 Marks

Project:

❖ Internal Marks presentations - 40 marks
❖ Viva - 10 marks
❖ Project Report - 50 marks

Break – up Details for Attendance

❖ Below 60% - No marks
❖ 60% to 75% - 3 marks
❖ 76% to 90% - 4 marks
❖ 91% to 100% - 5 marks
IMPORTANT POINTS

1. The each practical examination should be conducted for 6hrs/day, 2 consecutive days. The fee for the practicals is double the amount of the normal 6 hours practicals (ie. If the practical fee is Rs. 210 for 6 hrs practical's, for these Applied Microbiology students, the fee will be Rs. 420/- practical). Similarly, the practical examiners also should be paid with double the remuneration (i.e. Rs. 100/- practical)

2. Elective papers can be selected by the concerned College Departments based on the student's interest.

3. For EDC papers, students should choose the other department EDC papers.

4. For Internship Training Programme Fees should be decided.

According to TANSHE

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<tr>
<th>S.No</th>
<th>Papers</th>
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<th>External</th>
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<td>Theory</td>
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<td>2.</td>
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<td>4.</td>
<td>Internship Training</td>
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<td>5.</td>
<td>MOOC’S (or)s SWAYAM (PDFs attached)</td>
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5. Human Rights – credits 2 (Compulsary) not included in Percentage

6. Elective Papers – 6 (any 3) (1 & 2 Compulsary)

7. EDC for other department students
<table>
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<td>Internship – 21PMBINI</td>
<td>15 days Training related to curriculum*</td>
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# Internship* sample courses

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<th>Course Name</th>
<th>SME Name</th>
<th>Institute</th>
<th>Course Duration</th>
<th>Nptel URL</th>
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<tr>
<td>Animal Physiology</td>
<td>Prof. Mainak Das</td>
<td>IIT Kanpur</td>
<td>12 weeks</td>
<td><a href="https://nptel.ac.in/courses/102104042">https://nptel.ac.in/courses/102104042</a></td>
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<tr>
<td>Applications Of Interactomics Using Genomics And Proteomics Technologies</td>
<td>Prof. Sanjeeva Srivastav</td>
<td>IIT Bombay</td>
<td>08 weeks</td>
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<td>Aspects Of Biochemical Engineering</td>
<td>Prof. Debabrata Das</td>
<td>IIT Kharagpur</td>
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<td>Biochemistry - IITM</td>
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<td>IIT Madras</td>
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<td>Bio electrochemistry</td>
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<td>Bioenergetics Of Life Processes</td>
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<td>Bioengineering: An Interface With Biology And Medicine</td>
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<td>Bio Informatics: Algorithms And Applications</td>
<td>Prof. Michael Gromiha</td>
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<td>Bio Interface Engineering</td>
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<td>Biomedical Nanotechnology</td>
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<td>Bio Microfluidics</td>
<td>Prof. Tapas Kumar Maiti, Prof. Suman Chakraborty</td>
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<td>Bioreactor Design And Analysis</td>
<td>Prof. Smita Srivastava</td>
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<td>Biostatistics And Design Of Experiments</td>
<td>Prof. Mukesh Doble</td>
<td>IIT Madras</td>
<td>08 weeks</td>
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<td>Cell Culture Technologies</td>
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<td>Computational Systems Biology</td>
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<td>Computer Aided Drug Design</td>
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<td>Demystifying The Brain</td>
<td>Prof. Srinivas Chakravarthy</td>
<td>IIT Madras</td>
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<td>Drug Delivery: Principles And Engineering</td>
<td>Prof. Rachit Agarwal</td>
<td>IISc Bangalore</td>
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<td>Environmental Chemistry And Microbiology</td>
<td>Prof. Anjali Pal, Prof. Sudha Goel</td>
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<td>Experimental Biotechnology</td>
<td>Prof. Vishal Trivedi</td>
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<td>Forests And Their Management</td>
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<td>Fundamentals Of Micro And Nanofabrication</td>
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<td>Genetic Engineering: Theory And Application</td>
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<td>IIT Guwahati</td>
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<td>Human Molecular Genetics</td>
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<td>Immunology</td>
<td>Prof. Sudip Kumar Ghosh, Prof. Agneyo Ganguly</td>
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<td>Industrial Biotechnology</td>
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<td>Interactomics : Basics &amp; Applications</td>
<td>Prof. Sanjeeva Srivastava</td>
<td>IIT Bombay</td>
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<td>Interactomics: Protein Arrays &amp; Label-free Biosensors</td>
<td>Prof. Sanjeeva Srivastava</td>
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<td>Prof. Shamik Sen</td>
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<td>Introduction To Developmental Biology</td>
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<td>Introduction To Dynamical Models In Biology</td>
<td>Prof. Biplab Bose</td>
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<td>Introduction To Geographic Information Systems</td>
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<td>Introduction To Professional Scientific Communication</td>
<td>Prof. S. Ganesh</td>
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<td>Prof. Sanjeeva Srivastava</td>
<td>IIT Bombay</td>
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<td>Introductory Mathematical Methods For Biologists</td>
<td>Prof. Ranjith Padinhateeri</td>
<td>IIT Bombay</td>
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<tr>
<td>Learning About Learning: A Course On Neurobiology Of</td>
<td>Prof. Balaji Jayaprakash</td>
<td>IISc Bangalore</td>
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<td>Mass Spectrometry Based Proteomics</td>
<td>Prof. Sanjeeva Srivastava</td>
<td>IIT Bombay</td>
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<tr>
<td>Material And Energy Balances</td>
<td>Prof. Vignesh Muthuvijayan</td>
<td>IIT Madras</td>
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<td>Medical Biomaterials</td>
<td>Prof. Mukesh Doble</td>
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<td>Metabolic Engineering</td>
<td>Prof. Pinaki Sar, Prof. Amit Ghosh</td>
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<td>Nanotechnology In Agriculture</td>
<td>Prof. Mainak Das</td>
<td>IIT Kanpur</td>
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<td>Plant Cell Bioprocessing</td>
<td>Prof. Smita Srivastava</td>
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<td>Plant Developmental Biology</td>
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<td>Prof. Hanudatta S. Atreya</td>
<td>IISc Bangalore</td>
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<td>Principles Of Downstream Techniques In Bioprocess</td>
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<td>Structural Biology</td>
<td>Prof. Saugata Hazra</td>
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<td>Thermodynamics For Biological Systems: Classical And Statistical Aspect</td>
<td>Prof. Suraishkumar G K, Prof. Sanjib Senapati</td>
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<td>Prof. Vignesh Muthuvijayan</td>
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<tr>
<td>Transport Phenomena In Biological Systems</td>
<td>Prof. G. K. Suraishkumar</td>
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<tr>
<td>Wildlife Conservation</td>
<td>Prof. Ankur Awadhiya</td>
<td>IIT Kanpur</td>
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<td>Wildlife Ecology</td>
<td>Prof. Ankur Awadhiya</td>
<td>IIT Kanpur</td>
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</table>
MOOC’S (or)s SWAYAM

https://swayam.gov.in/

Elective Courses – Major (Choose Any Three) - Paper Codes

1. Inheritance Biology(Compulsory From CSIR - NET) - 21PMIEL01
2. Methods in Biology(Compulsory From CSIR - NET) - 21PMIEL02
3. Plant Physiology and Plant Tissue Culture - 21PMIEL03
4. Bio Instrumentation and Biological Techniques - 21PMIEL04
5. Nanotechnology - 21PMIEL05
6. Basics of Phytochemistry - 21PMIEL06

EDC (Extra Disciplinary Courses) for other department

1. Entrepreneurial Microbiology - 21PMIED01
2. Microbial Nanotechnology - 21PMIED02
3. Basics of Microbiology - 21PMIED03
4. Human Infectious Diseases and Diagnostics - 21PMIED04
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*(Choose from other department EDC papers)*
6. **REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTERS:**
   
   (i) Candidates shall register their names for the First semester examination after the admission in the PG Courses.
   
   (ii) Candidates shall be permitted to proceed from the First Semester up to the Final Semester irrespective of their failure in any of the Semester Examination subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subject) Semester subjects.
   
   (iii) Candidates shall be eligible to proceed to the subsequent semester, only if they earn sufficient attendance as prescribed therefore by the Syndicate from time to time. Provided in case of candidate earning less than 50% of attendance in any one of the semester due to any extraordinary circumstance such as medical grounds, such candidates who shall produce Medical Certificate issued by the Authorized Medical Attendant (AMA), duly certified by the Principal of the College, shall be permitted to proceed to the next semester and to complete the course of study. Such candidate shall have to repeat the missed semester by rejoining after completion of final semester of the course, after paying the fee for the break of study as prescribed by the University from time to time.

7. **PASSING MINIMUM**
   
   a) There shall be no Passing Minimum for Internal.
   
   b) For External Examination, Passing Minimum shall be of 50% (Fifty Percentage) of the maximum marks prescribed for the paper.
   
   c) In the aggregate (External + Internal) the passing minimum shall be of 50% for each Paper/Practical/Project and Viva-voce.
   
   d) Grading shall be based on overall marks obtained (internal + external).

8. **CLASSIFICATION OF SUCCESSFUL CANDIDATES:**
   Candidates whose cured not less than 60% of aggregate mark (Internal + External) in the whole examination shall be declared to have passed the examination in the
First Class. All other successful candidates shall be declared to have passed in Second Class. Candidates who obtain 75% of the marks in the aggregate (Internal + External) shall be deemed to have passed the examination in First Class with Distinction, provided they pass all the examinations (theory papers, practicals, project and viva-voce) prescribed for the course in the First appearance.

9. **GRADING SYSTEM:**
The term grading system indicates a Seven (7) Point Scale of evaluation of the performances of students in terms of marks obtained in the Internal and External Examination, grade points and letter grade.
SEVEN POINT SCALE (As per UGC notification 1998)

<table>
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<td>'O' = Outstanding</td>
<td>5.50 – 6.00</td>
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<td>'A' = Very Good</td>
<td>4.50 – 5.49</td>
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<tr>
<td>'B' = Good</td>
<td>3.50 – 4.49</td>
<td>55 – 64</td>
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<tr>
<td>'C' = Average</td>
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<td>50 – 54</td>
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<tr>
<td>„D&quot; = Below Average</td>
<td>1.50 – 2.99</td>
<td>35 – 49</td>
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<tr>
<td>'E' = Poor</td>
<td>0.50 – 1.49</td>
<td>25 – 34</td>
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<tr>
<td>„F&quot; = Fail</td>
<td>0.00 – 0.49</td>
<td>0 – 24</td>
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10. RANKING
Candidates who pass all the examinations prescribed for the course in the first appearance itself alone are eligible for Ranking / Distinction.

Provided in the case of candidates who pass all the examinations prescribed for the course with a break in the First Appearance due to the reasons as furnished in the Regulations under “Requirements for Proceeding to subsequent Semester” are only eligible for Classification.

11. PATTERN OF QUESTION PAPER
PART – A (Objective type: Answer all Questions 15 X 1 = 15 Marks) PART - B
Answer all Questions either or type 5x4=20 marks PART – C (400 words) Answer all 5 Questions either or type 5x8=40 marks

12. APPEARANCE FOR IMPROVEMENT
Candidates who have passed in a theory paper / papers are allowed to appear again for theory paper/ papers only once in order to improve his/her marks, by paying the fee prescribed from time to time. Such candidates are allowed to improve within a maximum period of 10 semesters counting from his / her first semester of his/her admission. If candidate improve his marks, then
his improved marks will be taken into consideration for the award of Classification only. Such improved marks will not be counted for the award of Prizes / Medals, Rank and Distinction. If the candidate does not show improvement in the marks, his previous marks will be taken into consideration.

Candidate will be allowed to improve marks in the Practicals, Project, Viva-voce, Field work.

13. TRANSITORY PROVISION

Candidates who have undergone the course of study prior to the academic year 2021-2022 will be permitted to appear for the examinations under those Regulations for a period of three years i.e., up to and inclusive of April / May 2017 Examinations. Thereafter, they will be permitted to appear for the examination only under the Regulations then inforce.
M.Sc. MICROBIOLOGY
SEMESTER - I

CORE I: GENERAL MICROBIOLOGY

SUBJECT CODE: 21PMI01

Course Objectives

To enable the students to understand the basic knowledge in Microbiology about the different forms of bacteria, fungi, algae, protozoan's along with the basic principles of microbial taxonomy and microbial metabolism.

Course Outcome

At the end of the successful completion of this course, the learner will be able to

1. Gain a strong foundation on general microbiological practices

2. Learn the basics of various characteristics features of divisions used in the classification of bacteria, fungi, protozoa and algae.

3. Know the basics of Microbial taxonomy and Metabolism of microbes

UNIT – I


UNIT II

Microscopy - Working principle, instrumentation and applications of Bright field microscope, Phase contrast microscope, Dark field microscope, Fluorescent microscope and Electron microscopes (SEM and TEM). Staining Methods – Simple, Gram, Acid-fast, Spore, Granular, Capsular, Flagellar and Fat bodies.
UNIT – III


UNIT – IV


UNIT – V


**REFERENCES**

3. Holt JS, Kreig NR, Sneath PHA and Williams ST. Bergey’s Manual of Determinative Bacteriology (9th Edition), Williams and Wilkins,

Web References
2. www.microbiologyonline.org.uk
3. www.life.umd.edu/classroom/bsci424/BSCI223WebSiteFiles/LectureList.htm
5. https://www.boundless.com/microbiology
Course Objectives

To enable the students to understand the basic knowledge in Microbiology about the different forms of bacteria about their immunological facts.

Course Outcome

At the end of the successful completion of this course, the learner will be able to

1. Gain a strong foundation on general immunological practices
2. Understanding the Immunological assays and test.
3. Understanding the various drugs and vaccines in emerging diseases.

UNIT I - The Cells of Immune System


UNIT II - Humoral Immunity

Development,maturation,activation and differentiation of B-lymphocytes;Antibody: structure,classes and sub classes;antibody diversity-Antigen and antibody interaction. Complement – Classical, alternate and lectin pathways; Hybridoma
technology for production of the monoclonal antibody and applications.

UNIT III - Cellular Immunity

Classification and stages of development (T) Lymphocytes - T cell receptor - Major histocompatibility complex – structure, classification and genetic organization of MHC; mechanism of phagocytosis- ADCC- cell biology of antigen processing and presentation- cytokines; immunosuppression, tolerance.

UNIT IV- Hypersensitivity, Transplantation, Immunology of Tumors

Injury and inflammation; allergy and hypersensitivity-types; Transplantation: types, immunological mechanisms of graft rejection- immunological strategies to prevent graft rejection- Tumors: Immune response to tumors- type of tumor antigens.

UNIT V- Autoimmunity Immuno pathology and Techniques in Immuno technology

Autoimmunity: Diseases & mechanisms - Preparation and storage of tissues - identification of various cell types and antigens in tissues. Immuno cytochemistry- immuno fluorescence, immuno enzymatic and immuno ferritin techniques and immune electron microscopy; Isolation of pure antibody, assays of circulating immune complexes; Isolation of lymphocyte populations. Vaccine Types- Preparation of vaccines.

TEXT BOOKS

2. Abbas,


REFERENCE BOOKS


Course Objectives

To enable the students to understand the basic knowledge of Cell Structure Division and Molecular Structures of different forms of bacteria.

Course Outcome

At the end of the successful completion of this course, the learner will be able to

1. Gain a strong foundation on general Cell Structures and Molecular practices.

2. Understanding the Molecular Structure of Genes.

3. Basic process and encoding Genetic level important mechanisms.

UNIT I Cell Structure Permeability and Transport

Prokaryotes, Development of multicellular organisms, Cell wall structure of bacteria and eukaryotes, Plasma membrane structure and models, cell organelles; cell permeability-concentration gradient and partition coefficient, transport of small molecules- active, passive, ion channels, facilitated diffusions.

UNIT – II Cell division, Cell signaling and protein localization

Cell cycle and its regulation, Bacterial cell division, Eukaryotic
cell division, mechanicsofcelldivision-mitosisandmeiosis;Cellsignaling–signalingmolecules,G protein coupled receptors, Ion-channel receptors, enzyme linked receptors, protein sorting, nuclear localization, mitochondria and chloroplast import and export mechanism.

UNIT – III Molecular structures of genes and chromosomes

Structure of DNA - DNA melting and reannealing, base composition and sequence, size, shape, super twisting; molecular events of prokaryotic and eukaryotic chromosome organization, exon; intron- DNA mutation and repair mechanism.

UNIT IV Replication and Transcription

Basic rules of replication- genes and enzymology of replication, processivity and fidelity of replication, rolling circle replication, termination of replication, importance of telomerase in eukaryotic replication- gene transfer mechanism in bacteria; Molecular events of Prokaryotic and Eukaryotic Transcription; initiation, elongation and termination.

UNIT V Gene expression and regulation

TEXT BOOKS


REFERENCE BOOKS


Course Objectives

The learners will be able to gain adequate knowledge and acquire skill to perform different staining techniques, growth rate of bacteria and biochemical test. To impart knowledge and understanding of practical skills in applying these principles in diagnostic, therapeutic techniques and research.

Course Outcome

At the end of the course, learners will be able to

1. Perform the various staining techniques of bacteria and study the growth rate of bacteria.

2. Understand the various methods to isolate and identify the Microorganisms.

GENERAL MICROBIOLOGY

1. Measurement of microorganisms – Micrometry

2. Staining methods - Gram Staining, Acid fast, Metachromatic granular Staining, Spore Staining, Capsule Staining, Flagella staining.

3. Motility Determination – Hanging drop method and Soft agar

4. Media preparation - Cultural Characters of bacteria on different types of Media - Selective, Differential, Enriched, Enrichment and Transport media
5. **Pure culture techniques** - Streak plate, Pour plate and Spread plate

6. **Bacterial Growth** - Growth curve and Effect of various intrinsic factors such as pH, Temperature on the growth of bacterium-Spectroscopic method.

7. **Anaerobic cultivation** - Anaerobic gas pack method (Demo), Wright’s tube method

8. **Algae** - Isolation and cultivation of Algae

9. **Fungi** - Fungal Slide Culture, Lactophenol Cotton Blue Staining

10. **Study on bacterial extra cellular enzymes** - Starch, Casein, Gelatin and Lipid hydrolysis

11. **Biochemical Tests for identification of bacteria**
   - Oxidase test
   - Catalase test
   - Coagulase test
   - Nitrate reduction test
   - Carbohydrate fermentation test
   - IMViC test
   - TSI test
   - Urease test
   - Amino acid decarboxylation test

12. **Antibiotic sensitivity methods** – Kirby-Bauer method and Stokes method

13. **Fumigation technique.**
References


Web References


3. http://www.microbiologyonline.org.uk/media/.../sgm_basic
   practical micro biology_2.pdf


5. http://www.vlab.amrita.edu/?sub=3&brch=69&sim=192&cnt=1


1. ABO Blood grouping – Rh typing and cross matching
2. Agglutination tests
   ❖ WIDAL
   ❖ RA
   ❖ ASO
   ❖ CRP
   ❖ Beta-HCG
3. Precipitation
   ❖ Ouchterlony's Double Immuno - diffusion test
   ❖ Counter Immunoelectrophoresis
   ❖ Rocket Immunoelectrophoresis
   ❖ Radial Immunoelectrophoresis
4. Rapid plasma reagin test (RPR)
5. ELISA (HIV & Hbs)

REFERENCES:

6. Myer's and Koshy's manual of diagnostic procedures in medical
microbiology and immunology/serology. Published by department of clinical microbiology, CMC and Hospital, Vellore, Tamil Nadu.


Course Objectives

The learners will be able to gain adequate knowledge and acquire skill to perform different staining techniques, various techniques isolation of Nuclic Acids. To impart knowledge and understanding of practical skills in applying these principles in diagnostic, therapeutic techniques and research.

Course Outcome

At the end of the course, learners will be able to

1. Perform the various staining techniques of bacteria and study the Isolation of DNA and RNA process of Bacteria.

2. Understand the various methods to isolate and identify the Microorganisms and Bacterial Genetical analytical process.

PRACTICALS

1. Identification of different stages of mitosis in Allium cepa (Onion) by staining
2. Isolation of genomic DNA from bacterial cells.
3. Extraction of genomic DNA from yeast cells.
4. Isolation of genomic DNA from blood by high salt method.
5. Isolation of genomic DNA from plants by CTAB method.
6. Extraction of plasmid DNA from bacterial cells.
7. Isolation of total RNA from prokaryotes.
8. Quantification of DNA by UV spectrometer.
9. Isolation of drug resistant mutants by gradient plate technique.
10. Size determination of DNA agarose gel electrophoresis.
13. Bacterial transformation.

REFERENCES

7. Kannan N (2003). Handbook of laboratory culture media, Reagents,


Course Objectives:

➢ To understand the basic information on bacterial and fungal disease
➢ Important knowledge on host and parasitic infections
➢ Create a knowledge on the infection caused by the organism
➢ To understand the pathogenesis of bacterial and fungal diseases

Course outcome:

on successful completion of the course the students will be able to

1. Gain wide information regarding various types of bacterial and fungal infections enable proper diagnosis and treatment of various infections caused by bacteria and fungi

2. Apply their acquired knowledge on laboratory techniques on diagnosis of bacterial and fungal disease

UNIT I Bacteriology

UNIT II

Morphology, classification, cultural characteristics, pathogenicity, pathology, laboratory diagnosis and prevention – Control and treatment of diseases caused by the Following organisms: *Staphylococci, Streptococci, Pneumococci, Neisseria* (Gonococci & Meningococci), *Corynebacterium diptheriae*, *Mycobacterium tuberculosis*, *M. leprae*, *Clostridium tetani*, *Cl. botulinum* and *Bacillus anthracis*.

UNIT III

Morphology, classification, cultural characteristics, pathogenicity, pathology, Laboratory diagnosis and prevention – *Salmonella, Shigella dysenteriae, Vibrio cholerae*, *E. coli*, *Pseudomonas aeruginosa*, *Haemophilus influenza*, *Helicobacter pylori*, *Brucella abortus*, *Bordetella*, *Spirochetes, Rickettsiae rickettsi, Chlamydiae trachomatis, Mycoplasmas* – *Emerging Bacterial infections*, Zoonotic diseases and their control – Hospital acquired infections – Hospital Infection control committee – functions – Hospital waste disposal – Ethical committee – functions.

UNIT IV Mycology

Classification of medically important Fungi (Morphology, Infection & Reproduction), Immunity to Fungal Infections. Culture Media and Stains in Mycology, Normal fungal flora of human beings, Specimen collection, preservation, Transportation & Identification of Mycological Agent. Biochemical tests for fungal identification, Anti fungal agents- sensitivity test

UNIT V

REFERENCE BOOKS


WEB REFERENCES.

1. https://microscopemaster.com
2. https://cartercenter.com
3. https://microbesnotes.com
4. https://microbiology info.com
5. https://www.ncbi.nih.gov.in
6. https://www.austincc.edu
7. https://www.mans.edu.eg
8. https://medicalfocustz.weebly.com
M.Sc. MICROBIOLOGY

SEMESTER - II

CORE V - INDUSTRIAL AND PHARMACEUTICAL MICROBIOLOGY

CODE : 21PMI05

Course Objectives:

➢ To understand the basic information on bacterial and fungal and importance of their industrial use.

Course outcome:

on successful completion of the course the students will be able to

1. Gain wide information regarding various types of bacterial and fungal Biochemical process and Fermentations.

2. Microbial production of various industrial important products by bacteria and fungai.

3. Understanding Pharmaceutical microbiological process by checking sterlity of the samples.

UNIT I

Introduction to fermentation – the range of fermentation process. The chronological development of the fermentation industry. The component parts of a fermentation process. Industrially important organisms – Isolation, preservation and strain improvement.

UNIT II

Development of inoculum-Scaleup (Pilotstudy)–Upstream processing–media for industrial fermentation–formulation–

UNIT III

Microbial production of organic acids (Citricacid, Aceticacid, Lactic acid and Itaconic acid), Amino acids (L - Glutamic acid and L - Lysine), Antibiotics (Penicillin, Semi synthetic penicillins, Streptomycin, Tetracyclines and Griseofulvin), enzymes (Amylases, Proteases and Pectinases), vitamins (B12, B2 and C), alcoholic beverages. Microbial transformations–steroids, sterols, antibiotics and pesticides. **Water analysis.**

UNIT IV

Production of vaccines, toxoid, antisera and their standardization. Antiseptics, disinfectants and their standardization. Types of water (DM/Purified water/water for injection) used in pharmaceutical industry. Environmental monitoring. Growth promotion test. Sterility sample analysis. Biological Indicators.

UNIT V

REFERENCE BOOKS


Course Objectives:

- To learn the basics of recombinant DNA technology.
- To acquire an idea about cloning mechanisms.

CONTENTS

UNIT I: Introduction to Genetic Engineering: Definition, Historical perspectives. Enzymes in rDNA technology - Restriction enzymes – types – nomenclature. DNA ligase. DNA modifying enzymes – alkaline phosphatase and polynucleotide kinase- Polymerases and types- Conversion of blunt ended molecules to sticky ended- linkers – adopters – homopolymer tailing.


UNIT V: rDNA technology: Blotting techniques – Southern, Northern and Western blotting. PCR amplification and its application. DNA sequencing methods – dideoxy, chemical and Next Generation Sequencing (NGS), RFLP, RAPD, Microarray. Applications of Genetic Engineering in Medicine and Agriculture.

Text Book

Reference Books
Course Objectives

To make the students to understand the concepts of human rights.

COURSE OUTCOME
After completion of the course, the students will be able to
1. Understand the core principles of human rights philosophy.
2. Know the importance and functions of human rights commission
3. Know the rights from the Governance, economic and social development through various Acts
4. Understand the right to information Act, rights for women, children, Nomads, refugees and various sectors of people in our country.

UNIT-I


UNIT-II

Vote and Contest in Elections - Right to Hold Public Offices- Right to Petition-
Right to Information - Right to Criticise the Government-Right to Democratic
Governance.

UNIT-III

Economic Rights: Right to Work - Right to Adequate Wages - Right to Reasonable
Hours of Work
- Right to Fair Working Conditions - Right to Self Government in Industry -
Customer Rights - Social and Cultural Rights - Right to Life - Right to Clean
Environment.

UNIT-IV

Women’s Rights: Right to Inheritance - Right to Marriage - Divorce and Remarry
-Right to Adoption - Right to Education - Right to Employment and Career.
Advancement - Rights Relating to Dowry - Right for Equality - Right for Safe
Working Conditions - Children’s Rights - Right to Protection and Care – Right to
Education - Issues Related with Infanticide - Street Children – Child Labour-
Bonded Labour - Refugees Rights - Minority Rights - Dalit Rights-Tribal Rights-
Nomads Rights.

UNIT_V

Human Rights Violation: International, National, Regional Level Organizations
to Protect Human Rights - UNO - National Commission for Human Rights - State
Commissions - Non Governmental Organizations and Human Rights - Amnesty
Terrorism and Human Rights - Emergency and Human Rights - Judiciary and

Reference Books

Course Objectives:

- To learn the basics of recombinant DNA technology. To acquire an idea about cloning mechanisms.

COURSE OUTCOMES

After completion of the course, the students’ will be able to

1. Recall the basics and importance of enzymes in molecular research.
2. Apply cloning for developing novel recombinant products.
3. Develop transformants for production of various pharmacologically important products.
4. Apply gene transfer technology for controlling plant diseases.

UNIT-I

Introduction to Genetic Engineering: Definition, Historical perspectives. Enzymes in rDNA technology - Restriction enzymes – types – nomenclature. DNA ligase. DNA modifying enzymes – alkaline phosphatase and polynucleotide kinase- Polymerases and types- Conversion of blunt ended molecules to sticky ended-linkers – adopters – homopolymer tailing.

UNIT-II

UNIT-III

**Cloning Strategies:** Construction of cDNA and genomic libraries. Gene transfer methods—transformation, electroporation, particle bombardment and microinjection. Screening and selection of clones.

UNIT-IV


UNIT-V

**DNA technology:** Blotting techniques – Southern, Northern and Western blotting. PCR amplification and its application. DNA sequencing methods – dideoxy, chemical and Next Generation Sequencing (NGS), RFLP, RAPD, Microarray. Applications of Genetic Engineering in Medicine and Agriculture.

**Text Book**


**Reference Books**


Course Objectives

The learners will be able to gain adequate knowledge and acquire skill to perform different staining techniques, various techniques isolation and identification of Baceteria and fungai. To impart knowledge and understanding of practical skills in applying these principles in diagnostic, therapeutic techniques and research.

Course Outcome

At the end of the course, learners will be able to

1. Perform the various staining techniques of bacteria and study the Isolation from various samples.

2. Understand the various methods to isolate and identify the Microorganisms from Bacterial Infection samples.

PRACTICAL

1. Preparation of cotton swab and sterile container for clinical sample collection.

2. Collection of clinical specimens (Throat swab, pus sample, sputum, urine and stool sample).

3. Microscopic examination of wet film (V.cholerae).

4. Preparation of Stains for bacterial and fungal observation. 5. Staining methods
a) Gram staining 

b) AFB staining 

c) Capsule staining 

d) Spore staining 

e) Granular staining 

f) Flagella (Silver staining) 

g) Nuclear staining 

6. Biochemical reactions for identification of pathogenic bacteria 

a) S. aureus, 

b) E. coli, 

c) K. pneumoniae, 

d) P. aeruginosa 

e) S. typhi, 

f) Shigella dysentriae, 

g) Proteus vulgaris, 

h) V. cholerae 


8. KOH, KOH-DMSO Mount, Indian Ink/LPCB preparation of Skin/hair/nail for fungal observation. 


10. Slide culture method.
11. Cultivation of Yeast (*Candida* & *Cryptococcus*).

12. **Biochemical identification *Candida* spp.**


15. Antibiotic sensitivity test for fungi.

**REFERENCE BOOKS:**


Determinative Bacteriology, 9th Edn. Williams & Wilkins, Baltimore.


M.Sc. MICROBIOLOGY SEMESTER - II PRACTICAL- IV

SUBJECT CODE: 21PMBP04

(GENETIC ENGINEERING AND INDUSTRIAL MICROBIOLOGY)

GENETIC ENGINEERING

Course Objectives:

➢ To understand the basic information on bacterial and fungal industrial products
➢ Important knowledge on microbial products.
➢ Create knowledge on industrially important process.
➢ To understand the isolation of nucleic acids from bacteria.

Course outcome:

On successful completion of the course the students will be able to

1. Gain wide information regarding various types of bacterial and fungal industrial products and various important processes in industries.

2. Apply their acquired knowledge on laboratory techniques and screening of various microbial products important in commercial products.

3. Production of various metabolites and enzymes and acids as end products.

4. To understanding the genetic analytical process.

PRACTICAL

1. Isolation of chromosomal DNA from bacteria.

2. Isolation of plasmid DNA.

3. Restriction digestion of λ DNA (EcoR1 and BamH1) and ligation.

5. SDS-PAGE.
6. Protein estimation by Lowry et al method
7. Western blotting.
8. Southern blotting.
9. Separation of biomolecules by paper, thin layer and column chromatography.
10. Polymerase chain reaction.
11. Plant tissue culture—Explant preparation, Callus formation in MS media.

REFERENCES BOOKS:

M.Sc. MICROBIOLOGY
SEMESTER - II
PRACTICAL- IV
SUBJECT CODE: 21PMBP04

INDUSTRIAL MICROBIOLOGY

1. Screening of antibiotics producing microbes from soil.

2. Production of microbial enzymes
   a). Solid state fermentation (Anyone enzyme)
   b). Submerged fermentation (Anyone enzyme)

3. Assay of enzymes
   a). Amylase
   b). Protease
   c). Lipase

4. Immobilization of cells and enzymes

5. Microbial production of wine


7. Minimal inhibitory concentration (MIC) determination of antibiotics – Broth Dilution

8. Minimal inhibitory concentration (MIC) determination of antibiotics – Filter paper disc assay

9. Evaluation of disinfectants – Filter paper disc assay

10. Phenolco–efficient test

11. Vitamin assay (B12/Nicotinic acid)

12. Sterility testing of pharmaceutical products (Membrane filter assay – Fluid thigly collate medium)(Demo)

13. Bacterial Endotoxin Test–Limulus Amoebocyte Lysate (LAL) assay (Demo).
REFERENCE BOOKS:


Course objectives.

The course is designed to develop the student with enough knowledge about disease caused by viruses and parasites

❖ The epidemiological diagnostic techniques
❖ Preventive measures and techniques

Course Outcome

Knowledge gained as collection from infected clinical samples

Isolation and identification of diseases producing bacteria from clinical samples. Anti biotic sensitivity test.

UNIT I

Brief outline on discovery of Viruses, nomenclature, ICTV classification of Viruses, Distinctive properties of Viruses, Morphology & ultra structure. General methods of diagnosis and serology, viriods, prions, satellite RNAs and virusoids. Anti viral agents
– Viral vaccines, Interferon.

UNIT II

UNIT III


UNIT IV


UNIT V

REFERENCE BOOKS


JAYPEE brothers, Medical Publishers (P) Ltd, New Delhi.


WEB REFERENCES:

1. http://dmoz.org/Science/Biology/Microbiology/


5. http://www.biosci.ohio-state.edu/-zoology/parasite/home.html

OTHER WEB

1. https://gmch.gov.in


3. https://www.cartercenter.org

4. https://www.studocu.com

5. https://www.microbenotes.com

6. https://www.labquality.be
7. https://www.kumc.edu
8. https://www.meddean.luc.edu
10. https://www.jcp.bmj.com
Course objectives.

The course is designed to develop the student with enough knowledge about disease caused by Food borne micro organism.

❖ The Micro organisms present in air and seawage.

Course Outcome

1. Knowledge gained as collection from infected food samples

2. Solution and identification of diseases producing bacteria from food samples.

3. Micro organism present in the air sample and seawage samples.


UNIT I

Food as a substrate for microbes. Microorganisms important in food microbiology. Factors influencing microbial growth in food. Extrinsic and Intrinsic factors. Sources of food contamination.

UNIT II

Principles of food preservation, Contamination, preservation and spoilage of fruits, vegetables, meat, poultry, eggs, fish and other seafoods. Canning-Methods-Types-Spoilage of canned foods. Food borne diseases, food intoxication and their control measures.
UNIT III


UNIT IV


UNIT V

Waste treatment- Types of wastes - Characterization of solid and liquid wastes. Effluent treatment - Primary, secondary (aerobic and anaerobic) and tertiary Methods - Disinfection - SCP and Biogas production. Definition of DO, BOD, COD and their limits in treated industrial effluents. Solid waste management - Composting, vermicomposting, silage, pyrolysis saccharifications and Mushroom cultivation.
REFERENCES


14.1 M.S. Bhatt and Asheref Illiyian (2012), Solid Waste Management: An Indian Perspective, Synergy Books India, New Delhi.
Course objectives.

The course is designed to develop the student with enough knowledge about soil micro organism.

❖ The Micro organisms present in soil.
❖ Bio fertilizers.

Course Outcome

Knowledge gained as

1. Isolation and identification of diseases producing bacteria from soil samples.
2. Micro organism present as Bio fertilizers.
3. Soil pathogens.

UNIT I

Discoveries in soil Microbiology; distribution of micro organisms in soil, Autochthonous, Allochthonous and Zymogenous microbes, quantitative estimation of micro organisms in soil, role of micro organisms in soil fertility; influence of soil and environmental factors on micro flora, moisture, pH, temperature, organic matter, agronomic practices.
UNIT II

UNIT III
Interaction between soil microbes–Neutralism, Commensalism, Symbiosis, Synergism, Amensalism, Parasitism, Predation and Competetion. Interrelationships between soil microbes and plants, Rhizosphere concept, R:S ratio, rhizoplane; spermosphere; phyllosphere, Mycorrhizae-types, Rumen flora, Insects microbial interactions.

UNIT IV
UNIT V

REFERENCE BOOKS:


Course objectives.

The course is designed to develop the student with enough knowledge about virus and parasites.

❖ Staining techniques to observe parasites.

Course Outcome

Knowledge gained as

1. Isolation and identification of viruses and parasites in the clinical sample.

PRACTICAL

1. Examination of parasites in clinical specimens - ova/cysts in faeces-

\[\text{Saline/Iodine/LPCB Wetmount}\]

2. Direct and concentration: methods - Formal Ether and Zinc sulphate methods - Saturated salt solution method.


4. Thin smear by Leishman's stain.


7. Spotters of viral inclusions and CPE - stained smears. Viral serology- HAI – ELISA kits, Western Blotting.
REFERENCE BOOKS:


Course objectives.

The course is designed to develop the student with enough knowledge about soil micro organisms.

❖ The Micro organisms present in soil.
❖ Bio fertilizers.

Course Outcome

Knowledge gained as

1. Isolation and identification of diseases producing bacteria from soil samples.
2. Micro organism present as Bio fertilizers.
3. Soil pathogens.

PRACTICAL

1. Microbiological (Bacteria and Fungi) examination of spoiled foods
   ❖ Vegetables
   ❖ Fruits
   ❖ Dairy products
2. Examination of microbial loading
Fruit pulp
Carbonated beverages
Ice creams

3. Assessment of milk quality by
  - Breeds count
  - Standard Plate Count (SPC) method
  - Methylene Blue Reduction Test (MBRT)
  - Resazurin Test

4. Litmus milk test

5. Quantification of microbes in air by
  - Settle plate method
  - Air sampler

6. Examination of pot ability of drinking water by
  - Membrane filter technique
  - Standard Plate Count (SPC) method
  - Most Probable Number Test (MPN)

7. Physico-chemical assessment of treated water by
  - DO
  - COD
  - BOD

REFERENCE BOOKS:


international, New Delhi.

1. Enumeration of Heterotrophic microbes from soil
2. Isolation of Rhizobium from rootnodules
3. Isolation of Azotobacter from soil
4. Isolation of Azospirillum from root
5. Isolation of Phosphate Solubilizers
6. Estimation of R:S ratio of rhizosphere
7. Isolation of Antagonistic microorganism from soil
8. Isolation and identification of plant pathogens
   - Citrus canker-Xanthomonas citric
   - Blight of paddy-Xanthomonas oryzae
   - Tikka leaf spot-Cercosporasp.
   - Wilt of cotton-Fusarium oxysporum
   - Redroot of sugarcane-Colletotricum falcatus
9. Study of Cyano bacteria
   - Anabaena
   - Nastoc
   - Oscillatoria
   - Lyngbya
10. Isolation and identification of Trichodermasp.
11. Isolation of Cellulose degrading bacteria.
12. Isolation of Xenobiotic (pesticide) degrading bacteria.
13. Isolation and Microscopic observation of Mycorrhizae/spore.
REFERENCES:

Course objectives.

The course is designed to develop the student with enough knowledge about data collections for research work.

❖ Bio informatics.

Course Outcome

Knowledge gained as

1. Data collection and computations in biology.
2. Presentation of research.

UNIT I

UNIT II


UNIT III

ANOVA (one way and two way), Chi square test – Student's T test – testing of hypothesis-null hypothesis- level of significance-standard error. F Test Web Resources for Microbiology–Use of Digital Library.

UNIT IV

Bioinformatics - Introduction and skills for a bioinformatician. Biological databases- Database searching, Sequence analysis, Pair alignment, Visualizing protein structures, Predicting structure and function of protein are using sequences, Tools for genomics and proteomics.

UNIT V

Problem selection and project designing. Review of literature, source of collection, processing of data, presentation of data, error, editing the final draft, presentation of research project.
REFERENCES:


16. S.P.Guptha - Statistical Methods
17. Palanisamy and Manoharan - Statistical methods of Biology
18. Khan and Khan - Fundamentals of Biostatistics
Course objectives.

The course is designed to develop the student with enough knowledge about genetic field.

Course Outcome

Knowledge gained as

5. Gene Mapping.
6. Mutation.

1. INHERITANCE BIOLOGY

UNIT-I

Mendelian principles: Dominance, segregation, independent assortment.

Concept of gene: Allele, multiple alleles, pseudoallele, complementation tests

Extensions of Mendelian principles: Codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters.
UNIT-II

Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population inplants.

Extra chromosomal inheritance: Inheritance of Mitochondrial and chloroplast genes, maternal inheritance.

UNIT-III

Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.

Human genetics: Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders.

UNIT – IV

Quantitative genetics: Polygenic inheritance, heritability and its measurements, QTL mapping.

Mutation: Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis.

UNIT- V

Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy and their genetic implications.

Recombination: Homologous and non-homologous recombination including transposition.
Course objectives.
The course is designed to develop the student with enough knowledge about Molecular Techniques.

Course Outcome
Knowledge gained as

1. Recombinant DNA methods.
2. Immuno Techniques.

2. METHODS IN BIOLOGY

UNIT-I
Molecular Biology and Recombinant DNA methods:
expression, such as micro array based techniques. Isolation, separation and analysis of carbohydrate and lipid molecules RFLP, RAPD and AFLP techniques.

**UNIT-II**

**Histochemical and Immuno techniques**

Antibody generation, Detection of molecules using ISA, IA, western blot, immune precipitation, fluocytometry and immune fluorescence microscopy, detection of molecules in living cells, in situ localization by techniques such as FISH and GISH.

**Biophysical Method:**

Molecular analysis using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy. Molecular structure determination using X-ray diffraction and NMR. Molecular analysis using light scattering, different types of mass spectrometry and surface plasma resonance method.

**UNIT-II**

**Statistical Methods:**

Measures of central tendency and dispersal; probability distributions (Binomial, Poisson and normal); Sampling distribution; Difference between parametric and non-parametric statistics; Confidence Interval; Errors; Levels of significance; Regression and Correlation; t-test; Analysis of variance; $X^2$ test; Basic introduction to Multivariate statistics, etc.

**UNIT-IV**

**Radio labeling techniques:**

Detection and measurement of different types of radioisotopes normally used in biology, incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material, safety guidelines.
**Microscopic techniques:**

Visualization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM, image processing methods in microscopy.

**UNIT-V**

**Electrophysiological methods:**
Single neuron recording, patch-clamp recording, ECG, Brain activity recording, lesion and stimulation of brain, pharmacological testing, PET, MRI, fMRI, CAT.

**Methods in field biology:**
Methods of estimating population density of animals and plants, ranging patterns through direct, indirect and remote observations, sampling methods in the study of behavior, habitat characterization: ground and remote sensing methods.
Course objectives.

The course is designed to develop the student with enough knowledge about Photosynthatic micro organisms and Energy generating process.

Course Outcome
Knowledge gained as

1. Photosynthetic mechanism Energy

2. Energy generating path ways

3. Micro propagation process

UNIT I

UNIT II
Respiration and photorespiration - Glycolysis, Citric acid cycle, plant mitochondrial electron transport and ATP synthesis. Secondary metabolites – Bio synthesis of Terpenes, Phenols and Nitrogenous compounds and their roles.
UNIT III

UNIT IV
General Techniques of Micro propagation, Initiation of culture, Multiplication, Rooting – Hardening, callus culture, Embryogenesis. Somaclonal and gametoclonal variation, uses in crop improvement. Synthetic seeds-practical application. PTC medium.

UNIT V

REFERENCES:
5. NIIR Board of Consultants & Engineers (2005). Handbook on plant and cell tissue culture. Asia Pacific Business Press Inc.,
M.Sc. MICROBIOLOGY
ELECTIVE COURSES
BIOINSTRUMENTATION AND BIOLOGICAL TECHNIQUES

SUBJECT CODE: 21PMIEL04

Course objectives.

The course is designed to develop the student with enough knowledge about bio instruments

Course Outcome

Knowledge gained as

1. Bio instruments mechanism Energy
2. Principles and methodology of biological technique

3. Molecular techniques process

UNIT I

Buffers, molars and normal solutions, pH meter, pH electrodes – calomel and glass electrodes. Incubator, water bath shaker, laminar airflow.

UNIT II


UNIT III

UNIT IV
Chromatography – paper, thin layer, column, ion exchange, gas chromatography and HPLC, Colorimetry, spectrometry - FACS - Biosensors.

UNIT V
Biological Techniques-ELISA-Principles and types. Immuno diffusion techniques- ODD, RIA. Agglutination and its applications-IFT, CFT.

REFERENCES:

Course objectives.

The course is designed to develop the student with enough knowledge about Nano Technology.

Course Outcome

Knowledge gained as
1. Nano technology and nano particals.

UNIT I - Introduction to nanotechnology


UNIT II- Synthesis Methods of Nano materials

Physical synthesis - Ball Milling - Electrodeposition - Spray Pyrolysis - Thermal evaporationChemicalsynthesis-Sol-GelProcess-MetalNanocrystalsbyReduction - Solvothermal Synthesis - Biological Synthesis - Protein-Based Nanostructure Formation - DNA-Templated Nanostructure Formation - Protein Assembly
UNIT III - Properties of Nano materials

Physical properties - Electrical, Optical, Mechanical, Magnetic, Quantum confinement, Surface Plasmon resonance - Electrochemical Properties of Nano scale Materials, Intra-molecular bonding, Inter-molecular bonding, Nano catalysis, Surface energy, Self-assembly - Interaction Between Biomolecules and Nano particle Surfaces

UNIT IV - Characterization methods


UNIT V - Applications of Nano particles

M.Sc. MICROBIOLOGY
ELECTIVE COURSES
BASICS OF PHYTOCHEMISTRY
SUBJECT CODE: 21PMIEL06

Course objectives:

1. To gain knowledge on diversity and distribution of the Indian medicinal plants
2. To know about the Indian Systems of medicine.
3. To understand the various phytochemicals that are of therapeutic use
4. To observe the applications of ethno medicine in synthesis and discovery of novel medicines
5. To get awareness on the constitutional laws related to medicinal plants

Course Outcome

Knowledge gained as

1. Plant secondary metabolize.
2. Phytochemical screening.

UNIT I

Distribution of Indian medicinal plants; Introduction, Important medicinal plants, eco distribution, mapping distribution in different bio geographic zones. Diversity hot spots - Endemism - Rare, endangered and threatened species. Plant genetic resources and their conservation: Knowledge on tribal and folkloric medicine in India. Hot spots in India: Western Ghats and The Himalayas. Medicinal and Aromatic plants – Scope and importance of medicinal plants. Drug discovery from plants – the role of plants in human history- the role of plant derived compounds in drug development. NMPB, AYUSH and their role in promoting research on medicinal plants in India.
UNIT II

UNIT III

UNIT IV

UNIT V
REFERENCES:


3. Bajpai, s. Biological instrumentation and methodology.


“An Introduction to Ethical, Safety and Intellectual Property Rights Issues in Biotechnology” by Padma Nambisan

www.nmpb.nic.in

ayush.gov.in

www.indiaenvironmentportal.org.in/.../minor-forest-produce
UNIT I
Entrepreneur development, activity, Institutes involved, Government contributions to entrepreneur, risk assessment, Industrial Microbiology, Definition, scope and historical development.

UNIT II
Microbial cells as fermentation products – Baker's yeast, food and feed yeasts, bacterial insecticides, legume inoculants, Mushrooms, Algae, Enzymes as fermentation products- bacterial and fungal amylases, proteolytic enzymes.

UNIT III
Mushroom cultivation and composting-cultivation of Agaricus campestris, Agaricus bisporous and Volvoriell volvaciae: Preparation of compost, filling tray beds, spawning, maintaining optimal temperature, casing, water harvesting, storage, Biofertilizer-Historical background, chemical fertilizers versus biofertilizers, organic farming. Rhizobiumsp., Azospirillumsp., Azotobactersp., as Biofertilizers

UNIT IV
Brewing - Media components, preparation of medium, microorganisms involved, maturation, carbonation, packaging, keeping quality, contamination, by products. Production of industrial alcohol.
UNIT V


REFERENCES:
5. Arora.Entrepreneurial Development in India.
UNIT I

Definition – Evolution of Nanoscience – Need of Nanotechnology – Hurdles for Nanotechnology development – Factors affecting the manufacturing process of nano materials – Role of physicists, chemists, medical doctors, engineers, biologists and computer scientists in nanotechnology.

UNIT II


UNIT III

UNIT IV


UNIT V


REFERENCES:

M.Sc. APPLIED MICROBIOLOGY

EDC COURSES - EXTRA DISCIPLINARY COURSES

BASICS OF MICROBIOLOGY

SUBJECT CODE: 21PMIED03

Course Objectives:

➢ Providing information on the basics of Microbiology.

COURSE OUTCOME

Knowledge gained as

➢ Understanding history of microbiology and microbial techniques

UNIT I


UNIT II

Structure and organization of bacterial cell. Sterilization and Disinfection, Methods of sterilization—Physical and chemical methods.

UNIT III

Culture and media preparation, Nutrition—Different phases of growth—Growth curve. Structure and function of DNA and RNA.

UNIT IV

UNIT V


REFERENCES:

M.Sc. MICROBIOLOGY
EDC COURSES - EXTRA DISCIPLINARY
COURSES HUMAN INFECTIOUS DISEASES AND DIAGNOSTICS
SUBJECT CODE: 21PMIED04

Course Objectives:
➢ Providing information on the types of infection and their diagnosis
➢ Imports knowledge on host defence mechanism

COURSE OUTCOME
Knowledge gained as
➢ Important technique of diagnosis procedure
➢ Understanding the preventive measure towards infection

UNIT I
Scope and relevance of Microbiology-Definition and concepts, Type of microorganism, Distribution of Microorganism in nature; Development of Microbiology as a Scientific discipline; General characteristics of microorganisms- General principles, Taxonomy, classification and structural organization of Bacteria, Fungi, Viruses, Algae, Actinomycetes, Mycoplasma, and Rickettsiae; Microscopy-Principles and applications.

UNIT II
Fixatives and Fixation of smears, Stains- Definition, Acidic, Basic stains, simple and differential staining, use and significance of stains in microbiology; cultivation of micro organism- Pure culture techniques; cultivation of anaerobes; control of
microorganism- sterilization by physical and chemical methods, Antiseptics.

UNIT III

Binomial nomenclature; Outline classification of living organisms- Haeckel, Whittaker, and woese system, normal micro flora in human body and their beneficial effects; Lymphoid organs and types of immunity; General principles of diagnostic microbiology- collection, transport, and processing of clinical specimens, General methods of laboratory diagnosis-cultural, biochemical, serological, and molecular methods.

UNIT IV

Host pathogen interaction- virulence factors, General account of the following diseases- Causal organisms, pathogenesis, diagnosis, prevention and therapy of Typhoid, cholera, dysentery, whooping cough, tuberculosis, Malaria, small pox, and AIDS. General account of Nosocomial Infections and prevention.

UNIT V

Antimicrobial therapy in the diagnosis of diseases; In vitro diagnostic methods agglutination, precipitation, immunofluorescence, ELISA, Skin test; Vaccines: Principles underlying the preparation of live and attenuated vaccines. Immunization; Automation in Disease diagnosis.

REFERENCES:


Hall, New Jersey.


WEB SITES


OTHER WEB SITES

1. https://www.mayoclinic.org
2. https://www.euro.who.int
3. https://animals.org/aim
4. https://www.yourgenome.org
6. https://www.austincc.edu
QUESTION PAPER PATTERN

Theory I/II/III/IV Semester

M. Sc. Examination,

...MONTH & ...YEAR

M.Sc. Microbiology

Paper title

Duration: 3Hrs MaxMarks: 75

Instruction: Answer all the two Parts.

PART – A (15 X 1 = 15)

(Three question from each unit)

Answer All the questions:

Objective Questions (Multiple Choice)

PART – B (Either or Choice)

(One question from each unit)

Answer All the questions: 5 X 2 = 10

1. a). (or) b) .
2. a). (or) b) .
3. a). (or) b) .
4. a). (or) b) .
5. a). (or) b) .
PART – C (Either or Choice)

(One question from each unit)

Answer all the questions: \(5 \times 10 = 50\)

1. a). (or) b).
2. a). (or) b).
3. a). (or) b).
4. a). (or) b).
5. a). (or) b).
QUESTION PAPER PATTERN PRACTICAL

M.Sc. Microbiology Scheme of Examination

I/II/III/ Semester M. Sc. Examination,

..MONTH &...YEAR

Applied Microbiology Practical Examination

Duration: 6 Hrs/ day, 2 days

Max. Marks: 60

Q.1. Major Practical

Q.2 Minor Practical Spotters

. Identify and Critical comment on.

Q.3 (Specimens/Spotters)

A.
B.
C.
D.
E.

Viva-Voce

Record note

20Marks

15marks

5 X 3 = 15 Marks

05Marks

05Marks
III - Semester M.Sc. Examination Project work (Training)

Internship Training Dissertation Thesis 50 Marks
Viva-Voce Training in Bioscience filed 10 Marks

IV Semester M.Sc. Examination Project work (Dissertation)

Dissertation Thesis 50 Marks
Viva-Voce 10 Marks