**PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

The B.Sc., Microbiology program describe accomplishments that graduates are expected to attain within five to seven years after graduation.

<table>
<thead>
<tr>
<th>PEO</th>
<th>Description</th>
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<tbody>
<tr>
<td>PEO1</td>
<td>Active and Principal investigator</td>
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<tr>
<td>PEO2</td>
<td>Resourceful educator</td>
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<td>PEO3</td>
<td>Administrative / Executive official</td>
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<tr>
<td>PEO4</td>
<td>Leadership excellence</td>
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<tr>
<td>PEO5</td>
<td>Intellectual adeptness in various perceptions</td>
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<tr>
<td>PEO6</td>
<td>Entrepreneur</td>
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<tr>
<td>PEO7</td>
<td>Chief microbiologist in clinical diagnostic and quality control sector</td>
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<td>PROGRAMME SPECIFIC OUTCOMES (PSOs)</td>
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<tr>
<td><strong>After the successful completion of B.Sc., Microbiology, the students are expected to</strong></td>
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<tr>
<td><strong>PSO1</strong></td>
<td>isolate and identify the microorganisms including bacteria, fungi and algae.</td>
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<td><strong>PSO2</strong></td>
<td>to get acquainted knowledge about the taxonomical classification of microorganisms.</td>
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<td><strong>PSO3</strong></td>
<td>acquire knowledge about modern microbiological techniques and bioinstrumentation which make them competent to be placed in various Microbiological / Biotechnological industries.</td>
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<td><strong>PSO4</strong></td>
<td>attain practical exposure during the institutional training.</td>
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<td><strong>PSO5</strong></td>
<td>gain the knowledge of clinical investigation and diagnosis of various infectious diseases.</td>
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<td><strong>PSO6</strong></td>
<td>acquire knowledge on health care, prevention and control of various pathogenic microbes which cause seasonal outbreaks, epidemics and pandemics etc.</td>
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<td><strong>PSO7</strong></td>
<td>understand theoretical and practical knowledge in the allied subjects Biostatistics and Computer Applications; Biochemistry in addition to the core course subjects in Microbiology.</td>
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<td>PROGRAMME OUTCOMES (POs)</td>
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<td><strong>On successful completion of the B.Sc., Microbiology programme</strong></td>
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<tr>
<td><strong>PO1</strong></td>
<td>Acquire eligibility for higher studies / technical and administrative placement in government and private sectors.</td>
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<td><strong>PO2</strong></td>
<td>Attain competency to be placed in various Microbiological / Biotechnological industries.</td>
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<td><strong>PO3</strong></td>
<td>Obtain technical experience to become an entrepreneur by institutional training / internship.</td>
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<td><strong>PO4</strong></td>
<td>Understand the integral role of science in life.</td>
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<td><strong>PO5</strong></td>
<td>Acquaint and establish equilibrium of nature and in fact create a fit biosphere with the knowledge of Microbiology.</td>
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<td><strong>PO6</strong></td>
<td>Acquire skills necessary to fulfill the personal, civil and social responsibilities.</td>
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<td><strong>PO7</strong></td>
<td>Develop knowledge in ethical thinking, quantitative analytical skills and its application to the issues in society.</td>
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<td><strong>PO8</strong></td>
<td>Acquire knowledge on harmful and beneficial role played by microbes in human health.</td>
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<td><strong>PO9</strong></td>
<td>Understand the impact of gene technology in microbiology for human welfare.</td>
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<tr>
<td><strong>PO10</strong></td>
<td>Comprehend the role of recent technologies in microbiological applications &amp; research data management.</td>
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### B.Sc., Microbiology Degree Course

**Scheme of Examination (Revised) CBGS-OBE Pattern**

*(Affiliated Colleges)*

*(For the students admitted from the academic year 2020 – 2021 batch onwards)*

<table>
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<tr>
<th>Part</th>
<th>Study Components</th>
<th>Course Title</th>
<th>Course / Subject Code</th>
<th>Ins. hrs/Week</th>
<th>Examinations</th>
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**SEMMESTER – V**

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**SEMMESTER – VI**

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Course code | 13A | FUNDAMENTALS OF MICROBIOLOGY | L  | T  | P  | C  \\
---|---|---|---|---|---|---
Core-I | | | 4 | 2 | - | 4 \\
Pre- requisite | Basic knowledge on Microbiology gained during H. Sc., | Syllabus Version | 2020 - 2021 \\

Course Objectives:
The main objectives of this course are to:
- gain insights on how the subject area developed over a period of time.
- impart knowledge on the working of different types of Microscopes.
- internalize the techniques used to observe microorganisms by different staining techniques.
- understand the concept of asepsis and modes of sterilization.
- identify the different types of medium and techniques used for the growth and cultivation of microorganisms.

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Get acquainted with contributions of various scientists.
2. Gain knowledge about microscopy.
3. Acquainted with staining techniques.
4. Explore basic techniques of microbiology.
5. Identify the shapes of microbes and cultivate microbes in the lab.

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Unit – I 18 Hours

Unit – II 18 Hours
Microscopy – Principles and applications – Bright field, Dark field, Phase contrast, Fluorescence, Confocal, SEM & TEM – Specimen preparation for Electron microscopy.

Unit – III 18 Hours
Structure and organization of bacterial cell wall: Gram positive and Gram Negative bacterial cell wall. Staining – Principles – Types of staining – Simple, Differential (Gram, Spore, AFB), Capsule staining (Negative), Giemsa Staining, LPCB, KOH Mount.

Unit – IV 18 Hours

Unit–V 18 Hours
Culture and Media preparation – Solid and Liquid – Types of Media – Synthetic and Complex, Enriched, Enrichment, Selective and Differential media, Natural components as media and Special Purpose Media (one example for each type). Anaerobic culture technique – Wright’s tube, Roll tube, McIntosh Fluid’s jar method. Pure culture techniques – Tube dilution, Pour, Spread and Streak plate.

Total Lecture hours | 90 Hours

Text Books

References

Related Online Contents
1. https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Kaiser)/Unit_1%3A_Introduction_to_Microbiology_and_Prokaryotic_Cell_Anatomy/1%3A_Fundamentals_of_Microbiology
5. https://www.swayam.gov.in

Course designed by: Mrs. C.L. Shathiyaapriya, Assistant Professor of Microbiology, Tiruppur Kumaran College For Women, Tiruppur
Mrs. M.MeenaKshi, Assistant Professor of Microbiology, Sri Ramakrishna College of Arts and Science For Women, Coimbatore

Verified by: Dr. Gandhimathi.R., Chairperson

Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low
Second Semester
Course code | 23A
---|---
Core-II | ANALYTICAL MICROBIOLOGY
Pre-requisite | Basic knowledge on Microbiology gained in Semester I of this programme.

Syllabus Version | 2020 - 2021

Course Objectives:
The main objectives of this course are to:
- gain insights on the concepts in chemistry for the preparation of solutions.
- get acquainted with the different instruments used in microbiology laboratory.
- impart knowledge to identify the physical and chemical properties of biomolecules
- facilitate the students with the concept of property of light absorption to study biomolecules.
- understand the principle and applications of chromatographic techniques.

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

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<tr>
<th>Unit</th>
<th>Course Content</th>
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<tbody>
<tr>
<td>I</td>
<td>Buffers, Molar and Normal solutions, pH meter, pH electrodes – Colomel and glass electrode</td>
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<tr>
<td>II</td>
<td>Principles and Applications of Autoclave, Hot air oven, Incubator, Laminar air flow chamber / Biosafety cabinets, BOD incubator, Metabolic shaker, Incinerator</td>
</tr>
<tr>
<td>IV</td>
<td>Colorimetry, Turbidometry, Spectrometry – UV and Visible Spectrophotometer. Flame Photometry, AAS.</td>
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<tr>
<td>V</td>
<td>Chromatography – Paper, Thinlayer, Column, Ion-exchange, Gas and HPLC. Electrophoresis – SDS – PAGE and Agarose gel electrophoresis, PFG.</td>
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Text Books

References

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<tr>
<td>1</td>
<td>Gedder, A. and L. E. Balser, John Wiley and Sons, Principles of applied Biomedical</td>
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<td>instrumentation.</td>
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<tr>
<td>2</td>
<td>Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.</td>
</tr>
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<td></td>
<td>New York.</td>
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<tr>
<td>4</td>
<td>Boyer, Rodney, F. Benjamin and Cummins, Modern Experimental Biochemistry. 2nd Ed.</td>
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Related Online Contents

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<td><a href="https://microbenotes.com/instruments-used-in-microbiology-lab/">https://microbenotes.com/instruments-used-in-microbiology-lab/</a></td>
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<td><a href="https://www.swayam.gov.in">https://www.swayam.gov.in</a></td>
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Course designed by: Mrs.C.L.Shathiyaapriya, Assistant Professor of Microbiology, Tiruppur Kumaran College For Women, Tiruppur
Mrs. M.Meenakshi, Assistant Professor of Microbiology, Sri Ramakrishna College of Arts and Science For Women, Coimbatore

Verified by: Dr.Gandhimathi.R., Chairperson

Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low
Course code: 23B  
**GENERAL BIOLOGY**  

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**Pre- requisite**  
Basic knowledge on biology gained during HSc.

**Course Objectives:**  
The main objectives of this course are to:  
- study about the ultrastructure of prokaryotes.  
- impart knowledge about eukaryotes.  
- learn about cell divisions.  
- know about the basics of plant kingdom.  
- understand few important systems of human physiology.

**Expected Course Outcomes:**  
On the successful completion of the course, student will be able to:  

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<tr>
<td>Provide knowledge about the structure and function of Prokaryotic cells.</td>
<td>Acquire knowledge about the structure and function of Eukaryotes.</td>
<td>Impart knowledge on cell division in Prokaryotes and Eukaryotes.</td>
<td>Understand basis of plant kingdom</td>
<td>Acquire knowledge about human physiology.</td>
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K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

**Unit – I**  
9 Hours  

**Unit – II**  
9 Hours  

**Unit – III**  
9 Hours  
Cell division in Bacteria – Binary fission – Cell division in Eukaryotes – Mitosis and Meiosis.

**Unit – IV**  
9 Hours  

**Unit – V**  
9 Hours  
Human physiology – Structure and functions of Digestive system and excretion, Respiratory system and Cardiovascular system.

**Total Lecture hours**  
45 Hours

**Text Books**  
### References

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<tr>
<td>6</td>
<td>Ross and Wilson, Anatomy and Physiology, 8thEd, Churchill Livingston.</td>
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### Related Online Contents

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<td><a href="https://m.jagranjosh.com/general-knowledge/amp/classification-of-plant-kingdom-1453445359-1">https://m.jagranjosh.com/general-knowledge/amp/classification-of-plant-kingdom-1453445359-1</a></td>
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<td><a href="https://www.innerbody.com/htm/body.html">https://www.innerbody.com/htm/body.html</a></td>
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**Course designed by:** Mrs.C.L.Shathiyapriyaa, Assistant Professor of Microbiology, Tiruppur Kumaran College For Women, Tiruppur

**Verified by:** Dr.Gandhimathi.R., Chairperson

### Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low*
Course code 33A  
MICROBIAL DIVERSITY  

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Pre-requisite  
Basic knowledge on classification of organisms gained during HSc. and basics of microorganisms during the first year of this programme.

**Course Objectives:**
The main objectives of this course are to:
- impart knowledge about the taxonomical classification of Microorganisms.
- understand the Bergey’s manual of systematic bacteriology.
- make aware of the taxonomy, characters, life cycle and economic importance of Fungi.
- elucidate the morphology, characters, reproduction and economic importance of Algae.
- summarize the basic morphology of Protozoa and its classification.

**Expected Course Outcomes:**
On the successful completion of the course, student will be able to:

1. Know about basics of microbial classification, taxonomy and their modern approaches.  
2. Gain knowledge about major divisions of Bergey’s Manual of Systematic Bacteriology.  
3. Explore the taxonomy, characters, life cycle and economic importance of Fungi with representative types.  
4. Know about the morphology, characters, reproduction and economic importance of Algae.  
5. Understand the basic structural characterization of Protozoa and its classification.

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

**Unit–I**  
12 Hours

**Unit–II**  
12 Hours

**Unit–III**  
Taxonomy & General Characteristics of Fungi – Life Cycle of Aspergillus, Mucor, Rhizopus and Penicillium – Modes of reproduction & its economic importance.  
12 Hours

**Unit–IV**  
Algae – Morphology & General Characters – Basic knowledge on its reproduction & its economic importance.  
12 Hours

**Unit–V**  
Protozoa – General characteristics and the economic importance of Sarcodina, Mastigophora, Rhizopoda, Ciliata, Sporozoa.  
12 Hours

**Total Lecture hours**  
60 Hours

**Text Books**

References


Related Online Contents

1. http://www.science direct.com
2. https://www.intechopen.com
4. https://swayam.gov.in
5. http://www.inflibnet.ac.in
8. http://www.freebookcentre.net/medical_text_books_journals/microbiology_ebooks_online_texts_download.html

Course Designed By: Dr. Gandhimathi.R., Assistant Professor of Microbiology, L.R.G. Government Arts College For Women, Tiruppur
Mrs. C.L.ShathiyaPriyaa, Assistant Professor of Microbiology, Tiruppur Kumaran College For Women, Tiruppur

Verified By: Dr. Gandhimathi.R, Chairperson

Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low

Course code | 43A       |
------------|-----------|
Microbial Physiology | L T P C |

Page 15 of 80
**Course Objectives:**
The main objectives of this course are to:
- understand the nutritional requirements of microorganisms and their uptake.
- elucidate the growth and growth factors of microorganisms.
- provide knowledge about the metabolic and biosynthetic pathways.
- acquire the knowledge about aerobic and anaerobic respiration of microorganisms.
- facilitate the understanding on photosynthesis and bioluminescence.

**Expected Course Outcomes:**
On the successful completion of the course, student will be able to:

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<td>1</td>
<td>Distinguish the Microorganisms based on their nutritional requirements and transport mechanisms of nutrients uptake.</td>
<td>K 2</td>
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<td>2</td>
<td>Gain knowledge about growth and key factors influencing the growth of microorganisms</td>
<td>K 3</td>
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<td>3</td>
<td>Understand about key metabolic and biosynthetic pathways carried out in microorganisms.</td>
<td>K 2</td>
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<td>4</td>
<td>Acquire the knowledge about aerobic and anaerobic respiration of microorganisms.</td>
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<td>Be acquainted with anabolism and bioluminescence.</td>
<td>K 4</td>
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**Unit–I**
12 Hours

**Unit–II**
12 Hours

**Unit–III**
12 Hours

**Unit–IV**
12 Hours
Anaerobic respiration – sulphur, nitrogenous compounds and CO2 as final electron Acceptor - Fermentation – alcoholic, propionic and mixed acid fermentation. Lactic acid fermentation.

**Unit–V**
12 Hours
Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, Biosynthesis of aminoacids( Glutamic acid family ) – Bioluminescence.

**Total Lecture hours**
60 Hours

**Text books**

**References**


Related Online Contents
1. http://www.science direct.com
2. https://www.intechopen.com
5. https://www.youtube.com/watch?v=NYMTeqpr6JI
8. http://www.freebookcentre.net/medical_text_books_journals/microbiology_ebooks_online_texts_download.html
10. https://www.youtube.com/watch?v=kfy92hdaAH0

Course Designed By: Dr. Gandhimathi.R., Assistant Professor of Microbiology, L.R.G. Government Arts College For Women, Tiruppur
Mrs. C.L. Shathiyaa Priyaa, Assistant Professor of Microbiology, Tiruppur Kumaran College For Women, Tiruppur

Verified By: Dr. Gandhimathi.R, Chairperson

Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low
Core -VI

Pre-requisite: Basic knowledge on Genetics gained during HSc. and during the previous years of this programme.

Syllabus Version: 2020 - 2021

Course Objectives:
The main objectives of this course are to:
- gain knowledge on the structure and characters of Genetic materials.
- understand replication of DNA.
- learn transcription and translation process in prokaryotes and Eukaryotes.
- perceive Genetic alterations and their repair mechanisms.
- understand the methods of genetic exchange.

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Know about basics structure of DNA and RNA, and Organization of genes in prokaryotes & Eukaryotes.  
2. Gain knowledge about replication in Prokaryotes & Eukaryotes and role of enzymes in replication.  
3. Understand the gene expression by Translation and Transcription process and regulation of gene expression.  
4. Know about the Mutation, their types and repair mechanism  
5. Understand the Genetics exchanges in microbes

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Unit–I 15 Hours
DNA and RNA as genetic material, Characters of a genetic material, Chemistry & Molecular structure of DNA, Topology of DNA, Structure and types of RNA. Bacterial chromosome, Organization of genes in prokaryotes & Eukaryotes.

Unit–II 15 Hours

Unit–III 15 Hours

Unit– IV 15 Hours
Mutation – spontaneous and induced – Mutagen & Mutagenesis – DNA repair mechanism.

Unit–V 15 Hours
Genetic exchange – Transduction (specialized & generalized), Transformation, Conjugation –Hfr mapping.

Total Lecture hours: 75 Hours

Text books
References


Related Online Contents

1. https://www.youtube.com/watch?v=0lZRAShqf0t0
2. https://www.youtube.com/watch?v=JQBtyjprj_Ma
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Course Designed By: Mr. P. Nallasamy, Asst. Professor of Microbiology, Bharathidasan College of Arts and Science, Erode
Mrs. M. Meenakshi, Assistant Professor of Microbiology, Sri Ramakrishna College of Arts and Science For Women, Coimbatore

Verified By: Dr. Gandhimathi.R, Chairperson

Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low
Course code  53B  

PRINCIPLES OF IMMUNOLOGY

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Core - VII

Pre- requisite  
Basic knowledge on Immunology gained during HSc. and basics learned during the first year of this programme.

Syllabus Version  
2020 - 2021

Course Objectives:
The main objectives of this course are to:
- recall the developments in immunology.
- learn immunity types and structure and function of immunoglobulins.
- categorize mechanism of antigen antibody reactions.
- gain knowledge on autoimmunediseases.
- acquire knowledge on blood transfusion and tissue transplantation.

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Understand the basics of Immunology and defense mechanisms.  
2. Gain knowledge about immunity types and function of immunoglobulins.  
3. Create awareness about hypersensitivity and immunodeficiency disease.  
4. Know about the autoimmune diseases and monoclonal antibodies.  
5. Gain knowledge about application of Immunohaematology.

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Unit – I  
History and Scope of Immunology – The basis of defence mechanisms – Cell and Organs involved in immune system – Phagocytosis.  
15 Hours

Unit – II  
Types of immunity – Antigen – Antibody – types – Complement pathways – Classical and Alternate – Immunoglobins – structure and functions.  
15 Hours

Unit – III  
Allergy and Hypersensitivity – Classification types and Mechanisms – Immunodeficiency diseases.  
15 Hours

Unit – IV  
Autoimmunity mechanisms and autoimmune response diseases: RA, SLE and Myasthenia Gravis. Monoclonal antibodies and its applications (Hybridoma technology)  
15 Hours

Unit – V  
15 Hours

Total Lecture hours  
75 Hours

Text books


References

1. Jenni Punt; Judith A Owen; Sharon A Stranford; Patricia P Jones; Janis Kuby; (2019). Immunology, 8th Ed., W.H. Freeman, NY
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*S – Strong; M – Medium; L – Low

Course Designed By: Mr. P. Nallasamy, Asst. Professor of Microbiology, Bharathidasan College of Arts and Science, Erode
Mrs. M. Meenakshi, Assistant Professor of Microbiology, Sri Ramakrishna College of Arts and Science For Women, Coimbatore

Verified By: Dr. Gandhimathi R, Chairperson

Related Online Contents
2. https://www.youtube.com/watch?v=X6wrFMvK904
3. https://www.youtube.com/watch?v=mB5nFSVysmw
4. https://www.youtube.com/watch?v=Y8-DnMe4O4k
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Course code  |  53C  | FOOD MICROBIOLOGY  | L | T | P | C  
---|---|---|---|---|---|---
Core – VIII | | | 4 | - | - | 4  
Pre- requisite | Basic knowledge on Microbiology during the previous years of this programme. | Syllabus Version | 2020 - 2021  

**Course Objectives:**
The main objectives of this course are to:
- learn the basic relationship between food and microorganisms.
- understand the principles of food preservation.
- analyze the mechanism of food spoilage.
- acquire knowledge on fermented foods.
- understand food borne diseases and food quality control measures.

**Expected Course Outcomes:**
On the successful completion of the course, student will be able to:

- Understand the role of Microbes in food. **K 2**
- Familiarize the preservation techniques in food. **K 2 & K3**
- Create awareness about spoilage of food by microbes. **K 3 & K 4**
- Gain acquaintance about fermented foods. **K 3 & K 6**
- Get the knowledge about food borne diseases and their outbreaks. **K 4 & K 5**

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

**Unit – I** 12 Hours
Food and Microorganisms – Important microorganisms in food (Bacteria, Mold and yeasts); Factors affecting the growth of microorganisms in food – pH, moisture, oxidation – Reduction potential, Nutrient content and Inhibitory substances and biological structure.

**Unit – II** 12 Hours

**Unit – III** 12 Hours
Spoilage of food – cereals, vegetables, fruits, egg and milk – canned foods and sea foods.

**Unit – IV** 12 Hours

**Unit – V** 12 Hours
Food borne diseases & Food Quality control Measures – Food poisoning and Food borne infections – Bacterial and Mycotoxins – Investigation of food poisoning outbreaks – food standards, quality control. HACCP, FDA, WHO.

**Total Lecture hours** 60 Hours

**Text books**
## References

4. Fundamental Food Microbiology, 5th Ed. Bibek Ray

## Related Online Contents

1. [https://www.wikilectures.eu/w/Micro-organisms_in_Foods](https://www.wikilectures.eu/w/Micro-organisms_in_Foods)
2. [https://www.youtube.com/watch?v=k1S1snrK_Aw](https://www.youtube.com/watch?v=k1S1snrK_Aw)
4. [https://www.slideshare.net/mohitjindal/principles-and-methods-for-food-preservation](https://www.slideshare.net/mohitjindal/principles-and-methods-for-food-preservation)
5. [https://www.youtube.com/watch?v=AMJYn3hgv3o](https://www.youtube.com/watch?v=AMJYn3hgv3o)
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8. [https://slideplayer.com/slide/4164539/](https://slideplayer.com/slide/4164539/)
9. [https://www.youtube.com/watch?v=WWGRTSbvef0](https://www.youtube.com/watch?v=WWGRTSbvef0)
10. [https://www.youtube.com/watch?v=MYOvhAWh-E0](https://www.youtube.com/watch?v=MYOvhAWh-E0)
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16. [https://www.youtube.com/watch?v=UC_n0CqJR3g](https://www.youtube.com/watch?v=UC_n0CqJR3g)
17. [https://butterwithasideofbread.com/homemade-bread/](https://butterwithasideofbread.com/homemade-bread/)
19. [https://www.youtube.com/watch?v=mjm5mjBVceo](https://www.youtube.com/watch?v=mjm5mjBVceo)
20. [https://www.youtube.com/watch?v=7nbj_TnU8o](https://www.youtube.com/watch?v=7nbj_TnU8o)

Course Designed By: **Mr. P. Nallasamy**, Asst. Professor of Microbiology, Bharathidasan College of Arts and Science, Erode

Mrs. **M. Meenakshi**, Assistant Professor of Microbiology, Sri Ramakrishna College of Arts and Science For Women, Coimbatore

Verified By: Dr. **Gandhimathi.R**, Chairperson

### Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low*
## Course code: 53D  MEDICAL MICROBIOLOGY

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### Course Objectives:
The main objectives of this course are to:
- learn basics of infection and the epidemiology of infectious diseases.
- understand the morphology, pathogenicity and laboratory diagnosis of gram positive and negative organisms.
- study the morphology, pathogenicity and laboratory diagnosis of acid fast bacteria.
  - acquire basic knowledge about the pathogenicity and laboratory diagnosis of fungal and protozoan pathogens.

### Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Gain the basic knowledge about infections, outbreaks and control measures.  
   - K2 & K3
2. Understand the pathogenicity of Gram positive bacterial pathogens. 
   - K2 & K3
3. Understand the pathogenicity of Gram negative bacterial pathogens. 
   - K2 & K3
4. Understand the pathogenicity of Acid Fast and miscellaneous bacteria. 
   - K2 & K3
5. Gain the basic knowledge about fungal and parasitic infections. 
   - K2 & K3

### Unit-I 
**12 Hours**

### Unit-II
**12 Hours**
Morphology, Pathogenicity and Laboratory diagnosis – Gram positive organisms – *Staphylococcus aureus, Streptococcus pyogenes, Pneumococcus sp. Bacillus anthracis, Corynebacterium diphtheriae, Clostridium botulinum and Clostridium tetani*

### Unit-III
**12 Hours**

### Unit-IV
**12 Hours**
Morphology, Pathogenicity and Laboratory diagnosis – *Mycobacterium tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydia, Rickettsiae and Mycoplasma.*

### Unit-V
**12 Hours**

Total Lecture hours | 60 Hours

### Text books

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References

Related Online Contents
1. https://www.youtube.com/watch?v=IBX3jj2uUjo
2. https://www.youtube.com/watch?v=MZyW3V8F7zY
3. https://www.youtube.com/watch?v=b8BD_3IWx_A
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15. https://www.youtube.com/watch?v=DDELNh7n7I1
16. https://www.youtube.com/watch?v=y3PE7mLbV

Course Designed By: Mr.P.Nallasamy, Asst. Professor in Microbiology
Bharathidasan College of Arts and Science, Erode
Mrs. M.Meenakshi, Assistant Professor of Microbiology,
Sri Ramakrishna College of Arts and Science For Women, Coimbatore

Verified By: Dr.Gandhimathi.R, Chairperson

Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low
Course code 63A
Core – X
INDUSTRIAL MICROBIOLOGY

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<th>Pre- requisite</th>
<th>Basic knowledge on microorganisms gained during the first and second year of this programme.</th>
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Course Objectives:
The main objectives of this course are to:
- learn about fermentation and its types.
- sensitize on methods of strain development for improved yield.
- impart knowledge on industrial production of economically important products using microorganisms.
- acquire knowledge on the production of health care products using microorganisms.
- analyze the methods for effective recovery and purification of fermented products.

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Understand that microorganisms play a vital role to all forms of life on earth. K 2
2. Screen and isolate beneficial microorganisms from the environment. K 3
3. Gain theoretical knowledge on production of microbial products. K 2
4. Acquire theoretical and technical knowledge on microbial production of health care products. K 3,4 & 5
5. Develop as an entrepreneur. K 3

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Unit – I 15 Hours
Fermentation – Definition & types – Submerged and Solid state. Fermentors & its types (CSTF Tower, cylinder-conical & airlift) – Batch fermentation – Continuous fermentation.

Unit – II 15 Hours
Industrially important strains – Screening methods – Strain development for Improved yield – Mutation, Recombination and protoplast fusion.

Unit – III 15 Hours

Unit – IV 15 Hours
Single cell protein – Baker’s yeast, Spirulina – Details of mushroom development – Oyster (Pleurotus) and Button (Agaricus) mushroom.

Unit – V 15 Hours
Downstream process Biochemistry – Intercellular and extracellular – Centrifugation, filtration, Floatation – solvent extraction, precipitation – Breakage of cells – Physical and Chemical methods.

Total Lecture hours 75 Hours

Text books


References


Related Online Contents


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5. sites.google.com›site›microbiology-courses-in-swayam

6. onlinecourses.nptel.ac.in›courses

7. www.classcentral.com›Subjects›Sciences›Biology

Course Designed By: Dr. A.K. Lakkum Venmal, Assistant Professor & HOD of Microbiology, L.R.G. Government Arts College For Women, Tiruppur

Verified By: Dr. Gandhimathi.R, Chairperson

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*S – Strong; M – Medium; L – Low

Course code: 63B

ENVIRONMENTAL AND

L  T  P  C
CORE – XI

AGRICULTURAL MICROBIOLOGY

<table>
<thead>
<tr>
<th>Pre-requisite</th>
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<tbody>
<tr>
<td>Basic knowledge on Microbiology gained from the previous subjects in this programme.</td>
<td>2020 - 2021</td>
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**Course Objectives:**
The main objectives of this course are to:
- understand the distribution of microorganisms in nature and microbial associations.
- acquire knowledge of microbial decomposition.
- know the various cycles involved in microbial degradation of organic matter.
- learn the microbial ecology, analysis and treatment of water.
- provide basic information on airmicrobiology.

**Expected Course Outcomes:**
On the successful completion of the course, student will be able to:

1. Able to know about basics of Microorganisms in nature  
2. Gain knowledge about Microbial decomposition, Principles & its Applications.
3. Explore about Decomposition of organic matter.
4. Acquire knowledge on Water Microbiology.
5. Help to learn techniques in Microbiological analysis.

**Unit I**  
Distribution of microorganisms in nature – Microbial communities in soil – Factors Influencing the microbial density in soil – zymogenous and autochthonous flora in Soil – Microbial associations – symbiotic proto cooperation, Ammensalism, Commensalism, Syntropism, Parasitism and Predation with suitable examples.

**Unit II**  

**Unit III**  

**Unit IV**  
Water microbiology, algae, phytoplankton – eutrophication – Water Pollution (Microbiological) water treatment – Primary, secondary and tertiary. Drinking water – Potability – MPN technique.

**Unit V**  

15 Hours
Aero microbiology – aerosol, droplet nuclei, air pollution – sources (Microbiological) – air quality
analysis – air sampling devices.

<table>
<thead>
<tr>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Rangasamy, G and D J Bagyaraj, Agricultural microbiology, Asia Publishing House.</td>
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<td>3 <a href="https://en.wikipedia.org/wiki/Bacteriological_water_analysis">https://en.wikipedia.org/wiki/Bacteriological_water_analysis</a></td>
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<td>5 <a href="https://aosts.com/role-microbes-microorganisms-used-wastewater-sewage-treatment/">https://aosts.com/role-microbes-microorganisms-used-wastewater-sewage-treatment/</a></td>
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Course designed by: Mrs. M. Meenakshi, Assistant Professor of Microbiology,  
Sri Ramakrishna College of Arts and Science For Women, Coimbatore  
Mr. P. Nallasamy, Asst. Professor in Microbiology  
Bharathidasan College of Arts and Science, Erode  
Verified By: Dr. Gandhimathi R, Chairperson

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*S – Strong; M – Medium; L – Low

Course code | 63C | VIROLOGY | L | T | P | C
### Core – XII

<table>
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<tr>
<th>Pre-requisite</th>
<th>Basic knowledge gained during HSc. and previous subjects in this programme.</th>
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<tbody>
<tr>
<td>Syllabus</td>
<td>Version 2020 - 2021</td>
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### Course Objectives:
The main objectives of this course are to:

- Recall the historical development and basic information on viruses.
- Learn the reproductive pathway of phages.
- Describe general method of viral lifecycle.
- Gain the knowledge about replication strategy of plant and animal viruses.
- Acquire knowledge about oncogenic virus and human viral infections.

### Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Able to know about basics of virology & assay of viruses. K2
2. Gain knowledge about general methods of viral life cycle. K2
3. Explore about plant & animal viruses. K3
4. Understand various viral infections. K4
5. Diagnose various viral diseases. K5

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

### Unit – I
12 Hours

Early development of virology, General Structure, Properties and Classification (Baltimore classification) – cultivation of viruses – virus purification and assays.

### Unit – II
12 Hours

Reproduction of DNA phages – DNA lytic phages – lytic cycle of T4 phage The one step growth – Adsorption to the host cell and penetration- synthesis of Phage nucleic acids and protein assembly of phage particles – release of phage particles.

### Unit – III
12 Hours


### Unit – IV
12 Hours

Viruses of Eukaryotes – Reproduction of animal (Pox and Adeno) and plant viruses (TMV and CMV) – Viruses of Algae, fungi and viruses – viruses and cancer.

### Unit – V
12 Hours


### Total Lecture hours
60 Hours
References


Related Online Contents

4. [https://nptel.ac.in/courses/102/103/102103039/](https://nptel.ac.in/courses/102/103/102103039/)
5. [https://www.healthline.com/health/viral-diseases#contagiousness](https://www.healthline.com/health/viral-diseases#contagiousness)

Course designed by: Mrs. M. Meenakshi, Assistant Professor of Microbiology, Sri Ramakrishna College of Arts and Science For Women, Coimbatore
Mr. P. Nallasamy, Asst. Professor in Microbiology, Bharathidasan College of Arts and Science, Erode

Verified By: Dr. Gandhimathi R, Chairperson

Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low
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<td>Pre-requisite</td>
<td>Basic acquaintance on microbiology gained during Semester I and II.</td>
<td>Syllabus Version 2020 - 2021</td>
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**Course Objectives:**
The main objectives of this course are to:

- get acquainted to the laboratory precautions and techniques to be followed in general microbiology laboratory.
- identify microorganisms microscopically.
- facilitate students in culturing techniques.
- acquire skills to isolate and quantify microorganisms.
- analyze biomolecules by separation techniques.

**Experiments**

1. Laboratory precautions.
2. Preparation of cleaning solutions.
4. Selective and differential media: Mac Conkey and Blood agar.
5. Methods of sterilization.
6. Pure culture techniques – Pour plate, Spread plate and Streak plate methods (Simple, Quadrant and Continuous).
7. Enumeration of Bacteria, Fungi and Actinomycetes from soil.
9. Cultural characteristics of Microorganisms - Colony morphology on Nutrient agar.
10. Maintenance and preservation of cultures.

**References**

## Scheme of Practical Examination

**Duration**: 6 Hours

**Max. Marks**: 45

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Experiment*</th>
<th>Marks</th>
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<tr>
<td></td>
<td>i. Procedure</td>
<td>5 marks each</td>
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<td></td>
<td>ii. Performance</td>
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<td></td>
<td>iii. Result and discussion</td>
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<td>2</td>
<td>II. Minor experiment (1× 10 =10 marks)</td>
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<td>i. Procedure and Performance</td>
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<td></td>
<td>ii. Result and discussion</td>
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<tr>
<td>3</td>
<td>III. Spotters (5× 3 =15 marks)</td>
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<tr>
<td></td>
<td>i. Identification</td>
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<td>ii. Description</td>
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</tbody>
</table>

**Total Marks**: 45

* Students to be divided into batches (5 students / batch) in order to perform all experiments. Question setting to be done by internal and external examiners and separately for each batch.

**Course designed by**: Dr. Gandhimathi R., Assistant Professor of Microbiology, L.R.G. Government Arts College For Women, Tiruppur

**Mrs. M. Meenakshi**, Assistant Professor of Microbiology, Sri Ramakrishna College of Arts and Science For Women, Coimbatore

**Verified By**: Dr. Gandhimathi R., Chairperson
Course code 43P

PRACTICAL – II

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<td>Pre-requisite</td>
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<td>Syllabus Version 2020-2021</td>
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</table>

Course Objectives:
The main objectives of this course are to:

- expertise in estimation of various biomolecules.
- measure morphological and population size of microbes.
- acquire knowledge about the physiological characteristics of microorganisms.
- screen the enzymatic potential of microorganisms.
- understand the morphological characters of Algae, Fungi and Parasites.

Experiments

1. Protein estimation (Lowry et al. method)
2. Estimation of Carbohydrates (DNSA method)
3. Micrometry
5. Influence of pH and Temperature on bacterial growth.
6. Cultivation of anaerobic Microorganisms – Wright’s tube – McIntosh filde’s jar
7. Indole, MR, VP, Citrate utilization tests
8. Carbohydrate fermentation tests – TSI – H2S production tests
10. Starch hydrolysis, Gelatin and Casein hydrolysis tests
12. Observation of representative forms of Fungi – Aspergillus – Pencillium – Rhizopus – Yeast

References

## Scheme of Practical Examination

**Duration:** 6 Hours  
**Max. Marks:** 45

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<tr>
<th>Sl.No.</th>
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**Total Marks: 45**

* Students to be divided into batches (5 students / batch) in order to perform all experiments. Question setting to be done by internal and external examiners and separately for each batch.

Course designed by: Dr. Gandhimathi.R., Assistant Professor of Microbiology, L.R.G. Government Arts College For Women, Tiruppur  
Mrs. C.L. Shathiyaapriyaa, Assistant Professor of Microbiology, Tiruppur Kumaran College For Women, Tiruppur

Verified By: Dr. Gandhimathi.R, Chairperson

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| Course code | 63P | PRACTICAL – III | L | T | P | C |

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### Core

<table>
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<tr>
<th>Pre-requisite</th>
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#### Course Objectives:
The main objectives of this course are to:

- Acquire knowledge about isolation and identification of DNA.
- Evaluate the microorganisms involved in food spoilage.
- Expose the screening and production mechanism of commercially important fermented products.
- Apply the new approach in laboratory diagnosis of mycotic infections.
- Assess the quality of drinking water from various resources.

#### Experiments

1. Isolation of total DNA from *E. coli*.
2. Isolation of *E. coli* plasmid DNA and detection by agarose gel electrophoresis.
3. Isolation of drug resistant mutants using UV and Chemical agents.
4. Phenol Coefficient method.
5. Methylene blue reduction test.
7. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*.
11. Immobilization-Demonstration.
13. Isolation of coliphages.
14. Microscopic identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*.
15. MPN Technique – Detection of potability of water.

#### References

7. K. R. Aneja; Laboratory Manual of Microbiology and Biotechnology, 2018. ED-TECH.
# Scheme of Practical Examination

## Duration: 9 Hours  
Max. Marks: 60

<table>
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* Students to be divided into batches (5 students / batch) in order to perform all experiments. Question setting to be done by internal and external examiners and separately for each batch.

---

**Course designed by:** Dr. Gandhimathi.R., Assistant Professor of Microbiology,  
L.R.G. Government Arts College For Women, Tiruppur  
Mr. M. Nallasamy, Assistant Professor of Microbiology,  
Bharathidasan College of Arts and Science, Erode

**Verified By:** Dr. Gandhimathi.R, Chairperson
Elective Courses
Course code 5EA

RECOMBINANT DNA TECHNOLOGY – I

Pre-requisite: Basic knowledge on DNA gained during HSc. and during the previous years of this programme.

Course Objectives:
The main objectives of this course are to:

- understand the role of Enzymes in Genemanipulation.
- learn Gene isolationtechniques.
- understand the role of vectors in R – DNAtechnology.
- perceive Gene transfertechniques.
- understand the methods of Blottingtechniques.

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Gain the basic knowledge about role of enzymes in Gene manipulation. K 2 & K3
2. Understand the Gene isolation techniques. K 2 & K4
3. Understand the uses of Vectors in rDNA technology K 2 & K3
4. Gain knowledge about Gene transfer techniques. K 2 & K3
5. Understand the Blotting techniques. K 3 & K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Unit – I

12 Hours
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action – Ligases and Methylases, Modifying enzymes – Alkaline Phosphatase, Phosphonucleo Kinase.

Unit – II

12 Hours
Isolation – Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

Unit – III

12 Hours

Unit – IV

12 Hours

Unit – V

12 Hours
PCR, DNA Sequencing (Sanger’s Method) Blotting (Southern, Western, Northern) Techniques, RFLP and Application – RAPD and Application – Microarray.

Total Lecture hours 60Hours
## Text books


## References


## Related Online Contents

1. [http://www.bio.miami.edu/dana/dox/restrictionenzymes.html#:~:text=A%20restriction%20enzyme%20is%20a,th%20manufacture%20them.](http://www.bio.miami.edu/dana/dox/restrictionenzymes.html#:~:text=A%20restriction%20enzyme%20is%20a,th%20manufacture%20them.)

2. [https://www.youtube.com/watch?v=YSFqEZ6jvOk](https://www.youtube.com/watch?v=YSFqEZ6jvOk)

3. [https://www.youtube.com/watch?v=nb06rF6Qyw](https://www.youtube.com/watch?v=nb06rF6Qyw)

4. [https://www.youtube.com/watch?v=2JKDu8kJirs](https://www.youtube.com/watch?v=2JKDu8kJirs)

5. [https://www.youtube.com/watch?v=fmMp6av1B6I](https://www.youtube.com/watch?v=fmMp6av1B6I)

6. [https://www.youtube.com/watch?v=IsQM-u3in2Y](https://www.youtube.com/watch?v=IsQM-u3in2Y)

7. [https://www.youtube.com/watch?v=EA-gI5CjAR0](https://www.youtube.com/watch?v=EA-gI5CjAR0)

8. [https://www.youtube.com/watch?v=1JOK_i9E9xk](https://www.youtube.com/watch?v=1JOK_i9E9xk)

9. [https://www.youtube.com/watch?v=matsiHSuoOw](https://www.youtube.com/watch?v=matsiHSuoOw)

10. [https://www.youtube.com/watch?v=ONGdehkB8jU](https://www.youtube.com/watch?v=ONGdehkB8jU)

11. [https://www.youtube.com/watch?v=OUlfbGfwdIk](https://www.youtube.com/watch?v=OUlfbGfwdIk)

12. [https://www.youtube.com/watch?v=Vfm57MqqQaQ](https://www.youtube.com/watch?v=Vfm57MqqQaQ)

13. [https://www.youtube.com/watch?v=JVM4LpCuT7g](https://www.youtube.com/watch?v=JVM4LpCuT7g)

14. [https://www.youtube.com/watch?v=0ATujAxNf6U](https://www.youtube.com/watch?v=0ATujAxNf6U)

15. [https://www.youtube.com/watch?v=PV73-V7bxU8](https://www.youtube.com/watch?v=PV73-V7bxU8)

**Course Designed By:** Mr. P. Nallasamy, Asst. Professor of Microbiology, Bharathidasan College of Arts and Science, Erode  
**Mrs. M. Meenakshi**, Assistant Professor of Microbiology, Sri Ramakrishna College of Arts and Science For Women, Coimbatore  

**Verified By:** Dr. Gandhimathi.R, Chairperson

## Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low*
**Course code** 5EB

**PLANT THERAPEUTICS**

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<td>Elective – I (Group – B)</td>
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**Pre-requisite**

Basic knowledge on botany gained during HSc. and during the previous years of this programme.

**Course Objectives:**
The main objectives of this course are to:

- Understand the historical and cultural aspects of plants and medicine.
- Facilitate the understanding on blood sugar level and Diabetes mellitus.
- Understand the contribution of medicinal plants to alternative and modern.
- Have a complete understanding of phytochemicals.
- Elucidate the production of pharmaceutical compounds.

**Expected Course Outcomes:**
On the successful completion of the course, student will be able to:

1. Learn the history of medicinal plants and methods of extraction of various therapeutics from medicinal plants.
   - **K2 & K3**

2. Be trained in skills associated with screening of active principle of biologically important plants.
   - **K3 & K4**

3. Comprehend the mechanism of free radicals damage in living cells and antioxidant defense system from phytochemical sources.
   - **K2 & K3**

4. Analyse the primary metabolites distribution in therapeutic plants and applying the knowledge in maintaining health and lifestyle.
   - **K3 & K4**

5. Develop novel pharmaceutical products and understand the tissue culture techniques.
   - **K5 & K6**

- **K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

**Unit– I** 12 Hours

Medicinal plants-bioactive principles in medicinal plants: methods of extraction, isolation, separation and screening, pharmacologically active plants – CNS, CVS, Hypoglycemic.

**Unit– II** 12 Hours

Hepatoprotective, nephroprotective, anti allergic, anticancer, antibacterial, antiviral and antimalarial, anti-inflammatory, immunoactive properties of the medicinal plants, plants protecting against oxidative stress, chemotherapeutic products.

**Unit– III** 12 Hours

Free radicals – types, sources, importance, production, free radicals induced damages, lipid peroxidation, measurement of free radicals, disease caused by radicals, reactive oxygen species, antioxidant defence system, enzymic and non-enzymic antioxidants, role of antioxidants in prevention of diseases, phytochemicals as antioxidants.
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<tr>
<th>Unit– IV</th>
<th>12 Hours</th>
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<td>Primary metabolites, Alkaloids, flavanoids, terpenoids, phenolics, steroids, Vitamins, minerals – Occurrence, distribution &amp; functions.</td>
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<td>Production of secondary metabolite in plants, stages of secondary metabolite production, uses of tissue culture techniques, elicitation, biotransformation- production of pharmaceutical compounds</td>
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<th>Total Lecture hours</th>
<th>60 Hours</th>
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Text books


References


Related Online Contents

2. https://www.youtube.com/watch?v=_7RHYEZ5x9c
3. https://www.youtube.com/watch?v=DWZJEQv7kqY
4. https://www.youtube.com/watch?v=EyZZxDb7VpE
5. https://www.youtube.com/watch?v=hOHyluO20-4

Course designed by: Dr.R.Parimala, Assistant Professor of Biochemistry, L.R.G: Government Arts College For Women, Tiruppur

Verified By: Dr.Gandhimathi.R, Chairperson

Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low
Course code: BIOMOLECULES  
Elective – I (Group – C)  
Pre- requisite: Basic knowledge gained during the previous years in the previous semester of this programme.

Course Objectives:
The main objectives of this course are to:
- Understand the structures of biomolecules and reaction mechanisms perfectly.
- Facilitate the understanding on complex biomolecules.
- Learn the molecular structures of biomolecules, properties and their functions.
- Recognize the structural levels of biomolecules.
- Emphasize on various biomolecules and its significance.

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Understand the structure and physicochemical properties of carbohydrates from monosaccharide to polysaccharides.  
2. Learn the significance of lipids and importance of cardiovascular diseases.  
4. Relate the structure of DNA with its function and understand their properties.  
5. Have a deeper insight into the fundamentals of vitamins and minerals.

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

Unit – I  
12 Hours

Unit – II  
12 Hours

Unit – III  
12 Hours

Unit – IV  
12 Hours
Nucleic acids; Structure of Purines and Pyrimidines; Nucleotides and Nucleosides. DNA: double helix: A, B and Z forms; DNA denaturation and renaturation. RNA: types, unusual bases. DNA as genetic material Structure of chromatids, nucleosome and histones.
Unit–V

Vitamins and Minerals


Total Lecture hours | 60 Hours
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Text books


References


Related Online Contents

1 https://www.youtube.com/watch?v=lkoDv6qqRjE
2 https://www.youtube.com/watch?v=EbxXYV_gJCYQ
3 https://www.youtube.com/watch?v=b_pg5sJ-JkQ
4 https://www.premierhealth.com/faq/what-is-the-difference-between-vitamins-and-minerals-

Course designed by: Dr. R. Parimala, Assistant Professor of Biochemistry, L.R.G. Government Arts College For Women, Tiruppur
Verified By: Dr. Gandhimathi.R, Chairperson

Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low

Course code | 6EA | RECOMBINANT DNA TECHNOLOGY | L | T | P | C
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Elective – II  
(Group – A)  

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<th>Pre-requisite</th>
<th>Syllabus Version</th>
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<tr>
<td>Basic knowledge about DNA gained in the previous years of the programme.</td>
<td>2020 - 2021</td>
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**Course Objectives:**
The main objectives of this course are to:
- Study about Recombinant DNA Technology and its role in industries.
- Impart knowledge about techniques in Recombinant DNA Technology.
- Learn about production of Recombinant products.
- Know about emerging techniques in Recombinant DNA Technology.
- Understand about Vaccines, Transgenic plants & Animals, DNA fingerprinting analysis and Human Genome Project.

**Expected Course Outcomes:**
On the successful completion of the course, student will be able to:

1. Able to know about basics of Biotechnology.  
   - **K1**
2. Gain knowledge about Techniques in Biotechnology.  
   - **K2**
3. Explore about Cloning.  
   - **K3**
4. Insist on production of new recombinant products.  
   - **K4**
5. Help to analyse different emerging Techniques in the field of Biotechnology  
   - **K5 & K6**

**Unit – I**  
*12 Hours*
Microbial synthesis of commercial products – Proteins-Pharmaceuticals – Interferons – Human growth hormone – Antibiotics – Biopolymers

**Unit – II**  
*12 Hours*
Vaccines – Subunit vaccines, Edible vaccine, Recombinant vaccine – Monoclonal antibody. Gene therapy.

**Unit – III**  
*12 Hours*

**Unit – IV**  
*12 Hours*

**Unit – V**  
*12 Hours*
DNA finger printing and its Application. Human Genome Project and History and its Application.

**Total Lecture hours**  
*60 Hours*

**Text books**

References


Related Online Contents

1. https://nptel.ac.in/courses/102/103/102103045/
6. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3854212/
8. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5178364/

Course designed by: Mrs. M. Meenakshi, Assistant Professor of Microbiology,
Sri Ramakrishna College of Arts and Science For Women, Coimbatore
Mr. P. Nallasamy, Asst. Professor of Microbiology,
Bharathidasan College of Arts and Science, Erode

Verified By: Dr. Gandhimathi. R, Chairperson

Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low
Course code: 6EB

ENTREPRENEURIAL MICROBIOLOGY

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Pre-requisite: Basic knowledge on microorganisms gained from courses learned in this programme.

Syllabus Version: 2020-2021

Course Objectives:
The main objectives of this course are to:
- develop as an entrepreneur by imparting knowledge on industrial production of economically important products using microorganisms.
- learn about fermentation, brewing and their types.
- acquire knowledge on the commercial production of health care products using microorganisms.
- familiarize about national and international patent / patenting processes.

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Understand the basics of entrepreneur development
2. Comprehend that microorganisms play a vital role to all forms of life on earth.
3. Acquire theoretical and technical knowledge on production of mushrooms and biofertilizers.
4. Attain acquaintance about national and international patent / patenting processes.
5. Acquire technical understanding of brewing process.

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

Unit–I 12 Hours
Entrepreneur development activity – Institutes involved, Government contributions to entrepreneurs, risk assessment. Industrial Microbiology, Definition, scope and historical development.

Unit–II 12 Hours
Microbial cells as fermentation products – Bakers yeast, food and feed yeasts, Bacterial Insecticides, Legume Inoculants, Mushrooms, Algae. Enzymes as fermentation products – Bacterial and Fungal Amylases, Proteolytic Enzymes, Pectinases, Invertases, and other enzymes.

Unit–III 12 Hours
Mushroom cultivation and Composting – Cultivation of Agaricus campestris, Agaricus bisporus, and Volvariellavolvacea; Preparation of compost, filling tray beds, spawning, maintaining optimal temperature, casing, watering, harvesting, storage. Biofertilizers – Historical background, Chemical fertilizers versus biofertilizers, organic farming. Rhizobium sp, Azospirillum sp, Azotobacter sp, as Biofertilizers.

Unit–IV 12 Hours
Patents and secret processes – History of patenting, composition, subject matter and characteristics of a patent, Inventor, Infringement, cost of patent – Patents in India and other countries. Fermentation Economics.

Unit–V 12 Hours
Brewing – Media components, preparation of medium, Microorganisms involved, maturation, carbonation, packaging, keeping quality, contamination, by products. Production of Industrial alcohol.
Total Lecture hours | 60 Hours
--- | ---

### Text Books

1. Entrepreneurial Development in India - By Arora.

### References


### Related Online Contents

2. [https://www.rapidmicrobiology.com/](https://www.rapidmicrobiology.com/)
4. [swayam.gov.in › nd1_noc20_bt21](http://swayam.gov.in › nd1_noc20_bt21)
5. [sites.google.com › site › microbiology-courses-in-swayam](http://sites.google.com › site › microbiology-courses-in-swayam)
6. [www.classcentral.com › Subjects › Sciences › Biology](http://www.classcentral.com › Subjects › Sciences › Biology)

### Course Designed By:

Dr. A.K. Lakkum Venmal, Assistant Professor & HOD of Microbiology, L.R.G. Government Arts College For Women, Tiruppur

Verified By: Dr. Gandhimathi. R, Chairperson

### Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low*
Course code 6EC
MEDICAL BIOCHEMISTRY
L T P C
4 - - 4

Pre-requisite
Basic knowledge on biochemistry gained in the second year allied subject of this programme.

Course Objectives:
The main objectives of this course are to:
- understand the knowledge about various metabolic diseases.
- facilitate the understanding on blood sugar level and diabetes mellitus.
- understand the metabolic processes by which energy is produced in cells.
- acquire the knowledge about molecular, biochemical and cellular mechanism.
- elucidate the nitrogen balance of living cells.

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Receive a fundamental grounding in the principles of carbohydrate metabolism, and its disorders namely diabetes mellitus and glycogen storage diseases.  K2
2. Reveal the knowledge in abnormalities of lipid metabolism and their relationship to various diseases.  K2
3. Understand about the functions of liver and kidney and their abnormalities.  K3
4. Emphasize the role of amino acid and protein intermediates of their metabolism and monitoring the deficiency disorders.  K4
5. Comprehend that hemoglobin is a key molecule in blood and recognize the important role of blood clotting mechanism.  K4

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

Unit – I 12 Hours
Disorders of carbohydrate metabolism—Diabetes mellitus, Glucose tolerance tests, sugar levels in blood, renal threshold for glucose, factors influencing blood glucose level, glycogen storage diseases, pentosuria, galactosemia.

Unit – II 12 Hours
Disorders of lipids – Plasma lipo proteins, cholesterol, triglycerides and phospholipids in health and disease, hyperlipidemia, hyperlipoproteinemia, Gaucher’s disease, Tay-Sach’s, ketone bodies, ß- lipoproteinemia.

Unit – III 12 Hours
Disorders of liver and kidney- Jaundice, fatty liver, normal and abnormal functions of liver and kidney, insulin and urea clearance.

Unit – IV 12 Hours
Abnormalities in nitrogen metabolism- Uremia, hyperurecemia, porphyria and factors affecting nitrogen balance.

Unit– V 12 Hours

Syllabus Version 2020-2021

| Total Lecture hours | 60 Hours |

Textbooks


References


Related Online Contents

1. https://www.sciencedirect.com/topics/biochemistry
2. https://www.youtube.com/watch?v=NoyM9zQamE0
3. https://www.youtube.com/watch?v=8F7wKGNAlpg
5. https://onlinelearning.hms.harvard.edu/hmx/courses/hmx-biochemistry/

Course designed by: Dr. R. Parimala, Assistant Professor of Biochemistry, L.R.G. Government Arts College For Women, Tiruppur

Verified By: Dr. Gandhimathi R, Chairperson

Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low
### Course Objectives:
The main objectives of this course are to:
- learn the basics of dairy processing units.
- impart knowledge on fermented milk products.
- be acquainted with food quality standards.

### Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Understand the dairy processing unit operations.  
   - K2
2. be acquainted with various types of dairy products.  
   - K2 & K3
3. Emphasize the role microorganisms on fermented milk products and milk borne diseases.  
   - K3 & K4
   - K3 & K6
5. Get the knowledge about Government regulatory practices and policies for quality assurance of dairy products.  
   - K4 & K5

**K1** - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

### Unit–I
12 Hours

**Milk** - Introduction, composition, Microorganisms in Milk – Bacteria, Yeasts, Moulds. Starter Cultures – Starter cultures their biochemical activities. (*Streptococcus thermophilus, Lactobacillus bulgaricus*) Dairy processing unit operations: Pasteurization, UHT treatment, homogenization, Membrane processing, storage, transportation and distribution of milk. Judging and grading of milk and its products.

### Unit–II
12 Hours


### Unit–III
12 Hours

Microbiology of fermented milk products – Acid fermented milks (acidophilus milk, yoghurt). Slightly acid fermented milks (Cultured butter milk), Acid-alcoholic fermented milk (Kefir). Fermented milk production with extended self-life (labneh)). Milk borne diseases, antimicrobial systems in milk, sources for contamination of milk – bacterial with examples of infective and toxic types – Clostridium, *Salmonella, Shigella, Staphylococcus, Campylobacter, Listeria*. Mycotoxins in milk with reference to *Aspergillus*.

### Unit–IV
12 Hours

## Unit – V


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<tr>
<th>Text books</th>
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### References


### Related Online Contents

1. [https://www.agrifarming.in/dairy-processing-plant-project-report-setup](https://www.agrifarming.in/dairy-processing-plant-project-report-setup)
2. [https://www.youtube.com/watch?v=6Tkx3PTz9Pc](https://www.youtube.com/watch?v=6Tkx3PTz9Pc)
3. [https://www.youtube.com/watch?v=_2z8iXU8dO0](https://www.youtube.com/watch?v=_2z8iXU8dO0)

**Course Designed By:** Mr.P. Nallasamy, Asst. Professor of Microbiology, Bharathidasan College of Arts and Science, Erode

**Mrs. M. Meenakshi,** Assistant Professor of Microbiology, Sri Ramakrishna College of Arts and Science For Women, Coimbatore

**Verified By:** Dr. Gandhimathi.R, Chairperson

### Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low*
### Elective – III (Group – B)

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<td>Basic knowledge gained in the previous years of the programme.</td>
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### Course Objectives:
The main objectives of this course are to:
- understand bionanomachines.
- impart knowledge about structural principles of bionanotechnology.
- learn about structural principles of bionanotechnology.
- know various tools and techniques of bionanotechnology.
- be acquainted with applications of bionanotechnology.

### Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Know about basics of bionanomachines and history of bionanotechnology. **K 1**
2. Gain knowledge about structural principles of bionanomachines. **K 2**
3. Acquire understanding of functional principles of bionanotechnology. **K 2**
4. Familiarize with various tools and techniques being used in bionanotechnology. **K 2**
5. Learn the applications of bionanotechnology. **K5 & K6**

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### Unit–I 12 Hours


### Unit–II 12 Hours


### Unit–III 12 Hours


### Unit–IV 12 Hours


### Unit–V 12 Hours

Applications of Bionanotechnology – Nanomedicines; Immunotoxins, Liposomes as drug carriers, Gene therapy, Personalised Medicines; Lab on chip concept. DNA Computers, Artificial Life, Hybrid materials, Biosensors.
### Text books

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### References

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<td>2</td>
<td>Vladimir P Torchilin, Nanoparticles as Drug Carriers, (2006). Imperial College Press, North Eastern University, USA.</td>
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### Related Online Contents

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### Course designed by:

- **Mrs. M. Meenakshi**, Assistant Professor of Microbiology, Sri Ramakrishna College of Arts and Science For Women, Coimbatore
- **Mr. P. Nallasamy**, Asst. Professor of Microbiology, Bharathidasan College of Arts and Science, Erode

### Verified By:

**Dr. Gandhimathi.R**, Chairperson

### Mapping with Programme Outcomes

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**S**-Strong; **M**-Medium; **L**-Low

### Course code

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Pre-requisite: Basic knowledge on database, proteomics and genomics gained from Recombinant DNA Technology learned in the previous semester of this programme.

**Course Objectives:**
The main objectives of this course are to:
- understand the basics of bioinformatics and its role in biosciences.
- gain knowledge about biological database and its types.
- familiarize with the nucleotide sequencedatabases.
- know about proteomics and genomics.
- understand gene finding, protein prediction, phylogenetic analysis and drug designing.

**Expected Course Outcomes:**
On the successful completion of the course, student will be able to:

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<td>know about basics of bioinformatics and information technology and their relationship with biology.</td>
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<td>gain knowledge about nucleotide sequence database.</td>
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<td>explore proteomics and genomics.</td>
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<td>know and explore biological databases.</td>
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<td>predict gene, protein, bio-molecular visualization, phylogenetic analysis and drug designing.</td>
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**K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create**

**Unit–I**
Introduction to Bioinformatics, Sequences used in Bioinformatics – DNA, RNA and Protein Sequences, Scope and application of Bioinformatics

**Unit–II**
Biological databases and its significance – objectives, properties and classification of Biological databases, Hard – link relationships between databases, Symbols used in databases

**Unit–III**
Biological database NCBI – GenBank, EMBL, DDBJ, Sequence Alignment Pairwise (BLAST and FASTA) and Multiple sequence alignment (ClustalW).

**Unit–IV**
Proteomics – Structure of Protein; Nomenclature of Protein Sequences; Protein Database Swiss-PROT, SCOP, CATH. Protein visualization tools – RASMOL, Swiss PDB viewer

**Unit–V**
Gene finding, protein prediction, phylogenetic analysis & Drug designing.

**Total Lecture hours** 60 Hours

**Text books**
2. Introduction to Bioinformatics S.SundaraRajan
References


Related Online Contents


2. https://www.ndl.iitkgp.ac.in


6. https://www.ebi.ac.uk/


Course designed by: Dr.Gandhimathi.R., Assistant Professor of Microbiology,

L.R.G. Government Arts College For Women,

Tiruppur

Mr.M.Vasudevan, Asst. Professor and HOD of Microbiology Erode Arts and Science College, Erode

Verified By: Dr.Gandhimathi.R, Chairperson

Mapping with Programme Outcomes

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*S-Strong; M-Medium; L-Low
Course code 1AB

**BIOSTATISTICS AND COMPUTER APPLICATIONS – I**

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**Pre- requisite**

Basic knowledge on statistics gained during school education and on computer.

| Syllabus Version | 2020 - 2021 |

**Course Objectives:**
The main objectives of this course are to:
- draw various diagrams and solving various problems in microbiology using computers.
- enable the students to learn the statistical measures.
- understand the concept of probability.
- learn the fundamentals of computers.
- expose the students to basics of MS Office Excel.

**Expected Course Outcomes:**
On the successful completion of the course, student will be able to:

1. Know the basics of Data Collections and Diagrams
2. Learn the basics of Measures of Location and Dispersion
3. Understand the basics of Probability and Various Distribution methods
4. Acquire knowledge about the Basics of Computer Software and Hardware
5. Explore the MS Office Excel for the use of Biological data analysis

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

**Unit – I**

12 Hours


**Unit – II**

12 Hours

Measures of Location and Dispersion – Stem and Leaf plots – Box and Whisker Plots – Coefficient of variation – Skewness and its measures.

**Unit – III**

12 Hours

Probability – Concept and Definition – Addition and Multiplication theorems of Probability (statement only) – simple problems – Binomial, Poisson and Normal distributions (without proof) – simple problems.

**Unit – IV**

12 Hours

Introduction to Computers – Software and Hardware – Operating Systems – Compilers and Interpreters – Personal, Mini, Main frame and Super computers – their characteristics and application, BIT, BYTE, WORD computer memory and types; data representation and storage, binary codes, binary system

**Unit – V**

12 Hours

Microsoft Excel – Data entry – Graphs – Aggregate functions- formulae and functions (students are expected to be familiar with all operations) – different number systems and conversions, input and output devices, secondary storage media – Numerical problems based on Units I to III may be worked using Microsoft Excel.
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**Course Designed By:** Mr.M.Vasudevan, Asst. Professor and HOD of Microbiology, Erode Arts and Science College, Erode

**Verified By:** Dr.Gandhimathi.R, Chairperson

### Mapping with Programme Outcomes

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*S – Strong; M – Medium; L – Low

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**Course code:** 2AB

**BIOSTATISTICS AND**

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Course Objectives:
The main objectives of this course are to:
- enrich students with computer knowledge to draw various diagrams and solving problems in microbiology using computers.
- enable the students to learn the Sampling methods.
- understand the Non-Parametric Tests.
- provide basic knowledge about Artificial Intelligence in Biological Sciences.
- make students familiar with the Big-Data Analysis.

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Know the basics of Correlation and its various types.  
2. Understand the basics of Sampling and Distributions  
3. Understand and apply Non-Parametric tests  
4. Acquire knowledge about the Artificial Intelligence and its applications in Biology  
5. Understand the Big-Data Analysis and its applications

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Unit—I 12 Hours
Correlation – Scatter diagram – Karl Pearson’s co-efficient of Correlation – Co-efficient of determination – Spearman’s Rank Correlation – Linear Regression. Curve fitting – Fitting of Linear, Parabolic and Exponential curves.

Unit—II 12 Hours

Unit—III 12 Hours

Unit—IV 12 Hours

Unit—V 12 Hours

Total Lecture hours 60 Hours
Text books

References
6 Patterson, (1997). Introduction to Artificial Intelligence & Expert Systems, Dan W. PHI

Related Online Contents
1 https://www.bmj.com/about-bmj/resources-readers/publications/statistics-square-one/11-correlation-and-regression
2 https://www.scribbr.com/methodology/sampling-methods/
3 https://www.statisticshowto.com/parametric-and-non-parametric-data/
5 https://www.researchgate.net/publication/264888238_ARTIFICIAL_INTELLIGENCE_IN_BIOLOGY

Course Designed By: Mr.M.Vasudevan, Asst. Professor and HOD of Microbiology, Erode Arts and Science College, Erode

Verified By: Dr.Gandhimathi.R, Chairperson

Mapping with Programme Outcomes

<table>
<thead>
<tr>
<th>COs</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
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<th>PO9</th>
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*S – Strong; M – Medium; L – Low

<table>
<thead>
<tr>
<th>Course code</th>
<th>2PB</th>
<th>PRACTICAL – I ( BIO-STATISTICS AND COMPUTER APPLICATIONS )</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
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<tbody>
<tr>
<td>Allied – A</td>
<td></td>
<td><strong>Basic knowledge on Bio-Statistics and Computer Applications gained during Semester I and II.</strong></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Pre- requisite</td>
<td></td>
<td>Syllabus Version 2020 - 2021</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
Course Objectives:
The main objectives of this course are to:

- enrich students with computer knowledge to draw various diagrams and solving problems in microbiology using MS-Excel.
- provide basic knowledge about Artificial Intelligence in Biological Sciences.
- make students familiar with the Big-Data Analysis.

Programs:
The listed topics to be covered under practical in MS-Excel provided the students have prior exposure in the package.

| 1. Graphical Representation | a. Histogram  
b. Ogives  
c. Scatter diagram |
|-------------------------------|------------------|
| 2. Diagrams                   | a. Linediagram  
b. Bardiagram  
c. Pediatric |
| 3. Measures of Location       | a. Mean (Arithmetic, Geometric and Harmonic)  
b. Median  
c. Mode |
| 4. Measures of Dispersion     | a. Range (max – min)  
b. Standard Deviation  
c. Variance  
d. Coefficient of variation  
e. Skewness |
| 5. Correlation                | a. Karl Pearson’s coefficient  
b. Spearman’s Rank  
c. Coefficient of determination |
| 6. Curve Fitting              | a. Linear Regression  
b. Parabolic  
c. Exponential curves |
| 7. Parametric tests           | a. Normal(z)  
b. t (Equal Variance)  
c. F  
d. Chisquare |
| 8. (i) Implement the following file management tasks in Hadoop | a. Adding files and directories  
b. Retrieving files  
c. Deleting files |
| ii) Benchmark and stress test an Apache Hadoop cluster |

Scheme of Practical Examination

<table>
<thead>
<tr>
<th>Duration : 3 Hours</th>
<th>Max. Marks : 30</th>
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<tr>
<td>Sl. No.</td>
<td>Program*</td>
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B. Sc. Microbiology 2020-21 onwards - Affiliated Colleges - Annexure No.32A
SCAA DATED: 23.09.2020
<table>
<thead>
<tr>
<th></th>
<th>I. Program (1 \times 10 = 10 marks) From Programs 1 to 4 (Graphical Representation, Diagrams Measures of Location and Measures of Dispersion)</th>
<th></th>
</tr>
</thead>
</table>
| 1 | i. Algorithm  
ii. Execution | 5 marks | 10 |

<table>
<thead>
<tr>
<th></th>
<th>II. Program (1 \times 15 = 15 marks) (From Programs 5 to 8 (Correlation, Curve Fitting, Parametric tests, Implement the following file management tasks in Hadoop and Benchmark and stress test an Apache Hadoop cluster)</th>
<th></th>
</tr>
</thead>
</table>
| 2 | i. Algorithm  
ii. Execution | 5 marks | 15 |

<table>
<thead>
<tr>
<th></th>
<th>III. Record</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

Total Marks 30

* Students to be divided into batches (5 students / batch) in order to perform all experiments. Question setting to be done by internal and external examiners and separately for each batch.

Course designed by: **Dr. Gandhimathi R.**, Assistant Professor of Microbiology, L.R.G. Government Arts College For Women, Tiruppur **Mr. M. Vasudevan**, Asst. Professor and HOD of Microbiology, Erode Arts and Science College, Erode

Verified By: **Dr. Gandhimathi R., Chairperson**
Skill Based Subject
Course code: 3ZA  

diagnostic microbiology – I  

**Pre-requisite:** Basic knowledge gained in the previous semester of this programme

<table>
<thead>
<tr>
<th>Course Objectives:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The main objectives of this course are to:</td>
<td></td>
</tr>
<tr>
<td>• Impart knowledge about the collection and processing of clinical samples.</td>
<td></td>
</tr>
<tr>
<td>• Gain insight about the complete blood components and processing.</td>
<td></td>
</tr>
<tr>
<td>• Acquire skills to examine urine, stool and sputum samples.</td>
<td></td>
</tr>
</tbody>
</table>

**Expected Course Outcomes:**  
On the successful completion of the course, student will be able to:

1. Enable to learn about the collection, transport, preservation and processing of clinical samples.  
   - K 3 & K4
2. Gain insight about the complete blood components and processing of human tissue specimens.  
   - K 3 & K4
3. Acquire skills to examine urine sample.  
   - K 3 & K4
4. Learn laboratory techniques to examine stool samples.  
   - K 3 & K4
5. Diagnose respiratory tract infections by examining sputum sample.  
   - K 3 & K4

**K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create**

<table>
<thead>
<tr>
<th>Unit – I</th>
<th>9 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection, Processing, transport and storage of specimens – Blood, Urine, Stool, Sputum, CSF &amp; Pus.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit – II</th>
<th>9 Hours</th>
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</table>

<table>
<thead>
<tr>
<th>Unit – III</th>
<th>9 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination of urine: Physical and chemical tests, microscopic examination – crystals, casts, sediments, pregnancy tests – Diagnosis (Protocol Outline) of Urinary tract infection.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit – IV</th>
<th>9 Hours</th>
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</thead>
<tbody>
<tr>
<td>Examination of Stool – Physical, Chemical and Microscopic examination and its significance.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Unit – V</th>
<th>9 Hours</th>
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</thead>
<tbody>
<tr>
<td>Examination of Sputum: Microscopic examination – Diagnosis (Protocol Outline) of Respiratory tract infections (Upper and Lower).</td>
<td></td>
</tr>
</tbody>
</table>

**Total Lecture hours: 45 Hours**

**Text books**  


**References**


Related Online Contents
1  https://www.youtube.com/watch?v=uAmTgVvTUNk
2  https://www.youtube.com/watch?v=KrpooZv5juo
3  https://www.youtube.com/watch?v=Oy5uixdzJ_c
4  https://www.ndl.iitkgp.ac.in

Course Designed By: Mr.P.Nallasamy, Asst. Professor in Microbiology
Bharathidasan College of Arts and Science, Erode
Mrs. M.Meenakshi, Assistant Professor of Microbiology,
Sri Ramakrishna College of Arts and Science For Women, Coimbatore

Verified By: Dr.Gandhimathi.R, Chairperson
<table>
<thead>
<tr>
<th>Course code</th>
<th>4ZB</th>
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<tbody>
<tr>
<td>Skill Based Subject – II</td>
<td>DIAGNOSTIC MICROBIOLOGY – II</td>
</tr>
<tr>
<td>Pre-requisite</td>
<td>Basic knowledge gained from Diagnostic Microbiology – I studied in the previous semester of this programme.</td>
</tr>
<tr>
<td>Syllabus Version</td>
<td>2020 - 2021</td>
</tr>
</tbody>
</table>

**Course Objectives:**
The main objectives of this course are to:
- identify the bacterial pathogen by microscopic and physiological characterization.
- demonstrate the antibiotic susceptibility and resistance pattern of pathogens and result interpretation.
- impart the knowledge about the Immunological and rapid diagnostic tests.
- learn basic Laboratory techniques in mycology.
- gain the knowledge of parasitic infections and diagnosis.

**Expected Course Outcomes:**
On the successful completion of the course, student will be able to:

1. Identify the bacterial pathogen by microscopic observation and biochemical tests from clinical samples.  
   - **K3 & K4**
2. Perform the antibiotic susceptibility testing and result interpretation.  
   - **K3 & K4**
3. Become experienced in Immunological and rapid diagnostic tests.  
   - **K3 & K4**
4. Learn basic diagnosis in mycology to identify fungal pathogens.  
   - **K3 & K4**
5. Diagnose parasitic infections.  
   - **K3 & K4**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

**Unit – I**  
Identification of Bacterial pathogens – Microscopic examination of specimen – simple, differential staining and motility. Biochemical reaction – Sugar fermentation test  
9 Hours

**Unit – II**  
Antimicrobial susceptibility testing- Disc diffusion – Kirby Bauer method. MIC, E test – reporting of results & interpretation.  
9 Hours

**Unit – III**  
Serology – Antigen – Antibody reactions – Agglutination (blood grouping, WIDAL) RPR and Hemaagglutination Precipitation (VDRL), Immunodiffusion – (Mono and Double), Immunoelctrorophoresis (Rocket and Counter current). Advanced techniques – ELISA, Radioimmuno Assay (RIA) Quantitative study of Antigen – Antibody reactions. Immunosensors. CD4, CD8 cell counting, Western blot analysis for HIV, RT-PCR for Covid 19.  
9 Hours

**Unit – IV**  
9 Hours

**Unit – V**  
9 Hours
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen. Identification of Protozoa – Amoebiasis and Malaria. Identification of Helminths – Filariasis and Ascariasis

<table>
<thead>
<tr>
<th>Text books</th>
</tr>
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<table>
<thead>
<tr>
<th>References</th>
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<table>
<thead>
<tr>
<th>Related Online Contents</th>
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<td>1</td>
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<tr>
<td>3</td>
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<tr>
<td>4</td>
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<tr>
<td>5</td>
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</tbody>
</table>

Course Designed By: Mr.P. Nallasamy, Asst. Professor in Microbiology, Bharathidasan College of Arts and Science, Erode

Mrs. M. Meenakshi, Assistant Professor of Microbiology, Sri Ramakrishna College of Arts and Science For Women, Coimbatore

Verified By: Dr. Gandhimathi, R, Chairperson
### Course Objectives:
The main objectives of this course are to:

- gain insights on concepts of terminologies in medical coding.
- understand and identify ICD guidelines.
- impart knowledge on assigning diagnosis and procedure codes.
- provide practical application of coding operative reports and evaluation and management services.

### Expected Course Outcomes:
On the successful completion of the course, student will be able to:

<p>| | |</p>
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<tbody>
<tr>
<td>1</td>
<td>Able to know about basics of Medical coding.</td>
</tr>
<tr>
<td>2</td>
<td>Gain knowledge about different types of Coding.</td>
</tr>
<tr>
<td>3</td>
<td>Explore ICT &amp; CPC coding.</td>
</tr>
<tr>
<td>4</td>
<td>Insist different types of procedure codes.</td>
</tr>
<tr>
<td>5</td>
<td>Help to predict codes based on anatomy and its ICD guidelines.</td>
</tr>
</tbody>
</table>

**K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create**

### Unit I

**Unit History and the Codes – The Coder – ICD Coding – CPT Coding – Specialty Coding – Liability and Legal Issues.**

**9 Hours**

### Unit II

**The World of Health Care – Introduction to Medical Terminology – Medical Terminology: Dividing and Combining Terms – Medical Terminology: Abbreviations, Symbols and Special Terms – Documenting Medical Records – Medical Ethics**

**9 Hours**

### Unit III


**9 Hours**

### Unit IV


**9 Hours**

### Unit V

**History of HCPCS Coding – Levels of HCPCS – Medical Coding – Medical Billing – Auditing – Medical Documentation – Compliance – Medical coding tools.**

**9 Hours**
### Text books

<table>
<thead>
<tr>
<th></th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alok Gha, Priyanka Arora - Medical Transcription Made easy.</td>
</tr>
</tbody>
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### References

<table>
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<tr>
<th></th>
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<tr>
<td>2</td>
<td>Besty J Shiland - Medical terminology and anatomy for ICD-10.</td>
</tr>
<tr>
<td>3</td>
<td>Karen Smiley - Medical Billing and coding for dummies, 2nd edition.</td>
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### Related Online Contents

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<td><a href="https://www.medicalbillingandcoding.org/coding-training/">https://www.medicalbillingandcoding.org/coding-training/</a></td>
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<td>3</td>
<td><a href="https://www.rasmussen.edu/degrees/health-sciences/blog/what-is-medical-coder/">https://www.rasmussen.edu/degrees/health-sciences/blog/what-is-medical-coder/</a></td>
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<td><a href="https://www.ultimatemedical.edu/blog/what-is-a-medical-coding-and-billing-specialist/">https://www.ultimatemedical.edu/blog/what-is-a-medical-coding-and-billing-specialist/</a></td>
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</table>

### Course Designed By: Mrs. M. Meenakshi, Assistant Professor of Microbiology,
Sri Ramakrishna College of Arts and Science For Women, Coimbatore

Verified By: Dr. Gandhimathi R, Chairperson
Course code: 6ZP  
Skill Based Subject: PRACTICAL – III

Pre-requisite: Knowledge in practical and theory gained from previous years of this programme.

Course Objectives:
The main objectives of this course are to:

- Acquire skill on collection and processing of clinical specimens.
- Gain knowledge on various serological techniques.
- Get accustomed to immunological techniques involved in diagnosis.
- Visualize different types of infectious fungi.

Experiments:

1. Collection, transport, processing of specimen and Identification of bacteria from clinical specimens – Urine, Blood, Sputum, Pus and Faeces.
2. Slide agglutination - Blood grouping
3. Tube agglutination- Widal
4. Precipitation – RPR
5. Immunodiffusion- Radial and Ouchterlony’s
6. Immunoelectrophoresis- Rocket and Counter current
7. ELISA
8. SDS-PAGE
9. Observation of fungi- LCB or KOH mount
11. Interpretation of diagnostic reports using ICD – 10 and CPT medical coding.

References:

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<tr>
<th>Sl. No.</th>
<th>Experiment*</th>
<th>Marks</th>
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<tbody>
<tr>
<td></td>
<td>I. Major experiment (1 × 15 = 15 Marks)</td>
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<tr>
<td>1</td>
<td>i. Procedure</td>
<td>5 marks each</td>
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<td>ii. Performance</td>
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<td>iii. Result and discussion</td>
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<td>20</td>
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<td></td>
<td>II. Minor experiment - A (1× 10 =10 Marks)</td>
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<td>2</td>
<td>i. Procedure and Performance</td>
<td>5 marks each</td>
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<tr>
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<td>ii. Result and discussion</td>
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<td>10</td>
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<td></td>
<td>III. Spotters (5 × 3 =15 Marks)</td>
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<td>3</td>
<td>i. Identification</td>
<td>1 mark</td>
</tr>
<tr>
<td></td>
<td>ii. Description</td>
<td>2 marks</td>
</tr>
<tr>
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<td>15</td>
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<td>4</td>
<td>IV. Record</td>
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<tr>
<td></td>
<td>Total Marks</td>
<td>45</td>
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</tbody>
</table>

* Students to be divided into batches (5 students / batch) in order to perform all experiments. Question setting to be done by internal and external examiners and separately for each batch.

Course designed by: Mr. M. Nallasamy, Assistant Professor of Microbiology, Bharathidasan College of Arts and Science, Erode  
Mrs. M. Meenakshi, Assistant Professor of Microbiology, Sri Ramakrishna College of Arts and Science For Women, Coimbatore

Verified By: Dr. Gandhimathi. R, Chairperson
BACHELOR OF SCIENCE MICROBIOLOGY DEGREE PROGRAMME
(Bharathiar University Affiliated Colleges)

Syllabus
(With effect from 2020 – 2021 onwards)

Programme Code: 22L

B. Sc. Microbiology 2020-21 onwards - Affiliated Colleges - Annexure No. 32A
SCAA DATED: 23.09.2020

Bharathiar University
Coimbatore - 641 046, India
(A State University, Accredited with “A” Grade by NAAC and 13th Rank among Indian Universities by MHRD - NIRF)
UG MICROBIOLOGY

MISSION AND PROGRAMME OUTCOMES
BHARATHIAR UNIVERSITY, COIMBATORE – 641 046

UG - MICROBIOLOGY

MISSION

The mission of the programme is to;

- Create an awareness on “the wonderful microbial world”
- Impart knowledge on the integral role of microbiology in the science of life.
- Inculcate theoretical knowledge on the various applied fields of microbiology.
- Facilitate acquisition of technical skills through practical and institutional training.
- Develop the students to acquire suitable career opportunities.
- Encourage entrepreneurship.
- Develop confidence and leadership along with team spirit.
- Nurture them towards self, national and global development.
Eligibility:

Pass in higher secondary (academic stream) examination conducted by the Government of Tamil Nadu with Biology / Botany / Zoology/ Microbiology / Nursing / Biochemistry as subjects or DMLT or Diploma in Pharmacy / Pharmacology or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

Medium of Instruction and examinations:

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects and part IV subjects other than Foundation, Value education and Non – Major Elective – II; the medium of instruction as well as the medium of examinations shall be English. For Foundation course; Value education and Non – Major Elective – II the medium of instruction shall be English and the medium of examinations is in English / Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

Passing Minimum:

A candidate shall be declared to have passed in a paper if he / she should obtain not less than 40% of marks in the external examination. A candidate failing to secure the minimum marks prescribed shall be required to reappear for the examination in that paper.

Qualification of the Faculty:

M.Sc. degree in Microbiology or equivalent recognized by Bharathiar University / TamilNadu State Council for Higher Education (TANSHE) along with qualifications prescribed by University / University Grants Commission (UGC) time to time.

Conferment of the Degree:

No candidate shall be eligible for conferment of the Degree unless he / she,

- has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by / affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
- has successfully completed the prescribed Institutional Training / internship as evidenced by certificate issued by the Principal of the College.

The successful candidates will be conferred with Bachelor Degree in Microbiology.
UG MICROBIOLOGY
AFFILIATED COLLEGES - SCHEME OF EXAMINATIONS

(For the students admitted from the academic year 2020 – 2021 onwards)
Institutional training / Internship:

Students should undergo an institutional training / Internship for a continuous period of 15 days before semester VI. It is evidenced by certificate issued by the Principal of the College.

@ No University Examinations. Only Continuous Internal Assessment (CIA).

# No Continuous Internal Assessment (CIA). Only University Examinations.

* Swatch Bharath Summer Internship is mandatory – Extra 2 credit points would be given.

---

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Group</th>
<th>Title of the subject</th>
<th>Sub. Code</th>
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<td>A</td>
<td>Recombinant DNA Technology - I</td>
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<td>B</td>
<td>Plant Therapeutics</td>
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<td>Bio-Molecules</td>
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<td>B</td>
<td>Entrepreneurial Microbiology</td>
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