BACHELOR OF SCIENCE IN MICROBIOLOGY

SYLLABUS: 2017-18 Onwards

Dr. N.G.P ARTS AND SCIENCE COLLEGE (Autonomous)
(Re-Accredited with A Grade by NAAC)
(Affiliated to Bharathiar University,)
Dr. N.G.P. Nagar - Kalapatti Road
Coimbatore-641 048

BACHELOR OF SCIENCE IN MICROBIOLOGY REGULATIONS

ELIGIBILITY:

A pass in Higher Secondary Examination with any Academic stream or Vocational stream with Biology / Zoology / Botany /Biotechnology/Microbiology/Life Science as one of the subject and as per the norms set by the Government of Tamil Nadu or an Examination accepted as equivalent thereto by the Academic Council, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the **Bachelor of Science (Microbiology)** Degree Examination of this College after a course study of three academic years.

OBJECTIVE OF THE COURSE:

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. To inculcate practical knowledge in correlation with the theoretical knowledge.
2. To equip the students to meet the requirements of the current technology in Microbiology.
3. To motivate and train the students in various clinical and industrial sectors.
4. To encourage students to involve in research to explore microorganisms for the betterment of mankind.

PROGRAMME OUTCOMES

On the successful completion of the programme, the following are the expected outcomes.

PO Number	PO Statement
PO1	To prepare microbiologists who are competent, creative, and highly valued professionals in academia, industry and private/public sector that are capable of excelling in careers of their choice.
PO2	To impart basic knowledge on the theoretical basis of the tools and techniques and to imbibe and demonstrate the practical skills in microbiology.
PO3	To disseminate knowledge in microbiological discipline and to promote and develop competency in microbiology that have enduring value beyond the classroom.
PO4	To instill a pattern of life-long learning and to translate the potentials of microorganisms to the welfare of biosphere.
PO5	To explore the scope of various branches of microbiology to become an entrepreneur.

SCHEME OF EXAMINATIONS FOR UG COURSE

Course Code	Course	Hrs of Instruction	Exam Duration (Hrs)	Max Marks			Credit Points
				CA	CE	Total	
First Semester							
Part – I							
17UTL11T 17UHL11H 17UML11M 17UFL11F	Tamil-I Hindi-I Malayalam-I French – I	5	3	25	75	100	3
Part – II							
17UEG12G	English - I	5	3	25	75	100	3
Part – III							
17UMB13A	Core-I: Fundamentals of Microbiology	6	3	20	55	75	4
17UMB13P	Core Practical- I	8	6	30	45	75	4
17UMT1AC	Allied- I: Basic Mathematics	4	3	20	55	75	4
Part – IV							
17UFC1FA	Environmental Studies	2	2	-	50	50	2
		30				**475**	**20**
Second Semester							
Part – I							
17UTL21T 17UHL21H 17UML21M 17UFL21F	Tamil-II Hindi-II Malayalam-II French – II	5	3	25	75	100	3
Part – II							
17UEG22G	English - II	5	3	25	75	100	3
Part – III							
17UMB23A	Core -II: Cell Biology	5	3	20	55	75	4
17UMB23P	Core Practical- II	6	6	40	60	100	3

BoS Chairman/HoD
Department of Microbiology
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

10/1/2018

Dr. P. R. MUTHUSWAMY
PRINCIPAL
Dr NGP Arts and Science College
Dr. NGP - Kalapatti Road
Coimbatore - 641 048
Tamilnadu, India

17UCS2AA	Allied- II: Basics of Computers	3	3	20	55	75	2
17UCS2AP	Allied Practical- I: Fundamentals of Computers	4	3	20	30	50	2
Part – IV							
17UFC2FA	Value Education : Human Rights	2	2	-	50	50	2
		30				**550**	**19**
Third semester							
Part – I							
17UTL31U 17UHL31H 17UML31M 17UFL31F	Tamil-III Hindi-III Malayalam-III French – III	4	3	25	75	100	3
Part - II							
17UEG32G	English-III	4	3	25	75	100	3
Part – III							
17UMB33A	Core-III: Microbial Physiology	5	3	20	55	75	4
17UMB33P	Core Practical- III	6	9	40	60	100	3
17UBC3AA	Allied-III: Biochemistry I	4	3	20	55	75	4
17UMB3SA	Skill based Subject-1: Introduction to Entrepreneurship	3	3	20	55	75	3
Part – IV							
	NMEC –I	2	-	-	50	50	2
17UFC3FA 17UFC3FB 17UFC3FC 17UFC3FD 17UFC3FE	Tamil / Advanced Tamil (OR) Yoga for Human Excellence / Women's Rights/ Constitution of India	2	2	-	50	50	2

		30				**625**	**24**
Fourth Semester							
Part – I							
17UTL41U 17UHL41H 17UML41M 17UFL41F	Tamil-IV Hindi-IV Malayalam-IV French – IV	4	3	25	75	100	3
Part – II							
17UEG42G	English-IV	4	3	25	75	100	3
Part – III							
17UMB43A	Core-IV: Bioinstrumentation	4	3	20	55	75	4
17UMB43P	Core Practical- IV	4	6	40	60	100	2
17UBC4AB	Allied- IV: Biochemistry II	3	3	20	55	75	2
17UBC4AP	Allied Practical – II: Biochemistry	4	3	20	30	50	2
17UMB4SA	Skill based Subject-2: Entrepreneurial Microbiology	3	3	20	55	75	3
Part – IV							
	NMEC – II	2	2	-	50	50	2
17UFC4FA 17UFC4FB 17UFC4FC	Tamil Advanced Tamil (OR) General Awareness	2	2	-	50	50	2
		30				**675**	**23**
Fifth Semester							
Part – III							
17UMB53A	Core-V: Microbial Genetics	4	3	20	55	75	4
17UMB53B	Core-VI: Immunology	4	3	20	55	75	4
17UMB53C	Core-VII: Food Microbiology	4	3	20	55	75	4
17UMB53D	Core-VIII: Medical	4	3	20	55	75	4

	Microbiology - I						
17UMB53P	Core Practical- V	6	9	40	60	100	3
	Elective- I	4	3	25	55	75	4
17UMB5SA	Skill based Subject-3: Food Quality Control and Food Preservation	4	3	20	55	75	4
Part – IV							
17UMB53T	Industrial Training	Grade A to C					
		30				**550**	**27**
Sixth Semester							
Part – III							
17UMB63A	Core-IX: Virology	4	3	20	55	75	4
17UMB63B	Core-X: Industrial Microbiology	4	3	20	55	75	4
17UMB63C	Core- XI: Medical Microbiology - II	4	3	20	55	75	4
17UMB63P	Core Practical VI	6	9	40	60	100	3
	Elective-II	4	3	25	55	75	4
	Elective- III	4	3	25	55	75	4
17UMB6SA	Skill based Lab	4	6	40	60	100	2
Part – V							
17UEX65A	Extension Activity	**-**	-	-	50	50	2
		30				**625**	**27**
Grand Total						**3500**	**140**

ELECTIVE – I

(Student shall select any one of the following subject as Elective - I in fifth semester)

S.No	Subject Code	Name of the Subject
1.	17UMB5EA	Recombinant DNA Technology
2.	17UMB5EB	General Biology
3.	17UMB5EC	Human Physiology

ELECTIVE - II

(Student shall select any one of the following subject as Elective – II in sixth semester)

S.No	Subject Code	Name of the Subject
1.	17UMB6EA	Environmental and Agricultural Microbiology
2.	17UMB6EB	Intermediate Metabolism
3.	17UMB6EC	Hematology

ELECTIVE - III

(Student shall select any one of the following subject as Elective - III in sixth semester)

S.No	Subject Code	Name of the Subject
1	17UMB6ED	Biotechnology
2	17UMB6EE	Enzyme Technology
3	17UMB6EF	Forensic Science

NON MAJOR ELECTIVE COURSES

- The Department offers the following two papers as Non Major Elective Courses for other than the Microbiology students.
- Student shall select any one of the following subject as Non Major Elective Courses during their III and IV semester

S. No.	Semester	Subject Code	Course Title
1.	III	17UNM34F	Microbiology and Public Health
2.	IV	17UNM44F	Microbes in and as food

FOR COURSE COMPLETION

Students have to complete the following Subjects:

- Language papers (Tamil/Malayalam/French/Hindi, English) in I, II, III and IV semester.
- Environmental Studies in I semester.
- Value Education in II and III semester respectively.
- Allied papers in I, II, III and IV semesters.
- Two Non Major Elective courses in the third and fourth semester.
- Extension activity in VI semester.
- Elective papers in the fifth and sixth semesters.
- Industrial training for 15 days during IV Semester Summer Vacation and the Evaluation of the Report done by the Internal and external Examiner in the V Semester. Based on their performance of the Students Grade will be Awarded as A to C.

  A- 75marks and above

  B- 60-74 marks

  C- 40-59 marks

  Below 40 marks - (Re-Appear)

Total Credit Distribution

Subjects	Credits	Total		Credits	Cumulative Total
Part I: Tamil	3	04 x 100	400	12	24
Part II: English	3	04 x 100	400	12	
Part III:					
Core	4	11 x 75=	825	44	102
Core Practical	4	01 x 75	75	4	
Core Practical	2	01X100=	100	2	
Core Practical	3	04 x 100	400	12	
Allied Theory	2	02 x 75	150	04	
Allied Theory	4	02X75=	150	08	
Allied Practical	2	02 x 50	100	04	
Elective	4	03 x 75	225	12	
Skill based subject theory	3	02X75=	150	06	
Skill based subject theory	4	01X75=	75	04	
Skill based subject	2	01X100=	100	02	
Part IV:					
Value Education	2	02 x 50	100	04	**12**
Environmental Studies	2	01 x 50	50	02	
Foundation Course	2	01 x 50	50	02	
NMEC	2	02 x 50	100	04	
Part V:					
Extension Activity	2	01 x 50	50	02	02
Total			**3500**	**140**	**140**

Earning Extra credits is not mandatory for course completion

Extra credits

Subject	Credit	Total credits
BEC/ Self study courses	1	**1**
Hindi / French/ Other foreign Language approved by certified Institutions	1	**1**
Type Writing / Short Hand Course	1	**1**
Diploma/certificate/CPT/ ACS Inter/ NPTEL Course	1	**1**
Representation – Academic/Sports /Social Activities/ Extra Curricular / Co-Curricular activities at University/ District/ State/ National/ International	1	**1**
Total	5	**5**

Rules:

The students can earn extra credits only if they complete the above during the course period (I to V sem) and based on the following criteria. Proof of Completion must be submitted in the office of the Controller of Examinations before the commencement of the VI Semester. (Earning Extra credits are not mandatory for Course completion)

1. Student can opt BEC course/ Self study course to earn one credit. They have to Enroll and complete any one of the course during their course period before fifth semester (I sem to V sem).

   Self study paper offered by Microbiology Department

S. No.	Semester	Course Code	Course Title
1.	III sem	17UMBSS1	Good Laboratory Practices
2.		17UMBSS2	Food Sanitation

2. Student can opt Hindi/ French/ Other foreign Language approved by certified Institutions to earn one credit. The certificate(Hindi) must be obtained from **Dakshina Bharat Hindi Prachar Sabha** and He/ she has to enroll and complete during their course period (**first to fifth semester).**

3. Student can opt for Type writing /short hand course to earn one extra credit. He/she has to enroll and complete the course during their course period to obtain certificate through **Tamil Nadu Board of Technical Education.**

4. Student can opt for Diploma/certificate/CPT/ACS Inter/ NPTEL Course to earn one extra credit. Student who opt for Diploma/ Certificate course have to enroll any diploma/certificate course offered by Bharathiar University through our Institution. Student who opt for CPT/ ACS/CMA have to enroll and complete the foundation level during the course period. Students who opt for NPTEL course should complete the course certificate through NPTEL.

5. Award Winners in Academic/ Representation in Sports /Social Activities/ Extra Curricular/ Co-Curricular Activities at University/ District/ State/ National/ International level can earn one extra credit.

17UMB13A	CORE I: FUNDAMENTALS OF MICROBIOLOGY	SEMESTER - I

PREAMBLE

This course has been designed for students to learn and understand

- The history behind microbiology
- Microscopy, Sterilization methods and Culture media
- Microbial Diversity.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	• Describe the emergence of systematic microbiology. • Provide details about the Pioneers and their invaluable contributions in microbiology. • Familiarize the history of microbiology.	K1
CO2	• Gives technical ideas about the handling of microscopes. • Develop robust technology in microscopical observation. • Route map for bacteriological study. • Improves practical knowledge in microbes handling and their topological study.	K1,K2
CO3	• Understand the aseptic techniques which are applicable in day today life. • Familiarize various types of disinfecting agents and their mode of action and application on inanimate objects.	K2,K3
CO4	• Describes the cultivation of various types of microbes and their handling.	K3
CO5	• Interpret the knowledge of fungi and algae for human welfare.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	S	S	S	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	M	M	M	M

S-Strong, M-Medium, L-Low

17UMB13A	CORE I- FUNDAMENTALS OF MICROBIOLOGY	SEMESTER - I

Total Credits: 4

Hours per week: 6

CONTENTS

UNIT - I

History and Scope of Microbiology – Spontaneous generation theory and its disproval – Contribution of Leuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Joseph Lister and John Tyndall.

UNIT - II

Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEM . Stains - Staining reactions – Types of staining – Simple, Differential (Gram's, Spore, AFB), Capsule staining, fungal staining.

UNIT - III

Sterilization and Disinfection- Principles- Methods of Sterilization – Physical methods: Dry Heat, Moist heat, Filtration and Radiation. Chemical methods - Formaldehyde, Alcohol, Phenol and Gaseous sterilizing agents.

UNIT - IV

Culture Media - Types of Media – Enriched, Selective, Differential and Special Purpose Media (one e.g. for each type) - Pure culture techniques - Maintenance and Preservation of microbial culture.

UNIT - V

Morphology, General Characteristics, Classification, and economic important of Fungi (Aspergillus, Saccharomyces) Algae (Anabena, Chlamydomonas, Volvox, Spirogyra).

TEXT BOOKS:

1. *Joanne Wiley, Linda Sherwood, Christopher J Woolverton.* 2016. **Prescott's Microbiology**, *10th Edition. Mc Graw Hill Company.*

REFERENCE BOOKS:

1. *Salle A.J.* 2014. **Fundamental Principles of Bacteriology** *7th edition, Tata Mc Hill Publishing Company Ltd.,*
2. *Michael Madigan, John Martinko, Kelly Bender, Daniel Buckley and David Stahl, 2015.* **Brock Biology of Microorganisms** *14th edition. Pearsons Education Ltd.*

17UMB13P	CORE PRACTICAL - I	SEMESTER - I

Total Credits: 4

Hours per week: 8

CONTENTS

1. Laboratory precautions
2. Preparation of cleaning solutions - Chromic acid
3. Culture media preparation – Nutrient Broth
4. Nutrient Agar (Plate, Deep, Slant)
5. Differential medium
6. Selective medium.
7. Sterility testing of Autoclave
8. Sterility testing of Hot air Oven
9. Decimal Dilution Technique
10. Pure culture techniques – Streak plate method, Pour plate method, Spread plate method
11. Isolation and Enumeration of bacteria from soil
12. Isolation of fungi from soil
13. Isolation of Actinomycetes from soil
14. Bacterial staining - Simple Staining
15. Gram Staining
16. Slide culture Technique
17. Preservation of bacterial cultures – Mineral oil overlay method

LABORATORY MANUALS:

1. *James.C.Cappuccino.* 2017. **Microbiology A laboratory manual**. *11th edition, Pearson education publishers.*
2. *Kannan, N.* 1996. **Laboratory manual of General Microbiology**, *2nd edition, Panima publishing house.*

REFERENCE BOOKS:

1. *Aneja. K.R.* 2012. **Experiments in Microbiology, plant pathology and biotechnology,** *4th Edition. New age publishers.*
2. *Kannan, N.* 2003. **Hand book of Laboratory culture media** *1st edition, Panima publishing house.*

17UMT1AC	Allied I- Basic Mathematics	SEMESTER – I

PREAMBLE:

- On successful completion of this subject the students should have Understand the basic concepts of Mathematics.
- To know about the applications of Statistical and Numerical Techniques of Mathematics.

COURSE OUTCOMES

On the successful completion of the course, student will be able to

CO Number	CO Statement	Knowledge Level
CO 1	Learn about Numerical Differentiation	K1
CO 2	Learn about Numerical Integration	K1
CO 3	Apply Statistical Techniques for data collection	K2
CO 4	Solve the problems related to Measures of central tendency	K2
CO 5	Solve the problems related to System of Simultaneous Linear Algebraic Equation	K3

MAPPING WITH PROGRAMME OUTCOMES

COS/ POS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	S	S	M	M	S
CO3	S	S	S	S	M
CO4	S	S	M	S	M
CO5	S	S	M	S	M

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

17UMT1AC	ALLIED – I: BASIC MATHEMATICS	SEMESTER – I

Total Credit: 4

Hours Per Week: 4

CONTENTS

UNIT - I

System of Simultaneous Linear algebraic Equation: Gauss elimination - Gauss Jacobi Gauss Jordon - Gauss Seidal methods.

UNIT - II

Numerical Differentiations: Newton's forward Difference - Backward Difference -Stirling's formula.

UNIT - III

Numerical Integration: Trapezoidal Rule & Simpson's rule - Numerical solutions of ordinary differential Equations: Taylor series for first order derivative.

UNIT - IV

Statistics: Meaning - Definition – Collection of data - Classification and Tabulation – Diagrammatic Representation and Graphical Representation.

UNIT - V

Measures of Central Tendency: Mean – Median – Mode - Measures of dispersion: Range – Standard deviation.

TEXT BOOKS:

1. *Kandasamy,P.and Thilagavathi ,K.* 2004. **Numerical Methods .***S.Chand and Company Ltd., New Delhi. (Unit I , II &III)*
2. *R.S.N.Pillai,V.Bagavathi*. 2002. **STATISTICS.** *S.Chand and Company Pvt. Ltd (Unit IV & V).*

REFERENCE BOOKS:

1. *Gupta, S.P. and Gupta, M.P .* 2002. **Business Statistics .** *Sultan Chand and Sons.*
2. *Venkataraman , M.K*. 2004. **Numerical Methods in Science & Engineering** . *NPC . Revised Edition*

17UMB23A	CORE II: CELL BIOLOGY	SEMESTER – II

PREAMBLE

To develop basic knowledge in

- The complexity and harmony of cell structure and functions
- The mode of cell divisions and
- Mechanism of nutrient transportation inside the cell.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	• Describe the morphological details of prokaryote and their physiology. • Explain the structure of internal organelles and their functions in organisms.	K1
CO2	• Addressing the structural details of eukaryotic organisms and their internal organelles.	K1,K2
CO3	• Identify the reproduction methods or cell division strategies.	K3
CO4	• Summarise the nutrient uptake mechanism and their transportation among cell to cell.	K2
CO5	• Provides knowledge in the primitive life form. • Outline the characteristics of the life in the extreme environment. • Summarize the environmental adaptation strategies via microbial life in extreme environment.	K1,K2

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	S	S
CO2	M	M	M	S	S
CO3	M	M	M	S	S
CO4	M	M	M	S	S
CO5	M	M	M	S	S

S-Strong, M-Medium, L-Low

17UMB23A	CORE II: CELL BIOLOGY	SEMESTER – II

Total Credits: 4

Hours per week: 5

CONTENTS

UNIT - I

Structure of Prokaryotes - Cell wall – Cell membrane- Extra mural layer - Slime – Capsule – Cytoplasmic inclusions – Mesosomes – Nuclear material – Reserve materials - Pigment – Cell appendages – Flagella – Pili. Endospore formation.

UNIT - II

Structure of Eukaryotes – Cell wall – Cell membrane - Mitochondria – Chloroplast – Endoplasmic reticulum – Golgi complex – Nucleus – Ribosomes – Inclusions Bodies - Flagella.

UNIT - III

Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis. Cell cycle.

UNIT - IV

Transport mechanisms – Diffusion - Facilitated diffusion – Active transport – Group translocation – Phagocytosis – Pinocytosis.

UNIT - V

Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidophiles.

TEXT BOOK:

1. *Joanne Wiley, Linda Sherwood, Christopher J Woolverton*. 2016. *Prescott's Microbiology, 10th Edition. Mc Graw Hill Company.*

REFERENCE BOOKS:

1. *Tortora, Funke and Case***. 2016. Microbiology**, *11th edition. Pearson Education India.*
2. *Verma P S,* 2004. **Cell biology, Genetics, Evolution and Ecology**, *14th Edition. S Chand Publishers.*

17UMB23P	CORE PRACTICAL - II	SEMESTER – II

Total Credits: 3

Hours per week: 6

CONTENTS

1. Observation of Plant cell
2. Observation of animal cell
3. Measurement of Microbial cell size by Micrometry
4. Cell count- Microscope
5. Screening of PHB production
6. Observation of permanent slides of Algae, Fungi and Protozoa
7. Observation of permanent slide for stages of mitosis
8. Observation of permanent slide for stages of meiosis
9. Extraction of chlorophyll pigments.
10. Acid Fast Staining
11. Capsular staining – Negative staining
12. Spore Staining
13. Motility test - Hanging drop and SIM agar
14. Fungal staining – Lacto phenol Cotton Blue Mount

LABORATORY MANUALS:

1. *J Jayaraman,* 2005. **Laboratory manual in Biochemistry**. *1st Edition. New Age International.*
2. *James.C.Cappuccino.* 2017. **Microbiology A laboratory manual**. *11th edition, Pearson education publishers.*

REFERENCE BOOKS:

1. *Aneja. K.R.* 2012. **Experiments in Microbiology, Plant Pathology and Biotechnology**, *4th edition. New age publishers.*
2. *Kannan, N.* 2003. **Hand Book of Laboratory Culture Media** *1st edition, Panima publishing house.*

17UCS2AA	ALLIED – II: BASICS OF COMPUTERS	SEMESTER –II

PREAMBLE:

On successful completion of this course, the students shall enrich the knowledge in the applications of internet in biosciences which helps them to gather updated information.

COURSE OUTCOME:

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

CO Number	CO Statement	Knowledge Level
CO1	• Learn the fundamentals of number systems	K1
CO2	• Understand the principle of system software	K2
CO3	• Learn the concepts of internet technologies	K1
CO4	• Ability to get knowledge in database	K2
CO5	• Understand the basic structure of networks	K1

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	S	S	M	M	S
CO3	S	S	S	S	M
CO4	S	S	M	S	M
CO5	S	S	M	S	M

S-Strong, M-Medium, L-Low

17UCS2AA	ALLIED – II: BASICS OF COMPUTERS	SEMESTER –II

Total Credits: 2

Hours Per Week: 3

CONTENTS

UNIT-I

General format of representing a number-Classification of number system: Positional and Non-positional number system. Decimal, Binary, Octal and Hexadecimal. Conversion from one system to another.

UNIT-II

Fundamentals of Information technology: History and Generations of computers-classification of programming languages- Operating systems and their types. Definitions of Compilers, Linker, Loaders, Assembler and Interpreter. Algorithms Flowchart and its components.

UNIT-III

Internet: Evolution of Internet-Internet terminologies: WWW, FTP, HTML, HTTP, Gopher, E-mail browsers, protocol Archie Telnet, Search engines. Application of Computers in education, business, entertainment, science, engineering and medicine

UNIT- IV

Database systems; Definitions: Data abstraction, Instances, Schemes, Entity, Entity set: Strong and weak entity sets, Primary key, Foreign key, Super key. Database models: Basic concepts of E-R model, Hierarchical model.

UNIT-V

Networking: Network architectures, Topologies, LAN, WAN, MAN AND Components of a network: Hubs, Routers, Repeaters, Bridges, Modems and cables. Linux: Installation-Basic commands.

TEXT BOOKS:

1. ***Leon A and Leon*** M, 2009. **Fundamentals of Information technology,** *second edition, Vikas publishing House Pvt. Ltd.*
2. *Date C.J.* 2003. **Introduction to Database systems.** *8th edition*, *Pearson publisher.*

REFERENCES BOOKS:

1. *Andrew S. Tanenbaum*, 2002, **Computer networks**, *Fourth edition, Prentice Hall.*

17UCS2AP	ALLIED PRACTICAL I- FUNDAMENTALS OF COMPUTERS	SEMESTER –II

Total Credits: 2

Hours Per Week: 4

OBJECTIVES:

Upon completion of this practical the students will gain knowledge on the hard ware components, operating systems, programming languages and basics of internet usage

CONTENTS

1. To create an email id, compose and send a mail.

2. To send a mail with an attachment and download the attached document of mail received.

3. Create a resume in MS Word and format it.

4. Create company letter head in MS Word.

5. Create a cover page of a project report using MS Word.

6. Create a simple News letter using MS Word.

7. Create a macro which creates a line chart using the data in the worksheet in

MS Excel.

8. Prepare Class Time-Table using MS Excel

9. Prepare student marksheet using MS Excel.

10. Prepare a mark list for the following conditions in MS Excel

a) Data Filter

b) Data sort

11. Create a website to display a message using basic HTML tags

12. Create a web page using HTML Tags &change its back ground.

13. Design a time-table using HTML Tags.

14. Prepare a presentation using MS powerpoint to advertise a product

15. Create a database for employee payroll using MS Access

TEXT BOOK:

1. *Balagurusamy .E*, 2004, **Programming In Basics**, *3rd edition, Tata McGraw-Hill Education*

REFERENCE BOOK:

1. Patrick Naughton, Internet complete reference

17UMB33A	CORE III- MICROBIAL PHYSIOLOGY	SEMESTER - III

PREAMBLE

Gain a fundamental understanding of microbial nutritional requirements, transport, growth, energy generation, diversity of metabolic processes and techniques used to elucidate physiological processes.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	Formulate a comprehensive definition of microbial physiology. Understand the nutritional requirements and modes of nutrient uptake by microorganisms. Categorize the microorganism based on mode of nutrition.	K1
CO2	Describe how environmental factors impact microbial growth, metabolism and physiology. Understand the physiology of growth and calculation of generation time. Evaluate the growth of microorganisms by experimental methods.	K3, K4
CO3	Confer the significance of different pathways of Carbohydrate metabolism. Infer the concepts of energy generation in aerobic cellular processes with calculation of ATP. Infer and extrapolate how small molecules are integrated into macromolecule (Biosynthetic process).	K3, K3
CO4	Respond on the concepts of anaerobic respiration. Describe and distinguish the various types of fermentation processes. Reiterate the importance of methanogens and methanogenic	K3, K2

	processes. Compare oxygenic and anoxygenic process.	
CO5	Acquire knowledge on the concepts of biosynthesis of aminoacids. differentiate gram-positive and gram-negative cell wall synthesis State the biological process of bioluminescence in microbes.	K3, K1

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	S	S	M	M

S-Strong, M-Medium, L-Low

17UMB33A	CORE III: MICROBIAL PHYSIOLOGY	SEMESTER - III

Total Credits: 4

Hours per week: 5

CONTENTS

UNIT – I

Definition, Introduction, terminologies and basic concepts of Microbial physiology. Nutritional requirements and uptake in vegetative and dormant stage of microbes. Factors influencing microbial growth – Microbial growth curve.

UNIT – II

Different phases of growth in batch cultures, continuous, semi continuous, synchronous and biphasic growth, calculation of generation time, Estimation of Microbial growth: Direct method - Microscopic count, Turbidometric assay and TVC. Indirect Methods - CO_2 liberation, Protein estimation.

UNIT – III

Aerobic respiration - EMP and its alternative pathways (HMP shunt & ED pathways) - TCA cycle – Electron transport – Energy generation via Oxidative and Substrate level phosphorylation. Calculation of ATP in aerobic cellular processes. Glyoxylate cycle, β oxidation of fatty acids.

UNIT - IV

Anaerobic respiration – Methanogens - Sulphur and nitrogen metabolism. Fermentation – alcoholic, propionic and mixed acid fermentation. Oxygenic and anoxygenic photosynthesis in bacteria.

UNIT - V

Microbial Metabolism: Biosynthesis of amino acids (Pyruvate family – alanine, leucine and Glutamic acid family). Lipids (Phospholipids and Archeal lipids) -Biosynthesis of bacterial cell wall – Bioluminescence – Biotransformation (Antibiotics and Steroids).

TEXT BOOKS:

1. *Gerhard Gottschalk,* 2006. **Bacterial Metabolism**. *Springer-Verlag New York.*
2. *David White and George D. Hageman.* 2000. **Microbial Physiology and Biochemistry Laboratory**. *Oxford University Press.*
3. *Moat. A.G. and Foster. J. W.* 1988. **Microbial Physiology**. *4th edition. John Wiley & sons.*
4. *Stanbury P T and Whitaker* 1984. **Principles of Fermentation Technology**, *1str Edition. Adithya Books pvt ltd. New Delhi.*

REFERENCE BOOKS:

1. *Doelle. H.W.*1975.**Bacterial Metabolism**. 2nd edition. Academic Press.
2. *David L. Nelson* and *Michael M. Cox.* 2009. Fourth edition. **Lehninger Principles of Biochemistry**. *Printed Test Bank, Terry Platt and Eugene Barber, University of Rochester Medical Center).*

17UMB33P	CORE PRACTICAL - III	SEMESTER - III

Total Credits: 3

Hours per Week: 6

CONTENTS

1. Measurement of microbial growth – TVC-Haemocytometer-Turbidity method-Determination of generation time
2. Utilization of amino acid as Carbon source
3. Mixed acid Fermentation test
4. Non-acid end product test
5. Citrate utilization test
6. Carbohydrate fermentation test
7. Preferential sugar utilization test - TSI.
8. H_2S production
9. Starch hydrolysis
10. Catalase test
11. Oxidase test
12. Urease test
13. Gelatin liquefaction
14. Starch Hydrolysis test
15. Casein hydrolysis test
16. Nitrate reduction test
17. Microbial Degradation of textile dyes

LABORATORY MANUALS:

1. *James.C.Cappuccino.* 2013. **Microbiology A laboratory manual**. *1st edition, Pearson education publishers.*
2. *Kannan, N.* 1996. **Laboratory manual of General Microbiology**, *2nd edition, Panima publishing house.*

REFERENCE BOOKS:

1. *Aneja. K.R*. 2012. **Experiments in Microbiology, plant pathology and biotechnology,** *4th Edition. New age publishers.*
2. *Kannan, N*. 2003. **Hand book of Laboratory culture media** *1st edition, Panima publishing house.*

17UBC3AA	ALLIED III - BIOCHEMISTRY- I	SEMESTER - III

PREAMBLE:

1. This course provides an overview of nature of biological macromolecules namely carbohydrate, lipids, proteins and nucleic acids.
2. Students can gain basic knowledge and key understanding of the role of Vitamins, Minerals and Hormones in the functioning of cell.

COURSE OUTCOME:

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

CO number	CO Statement	Knowledge Level
CO1	Outline carbohydrate definition, classification and function. Explain Monosaccharides, Disaccharides and Polysaccharides	K1 & K2
CO2	Define and classify lipids. List and compare saturated and unsaturated fatty acids. Summarize the physiochemical properties of lipids.	K1 & K2
CO3	Compare the different structural levels & Organization of proteins with suitable examples. Classify the standard amino acids and list the non protein aminoacids Experiment with aminoacids.	K1, K2 & K3
CO4	Define Nucleic acids. Identify the structures of purines, pyrimidines, nucleoside and nucleotides. Classification and identification different forms of DNA and RNA.	K1, K2 & K3
CO5	Define and classify vitamins. Explain the functions of minerals in biological system. Illutrate the role of hormones in metabolic regulation.	K1 & K2

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	S	S	M	M

S-Strong, M-Medium, L-Low

17UBC3AA	ALLIED III- BIOCHEMISTRY- I	SEMESTER – III

Total Credits: 4

Hours Per Week: 4

CONTENTS

UNIT - I

Carbohydrate – classification, structure, properties & chemical reactions of monosaccharide – Glucose, Fructose, Galactose, Mannose, Arabinose. Disaccharides – Maltose, Lactose and Sucrose. Polysaccharides – Homo polysaccharides – Starch, Glycogen and Cellulose & Hetero polysaccharides – Hyaluronic acid, Heparin, Chondroitin sulphate. Biological importance of sugar derivates – glycosaminoglycan, proteoglycan & glycoprotein – Blood group & Bacterial cell wall polysaccharides.

UNIT - II

Lipids: Definition classification of lipids, physiochemical properties. Storage lipids – fatty acids – types. Structural lipids – phospholipids, glycolipids & sphingolipids. Structure & Biological role of cholesterol.

UNIT - III

Classification of amino acids, general properties, Non protein amino acids. Peptide bond – structure & conformation, Protein classification, Physiochemical properties of proteins. Organization of protein Structure – Primary, Secondary (Keratin, Collagen) Tertiary (Myoglobin), Quaternary structure (Hemoglobin).

UNIT - IV

Structures of Purines, Pyrimidines, Nucleoside & Nucleotides. Properties of nucleic acids. DNA Double helical structure – Isoform. RNA – Types – mRNA, tRNA, rRNA - structure & function.

UNIT - V

Minerals in biological system & their importance – Iron, Calcium, Phosphorous, Iodine, Copper, Zinc. Vitamins – Definition, classification: Fat soluble (Vitamin A,D,E,K) and Water Soluble vitamins (Vitamin B)- Sources, functions and deficiencies. Role of vitamins as antioxidants & cofactors. Hormones involved in regulatory metabolism: Insulin, Glucagon and thyroid.

TEXT BOOKS:

1. *J.L.Jain.* 2016. **Fundamentals of Biochemistry,** *7th edition. S. Chand and company Ltd.*
2. *Sathyanarayana U.* 2013. **Biochemistry,** *4th Edition. Books and Allied (P) Ltd.*
3. *Stryer L.* 2011**. Biochemistry,** *7th Edition. W. H. Freeman and Company, New york.*

REFERENCE BOOKS:

1. *Zubay***,** 1999**. Biochemistry,** *4th edition. William.C.Brain publishers.*

17UMB3SA	SKILL BASED SUBJECT I - INTRODUCTION TO ENTREPRENEURSHIP	SEMESTER- III

PREAMBLE

The course will impart knowledge on the Concept, roles and responsibilities of Entrepreneurship, Small scale Industries planning and facilities available through Government and NGOs to become entrepreneur.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	To remember and understand the Concept, roles of Entrepreneurship	K1 & K2
CO2	To understand and design different SSU	K2 & K3
CO3	To procure knowledge on planning & raising funds	K2
CO4	To acquaint the Schemes available and roles of Banks	K2
CO5	To think and act as socially responsible entrepreneur.	K3 & K4

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S-Strong, M-Medium, L-Low

17UMB3SA	SKILL BASED SUBJECT I : INTRODUCTION TO ENTREPRENEURSHIP	SEMESTER- III

Total credits: 3

Hours per Week: 3

CONTENTS

UNIT - I

Concept of Entrepreneurship – Definition –Concept – Role and reasons. Entrepreneurial scenario in India – Entrepreneurial environment.

UNIT - II

Estabilishment of Small scale Industries – Generation of project – Project identification – Designing capital structure – Preparation of Project report – Provisional registration of small scale units- Statutory licences – Applying for Permanent Registration.

UNIT - III

Planning – Characteristics of Planning – Elements of Planning – Advantages and Limitations. Promotion of Venture – Legal requirements – Raising of Funds – Needs of Funds.

UNIT - IV

Financial institutions – Small Industries Development Bank of India (SIDBI) – Industrial Development Bank of India (IDBI) – State Financial Corporation (SFCs) – National Bank of Agricultural and Rural Development (NABARD) – Role of Commercial Banks – Schemes available with Commercial Banks - MSME.

UNIT - V:

Social responsibility of Entrepreneur – Business ethics. Digitalisation.

TEXT BOOKS:

1. *Dr. O. P. Gupta.* 2015. **Fundamentals of Entrepreneurship**. *SBPD publications.*
2. *Dr. P. T. Vijayashree and Dr. M. Alagammai*. 2013. **Entrepreneurship and Small Business Management**. *Margham Publications.*

17UMB43A	CORE IV- BIOINSTRUMENTATION	SEMESTER IV

PREAMBLE

The subject aims to build knowledge on

1. Concept of buffers, pH and biochemical calculations
2. Instrumental aspects in microbiology
3. Separation, Purification & Quantification of Biomolecules.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	• Describe the properties of Buffers. • Calculate different concentration units of solutions. • Understand the working principle of pH electrodes. • Determine the pH of samples using pH meter.	K2
CO2	• Demonstrate the use of instruments to maintain sterility and aseptic transfer of microbial cultures. • Use of instruments to preserve microorganisms. • Use of instruments to mix and blend substances.	K3
CO3	• Understand the core principles of Centrifugation. • Describe the features and components of major types of centrifuges. • Illustrate how centrifugation methods are utilized for bioanalysis.	K2
CO4	• Estimate the concentration of an unknown colored solution using colorimetry. • Explain the basic principles of	K3, K4

	spectrophotometer. • Demonstrate how to measure concentration by a UV Visible spectrophotometer.	
CO5	• Become familiar with fundamental concepts of chromatography and their role in achieving separations across different types of chromatography. • Develop the core skills and identify the key factors influencing in Electrophoresis.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S-Strong, M-Medium, L-Low

17UMB43A	CORE IV- BIOINSTRUMENTATION	SEMESTER - IV

Total Credits: 4

Hours per week: 4

CONTENTS

UNIT - I

pH meter - Instrumentation - pH electrodes - calomel and glass electrode – Applications. Buffers - Types of Buffers. Preparation of solutions - Molarity and Normality- Calculation methods.

UNIT - II

Principle, Instrumentation, and Applications of Autoclave, Hot air oven, Incubator, Laminar air flow, metabolic shaker, Lyophilizer. Biosafety cabinets – Introduction and types.

UNIT - III

Centrifugation: Principle- Types of Centrifuges –Low speed, High speed, Microfuge-Ultra centrifuge- Analytical and Differential Centrifuge- Applications.

UNIT - IV

Colorimetry- Principle, Instrumentation and Applications- Spectrometry – UV & Visible Spectrophotometer. Spectrofluorimeter.

UNIT - V

Chromatography– Paper, Thin layer, Column, Ion-exchange, Gas and HPLC. Electrophoresis –SDS – PAGE and Agarose gel electrophoresis.

TEXT BOOKS:

1. *L Veerakumari*. 2011. **Bioinstrumentation,** *1st Edition. MJB Publishers.*
2. *Keith Wilson and John Walker*. 2010. **Principles and Techniques of Biochemistry and Molecular Biology.** *Cambridge University Press. UK.*

REFERENCE BOOKS:

1. *Gedder , A. and L. E. Balser*, **Principles of applied Biomedical instrumentation.** *John Wiley and Sons Publications.*
2. *Dean, Willard and Merrit*. **Instrumental Methods of analysis** *Asian Ed.*
3. *Boyer, Rodney, F. Benjamin and Cummins*, **Modern Experimental Biochemistry** 2 Edi.

17UMB43P	CORE PRACTICAL - IV	SEMESTER - IV

Total credits: 2

Hours per week: 4

CONTENTS

1. P reparation of Buffers-Acidic, neutral and alkaline range

2. Preparation of Normal solutions-0.1 N and 1N

3. Preparation of Normal solutions-0.1 M and 1M

4. Measurement of pH -pH meter

5. Extraction and quantification of Pigments from Plants

6. Extraction and quantification of Pigments from bacteria

7. Density Gradient Centrifugation – Sucrose Gradient

8. Estimation of Protein-Lowry *et al* method

9. Estimation of sugars-DNSA method

10. Separation of amino acids-Paper Chromatography

11. Separation of amino acids-Thin Layer Chromatography

12. Agarose Gel Electrophoresis-Demonstration

LAB MANUALS:

1. *Aneja. K.R*. 2012. **Experiments in Microbiology, plant pathology and biotechnology,** *4th Edition. New age publishers.*
2. *James.C.Cappuccino.* 2013. **Microbiology A laboratory manual**. *1st edition, Pearson education publishers.*
3. *Rajan S. and Selvi Christy.* **Experimental Procedures in Life Sciences**. *Anjana book House.*
4. *Kannan,N*. 1997. **Laboratory Manual of General Microbiology,** *1st edition, Panima Publishing*

17UBC4AB	ALLIED IV- BIOCHEMISTRY - II	SEMESTER - IV

PREAMBLE:

1. This course provides an overview of information related to carbohydrate, fat, and nucleic metabolism that takes place in our body.
2. Students can gain basic knowledge and key understanding on Enzyme classification, specificity, kinetics and regulation.

COURSE OUTCOME:

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

CO number	CO Statement	Knowledge Level
CO1	Illustrate what happens during glycolysis, glycogenesis, and glycogenolysis. Explain the events that make up the process of TCA cycle, pentose phosphate pathway and HMP shunt.	K1, K2 & K3
CO2	Understand the chemical logic of lipid metabolic pathways.	K1 & K2
CO3	Explain how nucleic acids are synthesized and degraded. Demonstrate a model for DNA replication.	K1, K2 & K3
CO4	Define and classify enzymes. Explain active site and specificity of enzymes. Illustrate kinetics of enzyme catalysis.	K1, K2 & K3
CO5	Compare and contrast different types of enzyme inhibition.	K1 & K2

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S-Strong, M-Medium, L-Low

17UBC4AB	ALLIED IV- BIOCHEMISTRY - II	SEMESTER - IV

Total Credits: 2

Hours per Week: 3

CONTENTS

UNIT - I

Carbohydrate metabolism: Glycolysis- The citric acid cycle and regulation. The pentose phosphate pathway & its importance. Glycogenesis and Glycogenolysis

UNIT – II

Lipid metabolism: α , β, γ - Oxidation of fatty acids: Saturated and unsaturated – Biosynthesis of Lipids: Triacylglycerols, Glycerophospholipids and Cholesterol.

UNIT - III

Nucleic acid metabolism: Biosynthesis of Purines and Pyrimidines. Synthesis, Replication and Degradation of DNA and RNA.

UNIT - IV

Enzymes Classification & nomenclature. Specificity of Enzymes. Active site- Overview of Coenzymes and cofactors in enzyme catalyzed reaction.- - Enzyme Kinetics - factors affecting enzyme activity, Michaelis-Menten plot, Lineweaver-Burk plot.

UNIT – V

Enzyme regulation - Enzyme inhibition – Reversible - competitive, noncompetitive, uncompetitive and mixed inhibition- irreversible inhibition.

TEXT BOOKS:

1. *Deb A.C.* (2001). **Fundamentals of Biochemistry,** *9th edition, New Central Book Agency, Kolkatta.*

2. *Chatterjea M. N.* (2012)**, Textbook of Medical Biochemistry,** *8th edition, Jaypee Brothers, New Delhi.*

3. Palmar, T., 2001. **Understanding enzymes,** *1st edition, Horwood publishing house, Chichesper.*

4. *Asokan, P.* 2006. **Enzymes**, *1st edition, Chinnaa publications.*

5. *Sathyanarayana U.* 2013. **Biochemistry,** *4th Edition. Books and Allied (P) Ltd.*

REFERENCE BOOKS:

1. *Nelson, D.L., Cox, M.M.* 2008. Lehninger **Principles of Biochemistry**, *5th edition, W.H. Freeman and Company, New York.*

2. *Murray R.K., Granner D.K, Mayes P.A and Rodwell U. W.,* (2015)**, Harper's Biochemistry,** *30th edition, Lange Medical Publications*.

3. Price, N.C. and Stevens, L., 1999. **Fundamentals of Enzymology**, *3rd edition, Oxford University Press.*

17UBC4AP	ALLIED PRACTICAL II - BIOCHEMISTRY	SEMESTER- IV

Total Credits: 2

Hours per Week: 4

CONTENTS

1. **Analysis of Carbohydrates:**
   a. Monosaccharide - Pentose- Arabinose. Hexoses- Glucose, Fructose,
   b. Disaccharides - Sucrose, Maltose and Lactose
   c. Polysaccharide - Starch.

2. **Analysis of Amino acids:**
   a. Histidine
   b. Tyrosine.
   c. Tryptophan
   d. Arginine

3. **Characterization of lipids**
   1. Determination of acid number.
   2. Determination of iodine number.

4. **Quantification technique**
   a. Quantification of Protein by Lowry *et al* method
   b. Quantification of Carbohydrate by DNSA method

REFERENCE BOOKS:

1. *D.T. Plummer*, (2006), **An Introduction to Practical Biochemistry,** *3rd edition, TMH, New Delhi.*
2. *Pattabiraman T. N and Sitarama Acharya U.* (2015)**. Laboratory Manual in biochemistry,** *4th Edition. All India Traveller Book Seller.*
3. *J Jayaraman, (*2015)**. Laboratory manual in Biochemistry.** *5th Edition. New Age International (P) Ltd.*

17UMB4SA	SKILL BASED SUBJECT II : ENTREPRENEURIAL MICROBIOLOGY	SEMESTER - IV

PREAMBLE

To augment the ideas of the production of microbial products, techniques, trouble shooting and their role in improving economy.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	• Describe the microbial products that are having rich nutritive and commercial value • Discuss different types of yeast and their applications • Familiarize the fermented food products .	K1,K2
CO2	• Teach variety of enzymes and their beneficial aspects • Demonstrate large scale production of enzymes • Route map for industrial application of enzymes	K1,K3
CO3	• Explain the mushroom cultivation techniques • Acknowledge the variety of mushroom and their characterization • Review the protocol for mushroom cultivation	K2,K3
CO4	• Teach the historical aspects of bio fertilizer • Illustrate different types of bio fertilizer	K3,K1

	• Describe the organic farming and their importance	
CO5	• Describe about the media formulation • Interpret the involvement of microbes in the production of industrially important products • Augments the knowledge in alcohol production	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	S	S	M	M

S-Strong, M-Medium, L-Low

17UMB4SA	SKILL BASED SUBJECT II- ENTREPRENEURIAL MICROBIOLOGY	SEMESTER - IV

Total credits: 3

Hours per Week: 3

CONTENTS

UNIT - I

Introduction, Opportunities and challenges in entrepreneurial microbiology:

Microbial cells as fermentation products- Baker's yeast, food and feed yeasts, Bacterial Insecticides, Legume Inoculants, Algae. Yeast - microscopic observation of yeast, isolation and production, Commercial application of yeast products, preservation techniques followed in yeast products.

UNIT - II

Enzymes as fermentation products- Bacterial and Fungal Amylases, Proteolytic Enzymes, Pectinases. Penicillin structure and types, antibiotics application in food industry, Aseptic techniques followed in food industry.

UNIT - III

Mushroom cultivation and Composting- Cultivation of *Agaricus campestris*, *Agaricus bisporus,* and *Volvariella volvaciae;* Preparation of compost, filling tray beds, spawning, maintaining optimal temperature, casing, watering, harvesting, storage.

UNIT - IV

Biofertilizers - Historical background, Chemical fertilizers versus biofertilizers, organic farming. *Rhizobium* sp, *Azospirillum* sp, *Azotobacter* sp, Azolla, PGPR as Biofertilizers.

UNIT - V

Brewing- Media components, preparation of medium, Microorganisms involved, maturation, carbonation, packaging, keeping quality, contamination, Aging, by products. Production of Industrial alcohol. Pre and pro biotic definition, role, large scale production and side effects

TEXT BOOKS:

1. Dimitris Charalampopoulos, Robert A. Rastall, 2009 **Prebiotics and Probiotics Science and Technology**, *Volume 1, Springer Science & Business Media, pp - 1262*

2. Koen Venema and Ana Paula do Carmo -Editors, 2015. **Probiotics and Prebiotics: Current Research and Future Trends** .

3. Handbook of Probiotics and Prebiotics, 2009, Second Edition, Edited by YUAN KUN LEE and SEPPO SALMINEN , *published by John Wiley & Sons.*

17UMB53A	CORE - V: MICROBIAL GENETICS	SEMESTER – V

PREAMBLE:

To familiarize the concept of genetic material, Storage of genetic information, expression of genetic information, heritable transfer of genetic information and mutation of genes for the better understanding of genetic constitution.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge level
CO1	To understand the concept of genetic material and its replication. To obtain information on the types of DNA & RNA. To explain the principle behind replication.	K_2,K_3
CO2	To describe the principle behind transcription. To review on protein synthesis and the Enzymology behind it. To illustrate the properties of genetic code and its universality.	K_2
CO3	To categorize the mutational types and significance of mutation in recombinantion. To synergize the molecular basis of repair mechanism.	K_2
CO4	To be familiar with microbial recombination. To recognise the types of recombination in producing variants.	K_4,K_2
CO5	To distinguish constitutive and inducible enzymes and their expression. To understand positive and negative regulation.	K_2, K_3

MAPPING WITH PROGRAMME OUTCOMES

CO5/PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	M	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	M	M
CO5	S	S	M	S	M

S-Strong,M-Medium,L-Low

17UMB53A	CORE - V: MICROBIAL GENETICS	SEMESTER – V

Total Credits: 4

Hours per Week: 4

CONTENTS

UNIT-I

DNA: - DNA as genetic material, Structure of DNA and RNA, DNA Replication-Semiconservative-enzymology-mechanism.

UNIT-II

Transcription - Genetic Code – Organization of the code, Establishment of genetic code - Translation – Initiation, Elongation and Termination – Protein spilicing.

UNIT-III

Mutation – definition, types – silent, missense, non – sense, insertion, deletion, substitution - spontaneous and induced. Repair – light – dark – SOS –Recombinant.

UNIT-IV

Bacterial Genetics (Mutant phenotype, DNA mediated Transformation; Conjugation (Cointegrate Formation and Hfr Cells, Time–of–Entry Mapping, F′ Plasmid); Transduction (Generalized transduction, Specialized Transduction) - gene mapping.

UNIT-V

Molecular Mechanism of gene regulation in prokaryotes - Lac, Trp, Ara operons. Eukaryotic gene regulation – important differences in the genetic organization of Prokaryotes and Eukaryotes – Gene rearrangement. Yeast mating type.

TEXT BOOKS:

1. *Prescott, Harley, Klein.* 2002. **Textbook of Microbiology,** *5th Edition. McGraw Hill Education.*
2. *Gardner, E. J,Simmons, M J& D P Snustard* . 1991, **Principles of Genetics**, *8th edition. John Wiley & Sons.NY.*
3. *Freifelder .S*. 1987. **Microbial Genetics**, *1st Edi. Jones & Bartlett, Boston.*
4. *Robert H. Tamarin.* 1992. **Principles of Genetics**, *7th edition, Cm Brown Publishers.*

REFERENCE BOOKS:

1. *David Freofelder.* 1996. **Essentials of Molecular Biology**, *2nd Edition.*
2. *Lewin.B,* 1990. **Genes**, *1st edition, Oxford University Press.*
3. *Klug .W.S. & Cummings, MR*. 1996, **Essentials of Genetics**, *Mentics Hail. NewJersey.*

17UMB53B	CORE - VI: IMMUNOLOGY	SEMESTER – V

PREAMBLE:

The aim of the course is

- To develop knowledge among students about the immune system, its interaction with pathogens and
- Responses to stimulation and vaccines.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge level
CO1	• Understand the basis of complex, cellular processes involved in inflammation and immunity. • Recognise the importance of cell and organs of the immune system.	K1 and K2
CO2	• Define the cellular pathways of humoral/cell-mediated adaptive responses.	K2 and K3
CO3	• Compare the four types of hypersensitivity for the Immunologic mechanism involved.	K2,K3 and K4
CO4	• Detailed knowledge and understanding of immunology and the way it is applied in diagnostic and therapeutic techniques and research.	K2 and K3
CO5	• Understand the consequences of general types of immunodeficiency diseases. • Explain the mechanisms and factors associated with organ transplantation.	K2 and K3

MAPPING WITH PROGRAMME OUTCOMES

CO5/PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	M	S	S	S
CO3	S	S	S	M	M
CO4	S	S	S	M	M
CO5	S	S	M	S	M

S-Strong,M-Medium,L-Low

17UMB53B	CORE - VI: IMMUNOLOGY	SEMESTER – V

Total Credits: 4

Hours per Week: 4

CONTENTS

UNIT - I

History and Scope of Immunology. The basis of defense mechanisms. Cells and Organs involved in immune system.

UNIT - II

Types of immunity, Antigen and Antibody types, Complement pathways - Classical, alternate and lectin pathway. Immunoglobin – structure, Isotypes, and functions.

UNIT - III

Allergy and Hypersensitivity - Classification types and Mechanisms. Autoimmunity mechanisms and autoimmune response diseases: cell specific: Systemic Lupus Erythematosis and Organ Specific: Myasthenia Gravis.

UNIT – IV

Antigen-Antibody reactions - Agglutination: Direct, indirect, RPR and Hemaaglutination. Precipitation: Double Immuno Diffusion. ELISA. Radio immune assay (RIA). Monoclonal antibodies and its applications.

UNIT – V

Immuno hematology - Blood transfusion - ABO grouping - Rh factor. Tissue transplantation - HLA typing - Mechanism of acceptance and rejection. Immunodeficiency disease: AIDS.

TEXT BOOKS:

1. *Nandhini Shetti,* 2009. **Immunology, an Introductory Text Book**. *1st edition. New Age International Limited.*
2. *Tizard, I R.* 1998. **Immunology an Introduction**, *4th edition. Thomson publishers, Australia.*

REFERENCE BOOKS:

1. *Roitt, IM*. 2011. **Immunology** *1st edition. Mosboy Publishers.*
2. *Kuby.J.* 2002. **Immunology** *5th edition. W.H.Freeman, NY*.
3. *Rao C. V*. 2002, **an Introduction to Immunology**, *Narosa Publishing House, Chennai.*

17UMB53C	CORE VII- FOOD MICROBIOLOGY	SEMESTER -V

PREAMBLE

This course has been designed for students to learn and understand

- To know the types of microorganisms and their role in food and factors disturbing microbes
- To understand the role of microbes in fermented food product
- To acquire the knowledge on food borne illness and diseases by various microbes and hazards

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge level
CO1	• To understand the relation between the food and microbes and types of microorganisms in related to food. • To provide the knowledge on factors affecting the growth of microorganisms in food.	K2, K3
CO2	• To understand the role of microbes involved in production of various fermented food product and their production procedure.	K3
CO3	• To acquaint the knowledge on spoilage of various types of food by microbes.	K3
CO4	• To describe the characteristics food infections and poisoning and explain the bacterial food poisoning.	K3
CO5	• To impart the knowledge on non bacterial food borne illness by fungi, parasites, viruses and other hazards • To become equipped with the investigational procedure for food poisoning outbreaks.	K3

MAPPING WITH PROGRAMME OUTCOMES

CO5/PO5	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	M	M
CO2	S	S	M	S	S
CO3	S	M	S	M	M
CO4	S	S	M	M	S
CO5	S	S	S	M	S

S-Strong, M-Medium, L-Low

17UMB53C	CORE VII- FOOD ICROBIOLOGY	SEMESTER –V

Total credits: 4

Hours per week: 4

CONTENTS

UNIT – I

Food and Microorganisms – Important microorganisms in food (List of 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

Elementary knowledge on Fermented & Semi fermented food – Bread, pickle, fermented fish and meat products – Fermented dairy products – Yoghurt and cheese. Fermented beverages: Wine and beer.

UNIT - III

Spoilage and preservation of food - vegetables, fruits, Meat, Fish, Poultry, egg and milk – canned foods.

UNIT – IV

Bacterial Food borne diseases – Food poisoning and Food borne infections – *Salmonella, E.coli, Staphylococcus, Clostridum, Listeria, Shigella, Campylobacter, Yersinia, Vibrio, Aeromonas, Mycobacterium and Bacillus.*

UNIT - V

Non Bacterial Food borne illness: Mycotoxins, Parasites, Viruses, Biohazards and other hazards - Investigation of food poisoning outbreaks.

TEXT BOOKS:

1. *Frazier. W.C and D.C Westhoff.* 1978. **Food Microbiology**. *3rd ed. Tata Macgraw Hill publishing Co., New Delhi.*
2. *Adams M.R. and Moss M. O.,* 2000. **Food Microbiology** *2nd edition. Panima Publishers.*

REFERENCE BOOKS:

1. *Roger.Y.Stainer*. 2003. **Basic Food Microbiology**. *2nd edition, CBS Publishers.*
2. *Jay,J.M* . 1991. **Modern Food Microbiology** *4th edition. Van Nostra and Rainhokdd Co.*

17UMB53D	CORE VIII- MEDICAL MICROBIOLOGY - I	SEMESTER V

PREAMBLE

To comprehend the concept of infections, types, infectious disease process, morphology, pathogenicity and laboratory diagnosis of medically important microorganisms.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge level
CO1	To define the concept of infection, types and infectious disease process To illustrate epidemic, endemic and pandemic diseases To explain the investigation and control of epidemics	K_1, K_2
CO2	To classify the morphology, cultural characteristics, pathogenesis of gram positive cocci. To interpret knowledge on the morphology, cultural characteristics, pathogenesis of gram negative cocci.	K_2, K_4
CO3	To identify the gram positive rods. To classify the gram positive and negative cocci.	K_2, K_3
CO4	To infer the morphology, cultural characteristics, pathogenesis of gram negative rods.	K_2
CO5	To demonstrate the importance of Mycobacterium species. To acquire knowledge on Spirochete, Leptospira and their pathogenesis.	K_2, K_3

MAPPING WITH PROGRAMME OUTCOMES

CO5/PO5	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	M
CO2	M	M	S	S	S
CO3	M	M	S	M	S
CO4	S	S	M	S	S
CO5	S	S	M	S	S

S-Strong, M-Medium, L-Low

17UMB53D	CORE VIII- MEDICAL MICROBIOLOGY I	SEMESTER- V

Total Credits: 4

Hours per week: 4

CONTENTS

UNI T - I

Infections- sources of infections- Types of infections- methods of infections - Definitions- Epidemic, Pandemic, Endemic diseases- Epidemiology of Infectious diseases, Infectious diseases cycle- Investigation of epidemics- control of epidemics. Nosocomial infections.

UNIT - II

Morphology, Pathogenicity and laboratory diagnosis- Gram positive & negative coccus - Staphylococcus aureus, Streptococcus pyogenes, Pneumococcus, Neisseria gonorrhea and Neisseria meningitidis.

UNIT - III

Morphology, Pathogenicity and laboratory diagnosis- Gram positive organisms- Bacillus anthracis, Corynebacterium diptheriae, Clostridium botulinum, Clostridium tetani.

UNIT -IV

Morphology, Pathogenicity and laboratory diagnosis- Gram negative Organisms - Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.

UNIT - V

Morphology, pathogenicity and laboratory diagnosis- Mycobacterium tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira.

TEXT BOOKS:

1. *Ananthanarayanan R and CK Jayaram Panicker*, 1994, **Textbook of Microbiology.** *Orient Longman*.
2. *Chakraborty P* 1995, **A Text book of Microbiology**, *New Central Book Agency Pvt Ltd. Calcutta.*

REFERENCE BOOKS:

1. *Bailey and Scotts*, 1994, **Diagnostic Microbiology**, *9th edition, Baron and Finegold CV Mosby Publications.*
2. *Jawetz E Melnic JL and Adel berg EA* 1998, **Review of Medical Microbiology.** *Lange Medical Publications, USA.*
3. *Mackie and Mc Catney*, 1994, **Medical Microbiology No I and II**. *Churchill Livingston, 14th edition.*

17UMB53P	CORE PRACTICAL –V	SEMESTER- V

Total Credits: 3

Hours per Week: 6

CONTENTS

1. DNA Extraction from Bacteria.
2. Plasmid Extraction.
3. Separation of DNA by Agarose electrophoresis.
4. Isolation of drug resistant mutants using UV – Gradient plate and Replica plating
5. Ames test
6. Slide agglutination -Blood grouping
7. Tube agglutination- WIDAL
8. Precipitation – Ouchterlony's Immunodiffusion
9. Flocculation - RPR
10. DOT ELISA
11. Seperation of proteins by SDS – PAGE.
12. Processing of Clinical samples – Urine, Pus, Blood, Sputum
13. Isolation and Identification of clinical pathogens – Staphylococcus aureus, Streptococcus pyogenes, Escherichia coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella and Pseudomonas.

LABORATORY MANUALS:

1. *Maniatis, T. Tritsch E F and Sambrook J,* 2010. **Molecular Cloning. A Laboratory Manual.** *Cold Spring Harbor Laboratory, New York.*
2. *Rajan S. and Selvi Christy.* **Experimental Procedures in Life Sciences**. *Anjana book House.*
3. *Aneja. K.R.* 2012. **Experiments in Microbiology, Plant Pathology and Biotechnology**, *2nd edition, New age publishers.*

REFERENCE BOOKS:

1. *Jeffrey H. Miller,* 1972. **Experiments in Molecular genetics.** *Cold Spring Harbor Laboratory, New York.*
2. *Kannan N.,* 1997. **Laboratory Manual of General Microbiology**, *2nd ed. Panima Publications.*

17UMB5EA	ELECTIVE I- RECOMBINANT DNA TECHNOLOGY	SEMESTER – V

PREAMBLE

- To construct the recombinant DNA molecules and to direct their replication within host organisms.
- To explain the molecular screening and diagnostic methods.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	• Classify Restriction enzymes. • Compile the types and Mode of action, Polymerases,Ligases and Methylases.	K2, K3
CO2	• Outline the procedure of Isolation and Purification of DNA and RNA. • Compare the Genomic library and cDNA library.	K2, K3
CO3	• Appraise the knowledge about Vectors. • Summarize the importance of Hybrid Vectors.	K2, K3
CO4	• Demonstrate the Gene transfer techniques. • Outline the procedures of Screening and selection of recombinants.	K2, K3
CO5	• Describe the Blotting Techniques. • Explain the procedures of RFLP, RAPD and Protein Engineering.	K2, K3

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	S	S	M	M

S-Strong, M-Medium, L-Low

17UMB5EA	ELECTIVE I - RECOMBINANT DNA TECHNOLOGY	SEMESTER – V

Total Credits: 4

Hours per week: 4

CONTENTS

UNIT - I

Gene manipulation – Restriction Enzymes – Discovery, types and mode of action, Polymerases - Ligases - Methylases.

UNIT - II

Isolation and Purification of DNA (Chromosomal and Plasmid)-Isolation and Purification of RNA - Chemical Synthesis of DNA - Genomic Library and cDNA Library.

UNIT - III

Vectors – Plasmid based Vectors - Natural vectors – pSC101, pSF2124 and pMB1. Artificial vectors - pBR322 & pUC. Phage based Vectors- ʎ phage Vectors. Hybrid Vectors - Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT - IV

Gene Transfer Techniques – Biolistic Method, Calcium chloride and DEAE Methods. Screening and Selection of recombinants - Direct Method - Selection by Complementation, Marker inactivation Methods. Indirect Methods - Immunological and Genetic Methods.

UNIT - V

PCR - DNA Sequencing (Sanger's Method) - Blotting (Southern, Western, Northern) Techniques - RFLP - RAPD - Microarray. Protein Engineering.

TEXT BOOKS:

1. *T.A Brown* 1st edition, 2002. **Genomes**, *John- Wiley & Son.*
2. *Old. RW and Primbrose,* 1995. **Principle of Gene Manipulation**, *5th edition. Blackwell Scientific Publication, Boston.*

REFERENCE BOOKS:

1. *Winnecker, E.D,* 1987. **From Gene to Clones**, *Introduction to Gene Technology, 1 st edition. Panima educational book agency.*
2. *Glick B .R and Pasternak J .J* .1994. **Molecular Biotechnology**. **Principles and Application of recombinant DNA**, *2 nd edition. ASM Press, Washington.*

17UMB5EB	ELECTIVE I- GENERAL BIOLOGY	SEMESTER- V

PREAMBLE:

The subject aims to build the concepts regarding:

1. Cellular Organization
2. Different systems in human beings
3. Interdisciplinary studies in life sciences

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	• To understand the basics of Cellular organisation.	K2, K3
CO2	• Outline the importance of human physiology.	K3
CO3	• Appraise the knowledge Plant photosynthesis and plant hormones.	K2, K3
CO4	• Demonstrate the pattern of inheritance of recombinants.	K3
CO5	• Describe the flow of ecosystem and food chain.	K3

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	S	S	M	M

S-Strong, M-Medium, L-Low

17UMB5EB	ELECTIVE I- GENERAL BIOLOGY	SEMESTER- V

Total Credits: 4

Hours per Week: 4

CONTENTS

UNIT - I

Introduction: Study on Life- - Cellular Organization-Chemistry of Cell-membrane structure and diversity- osmosis and diffusion- mitosis and cell cycle- prokaryotes and eukaryotes- water and life.

UNIT - II

Digestive system- Respiratory system- Excretory system in human beings - Homeostasis- Circulation- -Nervous System

UNIT - III

Plant Photosynthesis- pigments- light reaction and dark reaction- C3 and C4 Photosynthesis-plant hormones.

UNIT - IV

Genetics: Heredity- Patterns of Inheritance- Dominant/Recessive - Sex-linked

Incomplete Dominance- Co-dominance- Polygenic Inheritance- Multiple Alleles

UNIT - V:

Ecology: Ecosystem Structure: Abiotic Factors, Biotic Factors, The Flow of Energy in Ecosystems- Food Chains, Food Webs, Energy Pyramids.

TEXT BOOKS:

1. *Taylor D J, Green, N P O, Stout G W.* 1997. **Biological Science**, *3rd edition, Cambridge University Publishers,*
2. *Verma P S,* 2004. **Cell biology, Genetics, Evolution and Ecology**, *14th Edition, S Chand Publishers.*
3. Chandi Charan Chatterjee, 1958. **Human Physiology,** *4th Edition. Central Book Agency.*

REFERENCE BOOK:

1. *Gerald Karp,* 2010. **Cell Biology**, *6th Edition, John Wiley & sons Publishers.*

17UMB5EC	ELECTIVE I- HUMAN PHYSIOLOGY	SEMESTER -V

PREAMBLE:

1. This course has been designed to enable students to understand the general structure and functions of various systems and organs in the body.
2. This will help students to understand the abnormal changes in tissues and organs in several disease states.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	• To understand the basics of organs of respiration.	K2, K3
CO2	• Outline the structure and functions of Digestive system.	K3
CO3	• Appraise the knowledge on structure and functions of excretory system.	K2, K3
CO4	• Demonstrate the structure and functions of skin.	K3
CO5	• Describe the structure and functions of skeleton and blood.	K3

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	S	S	M	M

S-Strong, M-Medium, L-Low

17UMB5EC	ELECTIVE I- HUMAN PHYSIOLOGY	SEMESTER -V

Total Credits: 4

Hours per week: 4

CONTENTS

UNIT - I

Organs of respiration - Nose, Larynx, Trachea, Bronchi, Lungs and their capacity - structure and functions. Mechanism of respiration - chemical respiration – Tissue respiration .

UNIT - II

Digestive System: Organs, structure, functions-Teeth, tongue, Salivary glands – Saliva- Composition and function. Oesophagus, stomach, small intestine,

Large intestine. Glands -Liver, Pancreas, gallbladder.

UNIT - III

Excretory system: Organs, structure and functions. Kidney, Ureter, Urinary bladder-Formation of Urine, Constitution of Normal Urine. Abnormal Constituents of Urine and diseases associated with it. Nephrites, Nephritis, Renal stones.

UNIT - IV

Skin – structure and Function. Disorders of skin – Dandruff, Dermatitis and Burns.

UNIT - V

The Skeleton - A general account of the axial skeleton and appendicular skeleton. Blood composition, Blood group - Blood Vessel - artery, Vein. Capillary, structure of heart. Blood pressure - pulse, systolic-diastolic, Lymphatic system.

TEXT BOOKS:

1. *Guyton, Arthur C.* 1987 **.11th edition. Textbook of medical physiology.***Elsiever Saunders publication***.**
2. *Chandi Charan Chatterjee.* 2016. **Human Physiology** *11th edition. Central Book Agency.*

17UMB5SA	SKILL BASED SUBJECT III- FOOD QUALITY CONTROL AND FOOD PRESERVATION	SEMESTER - V

PREAMBLE

This course has been designed for students to learn and understand

- To get the knowledge about wide variety of parameters affecting food safety
- To understand the quality food manufacturing & food safety regulations act
- Acquire skills in methods of food preservation.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge level
CO1	• Understand the principles of food safety and sanitation, cleanliness, personal hygiene, packaging , handling , transportation and recall procedures	K1
CO2	• Interpret the knowledge on GMP, SSOP and HACCP and their Principles. • To give the ideas on food adulteration.	K2, K3
CO3	• Describe about the food laws and laboratory. sampling, various food safety policies in food industry	K3
CO4	• Understand the principles of food preservation. • Summarize the importance of Canning and high temperature preservation methods.	K2
CO5	• Describes the preservation of food by low temperature, drying and chemical preservatives.	K3

MAPPING WITH PROGRAMME OUTCOMES

CO5/PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	M	M	S	S
CO3	S	M	S	M	M
CO4	S	S	M	S	S
CO5	S	S	S	M	M

S-Strong,M-Medium,L-Low

17UMB5SA	SKILL BASED SUBJECT III- FOOD QUALITY CONTROL AND FOOD PRESERVATION	SEMESTER – V

Total credits: 4

Hours per week: 4

CONTENTS

UNIT - I

Principles of food safety–Establishment: design and facilities –emergency preparedness –Maintenance cleaning and sanitation–personal hygienic–packaging and labeling– transportation– traceability–recall procedure.

UNIT - II

Codex Alimentarius –GMP -SSOP, HACCP-principles–Hazard analysis–determine CCP–establish critical limit–establish monitoring procedure–establish corrective action–recordkeeping–verification –HACCP plan chart. Food Adulteration: Intentional and unintentional.

UNIT - III

Food Laws: FSSAI, Essential Commodities Act, BIS, organizational chart –prohibition and regulation of sales – Scope and objective of industry – food safety policy – environmental policy Glass policy – jewelry policy–visitor policy. Laboratory and sampling analysis.

UNIT - IV

Principles of food preservation – General principles and application methods – Asepsis - Techniques of removal – use of high temperature preservation and Canning Process.

UNIT - V

Preservation by use of low temperature, Drying, chemical preservatives and Radiation.

TEXT BOOKS:

1. *Frazier. W.C and D.C Westhoff*. 1978. **Food Microbiology. 3rd ed.** *Tata Macgraw Hill Publishing Co., New Delhi.*
2. *Adams. M. R and M. D Moss*. 1995. **Food Microbiology**. *5th Edition. New Age International limited.*

REFERENCE BOOKS:

1. Food safety and standards regulations, 2010.
2. *Jay,J.M* .1991. **Modern Food Microbiology** *4th edition, Van Nostra and Rainhokdd Co.*
3. The ministry of health and family welfare,The Gazette of India : Extraordinary, Part - III, section.
4. *D Kumar Bhatt*, *Priyanka Tomar*, 2010**.An Introduction to Food Science Technology and Quality Management** *1st Edition, Kalyani Publishers.*

17UMB63A	CORE IX: VIROLOGY	SEMESTER- VI

PREAMBLE

To comprehend the concept of viral infections, types, infectious disease process, morphology, pathogenicity and laboratory diagnosis of medically important virus.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge level
CO1	Recall the early development of Virology – Virus – Morphology. Describe the general characteristics and structure of viruses. Illustrate classification, cultivation, purification and assay of viruses.	K2, K3
CO2	Compare the reproduction of DNA phages.	K2
CO3	Distinguish the Lysogeny - Temperate bacteriophages, lambda phage, Induction of lysogens. Compose the generation of defective phages and their uses. Demonstrate the reproduction of RNA phages.	K2, K3
CO4	Discuss the Viruses of Eukaryotes. Categorize the reproduction of animal and plant viruses. Outline the Viruses of Algae, fungi and viruses. Distinguish the Viruses and cancer.	K2, K3

CO5	Understand the process of Human viral infections. Compile the Pathogenicity and diagnosis of Hepatitis (A, B, C), Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Polio virus. Infer the knowledge of Emerging viral diseases.	K3

MAPPING WITH PROGRAMME OUTCOMES

CO5/PO5	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	M
CO2	M	M	S	S	S
CO3	M	M	S	M	S
CO4	S	S	M	S	S
CO5	S	S	M	S	S

S-Strong, M-Medium, L-Low

17UMB63A	CORE IX- VIROLOGY	SEMESTER- VI

Total Credits: 4

Hours per week: 4

CONTENTS

UNIT - I

Early development of Virology – Virus - Morphology, General characteristics, Structure of viruses - Virion size - Helical and icosahedra capsid - Nucleic acids - Viral envelopes and enzymes. Classification of viruses. Cultivation of Viruses. Virus purification and assays.

UNIT - II

Reproduction of DNA phages - ds DNA lytic phages - T4 phage - The one step growth – Adsorption, penetration, synthesis, assembly and release of phage particles. ss DNA phage - φX 174 - Rolling circle replication.

UNIT - III

Lysogeny - Temperate bacteriophages - lambda phage - Induction of lysogens - Generation of defective phages and their uses. Reproduction of RNA phages.

UNIT – IV:

Viruses of Eukaryotes - Reproduction of animal and plant viruses - Viruses of Algae, fungi and viruses.

UNIT - V

Human viral infections - Pathogenicity and diagonosis of Hepatitis (A, B, C), Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Polio virus, Emerging viral diseases: Ebola. Oncogenic viruses.

TEXT BOOKS:

1. *Dimmock.* 1998. **Introduction to Modern Virology**.*5th edition. Blackwell scientific publications.*
2. *Rogger Hull*. 2001. **Mathews Plant Virology**. *4th edition. Academic press.*

REFERENCE BOOKS:

1. *Luria S.E. Darnel, J.E Jr. Baltimore. D and Campbell A*. 1978. **General Virology,** *3rd edition, Wiley and sons.*
2. *Ananthanarayanan R and CK Jayaram Panicker*, 2005. **Introduction to Medical Microbiology**, *2nd edition .Orient Longman.*

17UMB63B	CORE X- INDUSTRIAL MICROBIOLOGY	SEMESTER- VI

PREAMBLE

To comprehend the commercial value of fermented products, fermentation types, harvesting and purification processing and the application of economically important microorganisms for the large scale production.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	• Intimate the economically and commercially important microbes • Demonstrate industrially important microbes and their isolation techniques • Familiarize the method to increase the yield	K1,K3
CO2	• Recall the types of fermentation • Describe the components of fermentor • Give ideas about the operative mechanism of fermentor.	K1
CO3	• Illustrate the large scale production of fermented foods • Teach the types of antibiotics and their production • Provide the protocol for enzyme production	K3
CO4	• Demonstrate the nutritive and the commercial value of SCP • Recall different types of mushroom cultivation techniques • Describe the commercial importance of mushroom	K1,K3

CO5	• Outline the harvesting techniques of industrially important microbial products • Classify the microbial metabolites based on their production.	K1, K2

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	M	S
CO4	S	S	S	S	S
CO5	S	S	S	M	M

S –Strong, M – Medium, L – Low.

17UMB63B	CORE X- INDUSTRIAL MICROBIOLOGY	SEMESTER VI

Total Credits: 4

Hours per week: 4

CONTENTS

UNIT – I

Industrially important strains- Screening methods- Primary and Secondary screening. Strain development for improved yield- Mutation, Recombination and protoplasmic fusion.

UNIT - II

Fermentation- Definition & types - Submerged and Solid state. Batch fermentation – Continuous fermentation. Fermentors –Design of a fermentor- Components (Baffles, Agitator, Impellers and Antifoaming agents). Types of Fermentors - Tower, cylindroconical & airlift,CSTF

UNIT - III

Industrial scale Production of beverages – beer and wine- vitamin B12 and Riboflavin – Antibiotics- penicillin and streptomycin - production of enzymes - Amylases and Proteases.

UNIT - IV

Single cell protein- Baker's yeast, Spirulina- Details of mushroom development- *Oyster Pleurotus*) and Button (*Agaricus*) mushroom. Baker's yeast - Cell and Enzyme immobilization methods and its applications.

UNIT - V

Downstream process- Intercellular and extracellular – Filteration-Centrifugation-Breakage of cells - physical and chemical methods, Floatation- solvent extraction, precipitation-Chromatography-Drying and Crystallisation.

TEXT BOOKS:

1. *Patel A.H.* 2011. **Industrial Microbiology**. *2nd Edition. Mac Millan Publishers.*
2. *Crueger W and Crueger A*. 1991. **Biotechnology. A textbook of Industrial Microbiology**. *Sinauer Associates Inc.,U.S.*
3. *Stanbury P T and Whitaker* 1984. **Principles of Fermentation Technology**, *1str Edition. Adithya Books pvt ltd.*

REFERENCE BOOKS:

1. *Prescott and Rehm* 1986. **Industrial Microbiology**. *1 st edition. Agarbios.*
2. *R.C.Dubey.*,Textbook of Biotechnology.

17UMB63C	CORE XI- MEDICAL MICROBIOLOGY - II	SEMESTER - VI

PREAMBLE

To comprehend the concept of fungal infections and its types, opportunistic mycoses, medically important parasites and its life cycle, antibiotics and prevention of its resistance.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge level
CO1	To acquaint with the collection procedure of clinical samples.	K_2
CO2	To classify the fungal infections To explain the infectious disease mycology To interpret the morphology and, pathogenesis of superficial mycoses. To analyze the subcutaneous mycoses.	K_2, K_4
CO3	To inspect the opportunistic mycoses To infer the antifungal agents and its testing methods	K_2, K_4
CO4	To classify the medically important parasites and its significance.	K_2
CO5	To analyze the life cycle and infection of medically important parasites To understand the action of antibiotic and its prevention of resistance.	K_2, K_4

MAPPING WITH PROGRAMME OUTCOMES

CO5/PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	S
CO2	S	S	M	S	S
CO3	S	S	S	M	S
CO4	M	S	M	S	S
CO5	S	S	M	S	S

S-Strong, M-Medium, L-Low

17UMB63C	CORE XI- MEDICAL MICROBIOLOGY – II	SEMESTER - VI

Total Credits: 4

Hours per week: 4

CONTENTS

UNIT - I

Collection, transport, processing and microbiological examination of clinical samples – urine, sputum, blood, CSF, feces and pus.

UNIT - II

Classification of Fungal infections: Mycoses - Superficial Mycoses- Pityrasis versicolor, Tinea nigra, Piedra. Dermatophytoses - Trichophyton, Epidermophyton and Microsporum. Candidosis. Deep mycoses – Subcutaneous mycoses – systemic mycoses.

UNIT - III

Opportunistic systemic mycoses – Aspergillus, Penicillium, Mucor. Mycotoxins, Antifungal agents, testing and methods.

UNIT - IV

Introduction to medical Parasitology – Classification, Protozoa – Entameoba – Plasmodium- Leishmania – Trypanosoma –Giardia – Trichomonas.

UNIT - V

Life cycle and infection - Platyhelminthes – Taenia-Nematihelminthes – Ascaris - Enterobius – Trichuris – Wuchereria. **Antibiotics**: Introduction, Mode of action with example of each class, Antibiotic resistance and prevention of antibiotic resistance.

TEXT BOOKS:

1. *Ananthanarayanan R and CK Jayaram Panicker*, 1994, **Textbook of microbiology.** *Orient Longman.*
2. *Chakraborty P* 1995, **A Text book of microbiology**, *New Central Book Agency Pvt Ltd. Calcutta.*
3. *CK Jayaram Paniker.* 2007. **Medical Parasitology**, *6th Edition. Jaypee Brothers Medical Publishers (p) Ltd. New Delhi.*

REFERENCE BOOKS:

1. *Prescott, L.M J.P. Harley and C.A. Klein*. 1995. **Microbiology** *2nd edition. Wm, C. Brown Publishers.*
2. *Bailey and Scotts*, 1994, **Diagnostic Microbiology**, *9th edition, Baron and Finegold CV Mosby Publications.*
3. *Jawetz E Melnic JL and Adel berg EA* 1998, **Review of Medical Microbiology.** *Lange Medical Publications, USA.*
4. *Jagdish Chander*, 2009. **Textbook of Medical Mycology**, *3rd edition. Mehta Publishers, New Delhi.*

17UMB63P	CORE PRACTICAL - VI	SEMESTER- VI

Total Credits: 3

Hours per Week: 6

CONTENTS

1. Isolation and titration of coli phages.
2. Cultivation of Animal viruses - Demonstration.
3. Enzyme production and assay – protease
4. Enzyme production and assay - amylase
5. Alcohol production - wine
6. Immobilization using Sodium alginate
7. Study of parasites – Entamoeba, Plasmodium, Ascaris, Taenia.
8. Isolation and Identification of clinically important fungi – Candida sp., and Aspergillus sp.,
9. Water potability test-MPN Test
10. Isolation of free living nitrogen fixers –Azotobacter, Azospirillum
11. Phosphate solubilizers
12. Isolation of symbiotic nitrogen fixers - Rhizobium from nodule.
13. Microbial degradation of synthetic dyes

LABORATORY MANUALS:

1. *Aneja. K.R.*2nd edition, **Experiments in Microbiology, Plant Pathology and Biotechnology,** *New age publishers.*
2. *Rajan S. and Selvi Christy.* **Experimental Procedures in Life Sciences**. *Anjana book House.*

REFERENCE BOOKS:

1. *James.C.Cappuccino.* 2013. **Microbiology A laboratory manual**. *1st edition, Pearson education publishers.*
2. *Kannan N.,* 1997. **Laboratory Manual of General Microbiology**, *2nd edition, Panima Publishing House.*

17UMB6EA	ELECTIVE II- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY	SEMESTER -VI

PREAMBLE

To understand the role and significance of microbes in a better ecological niche.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	List the distribution of microorganisms in Nature. Describe the importance of microbial communities in soil. Explain the factors influencing the microbial Density in soil. Compare the microbial associations in soil with suitable examples.	K1,K2,K3
CO2	Recall the microbial decomposition process taking place in soil. Compile the factors influencing degradation, Bioconversion of organic wastes.	K1
CO3	Illustrate the microorganisms in the decomposition of organic matter. Discuss the carbon cycle, nitrogen cycle and phosphorous cycle. Importance of biofertilizers in agriculture.	K2, K3
CO4	Demonstrate the procedure of water treatment. Appraise the importance of MPN	K1, K3

	technique in water quality analysis.	
CO5	Identify the factors influencing air quality. Demonstrate the methods of air quality analysis.	K1, K3

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	S	S	M	M

S- Strong, M – Medium, L – Low.

17UMB6EA	ELECTIVE II- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY	SEMESTER -VI

Total Credits: 4

Hours per Week: 4

CONTENTS

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

Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization - bioconversion of organicwastes- composting, principles andApplications- conversion process

sugarcane wastes- coir pith composition.

UNIT - III

Microorganisms in the decomposition of organic matter- carbon cycle – nitrogen Cycle- nitrogen fixing microorganisms- root nodule bacteria (symbiotic) – non symbiotic Nitrogen fixers – biofertilizers in agriculture- Rhizobium and phosphate solubilisers- Mycorrhizial association – phosphorous cycle.

UNIT - IV

Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT - V

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

TEXT BOOKS:

1. *Atlas R. M.and Bartha*., 1998. **Microbial Ecology**. *1st edition.Pearson education.*
2. *Subbarao.* 2005. **Soil Microbiology Soil Microorganisms and Plant Growth**. *1st edition. Oxford and IBH,*
3. *Mark S Coyne*, **Soil Microbiology: An Exploratory Approach**, *Delmar Publishers.*

REFERENCE BOOK:

1. *Black, J.G.* 2013. **Microbiology,** *8th Edition. John Wiley and Sons*.
2. *N.S. Subba Rao* 2014**. Soil Microbiology (Fourth Edition of Soil Microorganisms and Plant Growth**), *Science Publishers.*
3. *Michael J.Pelczar* 2001, **Microbiology**, *Tata Mc Graw Hill Eduaction.*

17UMB6EB	ELECTIVE II- INTERMEDIATE METABOLISM	SEMESTER -VI

PREAMBLE:

To teach metabolic pathways, their regulation and engineering and methods used in their elucidation.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	• Explain the basic concept and design of metabolism.	K2
CO2	• Recall the carbohydrate metabolism.	K1
CO3	• Illustrate the importance of lipid metabolism.	K2, K3
CO4	• Demonstrate the Protein metabolism.	K3
CO5	• Demonstrate the methods of nitrogen metabolism.	K3

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	S	S	M	M

S- Strong, M – Medium, L – Low.

17UMB6EB	ELECTIVE –II(B): INTERMEDIATE METABOLISM	SEMESTER -VI

Total credits: 4

Hours per week: 4

CONTENTS

UNIT - I

Introduction to metabolism: Basic concepts and design. High energy compounds.

UNIT - II

Carbohydrate metabolism: An overview of aerobic and anaerobic carbohydrate metabolism. Glycolysis and the catabolism of hexoses. Feeder pathways. Regulation. Pentose phosphate pathway. Utilization of glycogen. The Citric Acid cycle. Anaplerosis. Regulation. The glyoxylate cycle. Carbohydrate biosynthesis. Gluconeogenesis. Glycogen synthesis. Glycogen storage diseases. Glucoronic acid pathway, Photosynthesis. Light and dark reactions. Electron flow. ATP synthesis by photophosphorylation. Biosynthesis of starch and oligosaccharides.

UNIT - III

Lipid metabolism:Introduction to Lipids as energy sources. βoxidation. Oxidation of unsaturated and odd chain fatty acids. Ketone bodies. Biosynthesis

of: Fatty acids. Triacyl glycerols. Membrane phospholipids. Cholesterol, steroids and isoprenoids. Membrane Phosphoinositides, Ceremides.

UNIT - IV

Protein Metabolism:Metabolic fat of amino groups. Transamination, deamination and decarboxylation. Essential and non-essential amino acids. Nitrogen excretion and the urea cycle. Pathways of amino acid degradation. One carbon transfers, role of tetrahydrofolate and S - adenosyl methionine.

UNIT - V

Overview of Nitrogen Metabolism. Biosynthesis of amino acids and compounds derived from amino acids. In born errors of metabolism.

TEXT BOOKS:

1. *Lehninger:* 2000. **Principles of Biochemistry**, *3edition, by David L. Nelson and M.M. Cox Maxmillan/Worth publishers.*
2. *Donald Voet and Judith G Voet*, 1999. **Fundamentals of Biochemistry**. *John Wiley & Sons, NY .*

17UMB6EC	ELECTIVE II- HEMATOLOGY	SEMESTER- VI

PREAMBLE:

The subject aims to build the concepts regarding:

1. Blood and its nature
2. Blood Transfusion and blood transfusion reactions
3. Blood Analysis

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge Level
CO1	• Explain the definition, characters and composition of blood.	K2
CO2	• Recall the counting of blood cells and staining.	K1
CO3	• Illustrate the importance of coagulation mechanism.	K2, K3
CO4	• Demonstrate the preparation of stains and staining techniques.	K3
CO5	• Demonstrate the methods of coombs test.	K3

MAPPING WITH PROGRAMME OUTCOMES

CO5/ PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	S	S	M	M

S- Strong, M – Medium, L – Low

17UMB6EC	ELECTIVE II- HEMATOLOGY	SEMESTER- VI

Total Credits: 4

Hours per Week: 4

CONTENTS

UNIT - I

Blood: Definition, Characters, Composition. Collection of Blood - Capillary Blood: from Adults, Infants. Venous blood: from Adults, Infants. Anticoagulants: Definition - Type: Wintrobes /EDTA /Heparin / Citrate.

UNIT - II

Counting of Blood Cells: Neubaeur counting chamber - Total RBC count: diluting fluids, Macro dilution, and Micro dilution technique. Normal values - Total WBC count: diluting fluids, Macro dilution, and Micro dilution technique. Absolute Eosinophil count - Differential Leucocyte count: Granulocyte, Agranulocytes, Morphology, Function, Staining Technique - Platelet Count: Morphological characters, Functions. Haemoglobin: Composition, Normal Values:- Determinations:

UNIT - III

Coagulation Mechanism:- Factors: Bleeding time, Clotting time. Halmotological indices:- Packed cell volume : Wintrobes , Micro HCT method - Erythrocyte sedimentation Rate – Principle – Determination.

UNIT - IV

Preparations of stains and staining techniques: - Wright stain - Leishmans stain -Giemsa's stain —Fields stain - Peroxidase stain: Examination of Blood smear:-Peripheral smear report: Size, colour, shapes, inclusions.

UNIT - V

Coombs test : Direct, Indirect - Donor screening - Cross matching : Major, Minor - Collection of blood, preservation, storage.

TEXT BOOKS:

1. *Mukerjee, K.L.* 1988. **Medical Laboratory Technologies Vol I – III** *Tata McGraw Hill. Publishers, New Delhi.*
2. *Mukerjee, K.L.* 1988. **Medical Laboratory Technology: A Procedures Manual for Routine Diagnostic Tests.** *Tata McGraw Hill. Publishers, New Delhi.*

REFERENCE BOOK:

1. *Gadkar, P.B and Gadakar, D.P*. 2014. **Textbook Medical Laboratory Technology** *2nd Edition. Bhalani Publishing House.*

17UMB6ED	ELECTIVE III- BIOTECHNOLOGY	SEMESTER –VI

PREAMBLE:

The subject aims to build the concepts regarding:

1. Microbial synthesis of commercial products
2. Transgenic plants, transgenic animals and Bioremediation

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge level
CO1	To introduce the concept Biopharmaceutics To understand the principle of recombinant methods in commercial production of interferons, antibiotics, vaccines and monoclonal antibodies	K_2,K_3
CO2	To explain and understand the role of Ti plasmid in genetic recombination. To describe the method of genetic modification to obtain insect resistance and microbial resistance crops.	K_2
CO3	To comprehend the methods of producing transgenic animals. To demonstrate and create awareness on significance of embryonic stem cell methods.	K_2
CO4	To summarize biotechnological remedies for environmental issues like xenobiotic degradation, rapid degradation of organic waste for effective recycling of carbon and nitrogen.	K_4,K_2

CO5	To know the applications of genetic engineering in forensic science. To upgrade the concept of gene therapy to heritable and non curable disorders.	K_2, K_3

MAPPING WITH PROGRAMME OUTCOMES

CO5/PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	S	S	M
CO3	S	M	S	M	M
CO4	S	S	S	M	S
CO5	S	S	M	S	M

S-Strong,M-Medium,L-Low

17UMB6ED	ELECTIVE III- BIOTECHNOLOGY	SEMESTER -VI

Total Credits: 4

Hours per Week: 4

CONTENTS

UNIT - I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferon's - Human growth hormone- Antibiotics -Biopolymers. Vaccines – subunit vaccines, Edible vaccines, Recombinant vaccine – Monoclonal antibody.

UNIT - II

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT - III

Transgenic animals – mice – retroviral method – DNA Microinjection method – embryonic stem cell method. Application-Transgenic Sheep and Transgenic Fish.

UNIT - IV

Microbial Degradation of Xenobiotics: Manipulation by Transfer of Plasmids. Manipulation by gene alteration. Utilisation of Starch and Sugars – Imporving alcohol production, Improving fructose production,

Zymomonas mobilis –Utilisation of cellulose – Isolation of prokaryotic and Eucaryotic cellulose gene. Manipulation of cellulose gene.

UNIT - V

DNA finger printing and its Application. Gene therapy. Human Genome Project.

TEXT BOOKS:

1. *Brown T.A.,* 2002. **Genomes**, *1st edition, John- Wiley & Son.*
2. *Glick B .R and Pasternak J .J* .1994. **Molecular Biotechnology**. **Principles and Application of recombinant** *DNA, 2 nd edition. ASM Press, Washington.*

REFERENCE BOOKS:

1. *Winnecker, E.D,* 1987. **From Gene to Clones**, *Introduction to Gene Technology, 1 st edition. Panima educational book agency.*
2. *Old. RW and Primbrose,* 1995. **Principle of Gene Manipulation**, *5th edition. Blackwell Scientific Publication, Boston.*

17UMB6EE	ELECTIVE III- ENZYME TECHNOLOGY	SEMESTER- VI

PREAMBLE:

The subject aim to

1. Construct knowledge on roles and reactions of enzymes.
2. Instill the applications of enzymes in industrial microbiology.

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge level
CO1	To introduce the factors affecting the enzyme activity.	K_2,K_3
CO2	To explain and understand the role of Industrial enzymes.	K_2
CO3	To comprehend the clinical enzymes.	K_2
CO4	To summarize the immobilization of enzymes.	K_4
CO5	To know the organization of enzymes in the cell. To upgrade the concept of mechanisms of enzyme degradation.	K_2, K_3

MAPPING WITH PROGRAMME OUTCOMES

CO5/PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	S	S	M
CO3	S	M	S	M	M
CO4	S	S	S	M	S
CO5	S	S	M	S	M

S-Strong,M-Medium,L-Low

17UMB6EE	ELECTIVE III - ENZYME TECHNOLOGY	SEMESTER- VI

Total Credit: 4

Hours per week: 4

CONTENTS

UNIT - I

Factors affecting the enzyme activity - Concentration, pH and temperature. Kinetics of a single - substrate enzyme catalysed reaction, Michealis - Menten Equation, Km, Vmax, L.B Plot, Turnover number, Kcat. Kinetics of Enzyme Inhibition. Kinetics Allosteric enzymes.

UNIT - II

Industrial Enzymes - Thermophilic enzymes, amylases, lipases, proteolytic enzymes in meat and leather industry, enzymes used in various fermentation processes, cellulose degrading enzymes, Metal degrading enzymes.

UNIT - III

Clinical enzymes- Enzymes as thrombolytic agents, Anti-inflamatory agents, streptokinase, asparaginase, Isoenzymes like CK and LDH, Transaminases (AST, ALT), Amylases, Cholinesterases, Phosphatases.

UNIT - IV

Immobilization of enzymes, ELIZA. Biosensors. Enzyme Engineering and site directed mutagenesis, Designer enzymes

UNIT - V

Organisation of enzymes in the cell. localization, compartmentation of metabolic pathways, enzymes in membranes, concentrations. Mechanisms of enzyme degradation, lysosomal and nonlysosomal pathways.

TEXT BOOKS:

1. *J.L.Jain.* 2007. **Fundamentals of Biochemistry,** *1st edition. S. Chand and company Ltd.*
2. *Sathyanarayana U.* 2008. **Biochemistry** *3rd Edition. Books and Allied (P) Ltd.*
3. *Stryer L.* 1995**. Biochemistry** *4th Edition. W. H. Freeman and Company, New york.*

REFERENCE BOOKS:

1. *Zubay***,** 1999**. Biochemistry** *4th edition. William.C.Brain publishers.*
2. *Donald J. Voet* and *Judith* G. *Voet*. 2004. **Biochemistry** *3rd edition. John Wiley & Sons (Asia) pvt ltd.*

17UMB6EF	ELECTIVE III- FORENSIC SCIENCE	SEMESTER -VI

PREAMBLE:

1. Basics of Forensic Science
2. Role of Biological sciences in Forensic Science
3. Applications of Biological techniques in Forensic science

COURSE OUTCOMES

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

CO Number	CO Statement	Knowledge level
CO1	To introduce the concept forensic science and its techniques.	K_2,K_3
CO2	To explain and understand the importance of various biological evidence.	K_2
CO3	To comprehend the concepts of forensic entomology.	K_2
CO4	To summarize the forensic microbiology and molecular techniques.	K_4,K_2
CO5	To know the applications of forensic toxicology.	K_2, K_3

MAPPING WITH PROGRAMME OUTCOMES

CO5/PO5	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	S	S	M
CO3	S	M	S	M	M
CO4	S	S	S	M	S
CO5	S	S	M	S	M

S-Strong,M-Medium,L-Low

17UMB6EF	ELECTIVE III- FORENSIC SCIENCE	SEMESTER -VI

Total Credits: 4

Hours per week: 4

CONTENTS

UNIT - I

Definition of Forensic Science, Scope of Forensic Science, Need of Forensic Science, Basic Principles of Forensic Science, Tools and Techniques of Forensic Science. Ethics in Forensic Science, Duties of Forensic Scientist, Qualification of Forensic Scientist.

UNIT - II

Forensic Biology: Introduction, importance of various biological evidences (hair, fiber, pollens, wood), collection and evaluation in general, bite marks, human skeletal remains, importance and examination.

Forensic Serology: Forensic importance of various serological evidences (Blood serums, saliva, urine), collection, preservation and evaluation in general. DNA profiling: Introduction, importance and applications in forensic cases.

UNIT - III

Forensic Entomology: Forensic importance of various insects, importance of various insect growth stages, Entomological evidences, their location, collection and packing, Determination of time since death from entomological evidences.

UNIT – IV

Forensic Microbiology and Molecular techniques: Bacterial Pathogens, Bacterial Toxins, Virus general characteristics and diseases .DNA isolation, RFLP, MLST, Southern Blotting DNA finger printing.

UNIT – V

Forensic Toxicology: Introduction, types of cases, definition and classification of poisons, poisoning trends in India, collection and preservation of viscera, A brief introduction to extraction, isolation and identification of commonly used poisons (insecticides/pesticides, vegetable poisons, metallic poisons).

TEXT BOOKS:

1. *James, S.H and Nordby, J.J.*. 2003. **Forensic Science : An introduction to scientific and investigative techniques** CRC Press,
2. *Curry* . 1986. **Analytical Methods in Human Toxicology**,.
3. *Chowdhuri, S.* 197): **Forensic Biology**, *B P R & D, Govt. of India.*
4. *Jason H. Byrd and James L. Castner*; 2001.**Forensic entomology**, *CRC Press LLC,*

REFERENCE BOOKS:

1. *Race, R. R. and Sangar, R.* 1975: **Blood Groups in Man.** *Blackwell Scientific, Oxford.*
2. *Prescott, L.M J.P. Harley and C.A. Klein* 1995. **Microbiology** *2nd edition Wm, C. Brown Publishers.*
3. *Old. RW and Primbrose*, 1995 **Principle of Gene Manipulation**, *5th edition. Blackwell Scientific Publication, Boston.*

17UMB6SA	SKILL BASED LAB	SEMESTER - VI

Total Credits: 2

Hours per week: 4

CONTENTS

1. Production of Button Mushroom
2. Production of Oyster Mushroom
3. Production of Biofertilizer-Phosphobacteria
4. Production of Biofertilizer-Azospirillum
5. Quality control of packed food and canned food
6. Biomass production of Baker yeast
7. Biomass production of Brewer's yeast
8. Biomass production of Single Cell protein-Spirulina
9. Vermicomposting
10. Production of Biopesticide - *Trichoderma* sp.,

LABORATORY MANUALS:

1. *James.C.Cappuccino.* 2013. **Microbiology A laboratory manual**. *1st edition, Pearson education publishers.*
2. *Kannan, N.* 1996. **Laboratory manual of General Microbiology**, *2nd edition, Panima publishing house.*

REFERENCE BOOKS:

1. *Aneja. K.R*. 2012. **Experiments in Microbiology, plant pathology and biotechnology,** *4th Edition. New age publishers.*
2. *Kannan, N*. 2003. **Hand book of Laboratory culture media** *1st edition, Panima publishing house.*

17UNM34F	NMEC I- MICROBIOLOGY AND PUBLIC HEALTH	SEMESTER - III

Total Credits: 2

Hours per Week:2

OBJECTIVES:

The course is designed

1. To meet a national demand, which has reached critical proportions, for a trained workforce in biodefense and emerging infections.
2. It also addresses an international demand for training in diseases that affect developing countries.

CONTENTS

UNIT - I

Communicable Diseases: Introduction, Terminology. Modes of disease transmission, general measures for prevention & control of communicable diseases.

UNIT - II

Disinfection & Sterilization: Effective disinfection by liquid chemical agents like Halogen, Potassium per magnate solution etc. Solid chemical agent – Bleaching powder, Lime.

UNIT - III

Non-Communicable Diseases: Diagnosis & prevention of Cancer, Cardiovascular Diseases and Diabetes.

UNIT - IV

Food borne infection – Salmonellosis, Shigellosis and Hemorrhagic colitis. Food intoxication – *Staphylococcus aureus, Bacillus cereus* and Mycotoxins.

UNIT - V

Personal Hygiene: Factors influencing health & hygiene. Health habits & practice. Maintenance of normal circulation, respiration, digestion etc. Skin care cleanliness. Dental care. Care of hands, hand washing. Exercises-importance. Food values. Nutrition.

TEXT BOOKS:

1. *Frazier, W.C. and Westhoff, D.C.* 2008. **Food microbiology**. *4th Edition. McGraw Hill NY.*
2. *Park K.* 2013. **Preventive and Social Medicine 22nd Edition,** *Banarsidas Bhanot Publishers.*

REFERENCE BOOK:

1. *Adams, M.R.and Moss.* M.O. 1996. **Food Microbiology.** *2nd edition. Panima Publishers.*

17UNM44F	NMEC II- MICROBES IN AND AS FOOD	SEMESTER - IV

Total Credits: 2

Hours per Week: 2

OBJECTIVES:

The course is designed

1. To understand the relationship between food and microorganisms.
2. To create an awareness on production of fermented foods.

CONTENTS

UNIT - I

History and development of Food microbiology - Common Food borne Bacteria and Molds - Role and Significance of Microorganisms in Foods. Parameters Affecting Microbial Growth: Intrinsic and Extrinsic.

UNIT - II

Detection of Microorganisms in Foods - Milk, Fruits and Vegetables, fermented foods - Culture, Microscopic, and Sampling Method for detecting microbes.

UNIT - III

Production of Fermented foods- Idly, Bread, wine, Curd, Yoghurt, Butter milk, Cheese.

UNIT - IV

Microbial Food Spoilage and Food borne diseases - *Staphylococcal, E coli,* Salmonellosis, Shigellosis, Listerial infections. Mycotoxins and Aflatoxins.

UNIT - V

Applications of Food Microbiology: Beneficial Uses of Microorganisms in Food - Intestinal Beneficial Bacteria- Concept of Prebiotics and Probiotics – Mushroom – Single Cell Protein. Genetically modified foods. Biosensors in food

TEXT BOOKS:

1. *Frazier, W.C. and Westhoff, D.C.* 2008. **Food microbiology**. *4th Edition. McGraw Hill NY.*
2. *Roger Y Stainer,* 1989. **Food Microbiology. 2nd edition.** *CBS, New Delhi.*

REFERENCE BOOKS:

1. *Adams, M.R.and Moss.* M.O. 1996. **Food Microbiology.** *2nd edition. Panima Publishers.*
2. *James M Jay,* 1996. **Modern Food Microbiology.** *1st edition. CBS, New Delhi.*

17UMBSS1	SELF STUDY PAPER I- GOOD LABORATORY PRACTICES	SEMESTER III

Total credits: 1

OBJECTIVES:

1. To inculcate the knowledge on proper and safe handling of hazardous materials in the laboratory.
2. To understand the role of GMPs.

CONTENTS

UNIT - I

Chemical Labelling & Safety - Safe handling of chemicals and equipment in the laboratory. Handling and disposal of infected, dangerous materials, accidents, safety measures, emergency treatment.

UNIT - II

Good Manufacturing Practice - Good Laboratory Practices (GLPs)- Fire Safety Regulatory Agencies.

UNIT - III

International and federal regulatory agencies that impact the work of Microbiology.

UNIT - IV

Emergency Equipment & Standard Operating Procedures – Maintenance of emergency equipment in a laboratory setting - evaluating Standard Operating Procedures (SOPs) and safety plans.

UNIT - V

Calibration of volumetric and gravimetric equipment and apparatus.

TEXT BOOKS:

1. *Mark Gregory Slomiany*. **The indispensable guide to Good laboratory practices**. *Second edition.*
2. *Sandy Weinberg*. **Good Laboratory Practice Regulations**, *Fourth Edition. CRC Press.*

17UMBSS2	SELF STUDY PAPER II - FOOD SANITATION	SEMESTER III

Total credits: 1

OBJECTIVES:

1. To understand the laws and regulations related to food standards.
2. To widen the knowledge on hygiene and sanitation on food preparation.

CONTENTS

UNIT - I

Food Laws and Regulations – Essential commodities Act, Standards of Weights and Measures Act, Agmark, Bureau of Indian Standards, Export and Quality Control, Prevention of Food Adulteration Act.

UNIT - II

Food additives and contaminants, food colours flavouring agents and related substances, sweeteners, preservatives, antioxidants, emulsifying and stabilizing agents, antimicrobial substances, -Indirect additives, residues, contaminants and adulterants, pesticide residues, contaminants from packaging material, Metallic contaminants , adulterants Irradiated Food.

UNIT - III

Hygiene and sanitation in food sector – pest control measures, Garbage and Sewage disposal, Water – Sources, purification, Hazards Analysis & Critical Control Point (HACCP), Good Manufacturing Practices (GMP) .

UNIT - IV

International Organizations – FAO (Food & Agriculture Organization), WHO(World Health Organization), Codex Alimentaruis, ISO, WTO.

UNIT - V

National Organizations – ICMR, ICAR, Council for social welfare, Ministry of Health & Family Welfare – delivery Health Services in India.

TEXT BOOKS:

1. *Julie Lewthwaite*. **Introduction to Food Safety**. *Lulu Press Inc.*
2. *Norman Marriott, Gill Robertson*. **Essentials of Food Sanitation**. *Springer Science & Business Media.*
3. *S Roday*. **Food Hygiene and Sanitation**. *Tata McGraw-Hill Education.*

10/1/2018

BoS Chairman/HoD
Department of Microbiology
Dr. N. G. P. Arts and Science College
Coimbatore – 641 048

Dr. P. R. MUTHUSWAMY
PRINCIPAL
Dr NGP Arts and Science College
Dr. NGP - Kalapatti Road
Coimbatore - 641 048
Tamilnadu, India