

ET-01  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

<b>Programme Outcome</b>	
<b>PO1</b>	<b>Erudition of Knowledge</b> Acquire state-of-art knowledge in scientific findings that allows the students to have a glimpse into the history of the scientific discoveries and inventions and theory behind it
<b>PO2</b>	<b>Fundamentals</b> Understand the foundational concepts of basis sciences, and how these impact biotechnology research and development in the diverse fields that span healthcare and agriculture.
<b>PO3</b>	<b>Decisive Thinking</b> Analyze complex problems in instrumentation that makes an ability to discriminate, evaluate, analyze and synthesize existing and new knowledge, and integration of the same for enhancement of knowledge
<b>PO4</b>	<b>Usage of Modern Tools</b> Create, select, learn and apply appropriate techniques and resources in modern science with a detail understanding of the advantages and limitations
<b>PO5</b>	<b>Computer based literacy</b> Introduction to computer tools that educate and make the students up to date with the current scientific literature, computer programs and web information and their role in life sciences
<b>PO6</b>	<b>Problem Solving Skills</b> Explain and properly apply the scientific method by developing valid hypotheses, designing experiments, gathering relevant data using current technology, and interpreting quantitative and qualitative data.
<b>PO7</b>	<b>Entrepreneurial Skills</b> Demonstrate knowledge and understanding of biotechnology principles and apply the same to one's own work, as a member and leader in a team, manage efficiently in respective disciplines and multidisciplinary environments in science
<b>PO8</b>	<b>Collaborative and Multidisciplinary work</b> Possess knowledge and understanding of group dynamics, recognise opportunities and contribute positively to collaborative-multidisciplinary scientific research
<b>PO9</b>	<b>Ethical Practices and Social Responsibility</b> Acquire contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the research outcomes in biotechnology
<b>PO 10</b>	<b>Life Long Learning</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

<b>Programme Specific Outcome</b>	
<b>PSO1</b>	Acquire knowledge on the fundamentals of biotechnology for sound and solid base which enables them to understand the emerging and advanced biotechnological concepts in life sciences.
<b>PSO2</b>	Students will be able design, conduct experiments, analyze and interpret data for investigating problems in Biotechnology and allied fields
<b>PSO3</b>	Acquire knowledge in domain of biotechnology enabling their applications in industry and research
<b>PSO4</b>	Students will exhibit contemporary knowledge in Biotechnology and students will be eligible for doing jobs in various sectors of pharmaceutical and biotechnological industry.
<b>PSO5</b>	Students will be able to understand the potentials, and impact of biotechnological innovations on environment and their implementation for finding sustainable solution to issues pertaining to environment, health sector, agriculture, etc.

Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)

COIMBATORE - 641014

B.Sc. (BIOTECHNOLOGY)

(Under Choice Based Credit System)

EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021

SCHEME OF EXAMINATIONS

Sem.	Part	Course Code	Course Name	Credits	MARKS			Hrs./Week	Exam Duration (Hrs.)	Category
					CA	TEE	TOTAL			
I	I	20100T	TAMIL I	3	25	75	100	4	3	THEORY
I	I	20100H	HINDI I							
I	I	20100F	FRENCH I							
I	I	20100M	MALAYALAM I							
I	II	20100E	ENGLISH I	3	25	75	100	5	3	THEORY
I	III	20109A	CORE: MICROBIOLOGY	4	25	75	100	5	3	THEORY
I	III	20109B	CORE: BIOCHEMISTRY AND ENZYMOLOGY	4	25	75	100	5	3	THEORY
I	III	20109C	CORE: BIOANALYTICAL TECHNIQUES	4	25	75	100	5	3	THEORY
I	III	20109P	CORE: PRACTICAL I - LAB IN BASIC BIOLOGICAL TECHNIQUES	-	-	-	-	4	-	PRACTICAL
I	IV	20100G	SKILL BASED SUBJECT: GENERAL AWARENESS	2	25	75	100	2	3	THEORY
II	I	20200T	TAMIL II	3	25	75	100	4	3	THEORY
II	I	20200H	HINDI II							
II	I	20200F	FRENCH II							
II	I	20200M	MALAYALAM II							
II	II	20200E	ENGLISH II	3	25	75	100	5	3	THEORY
II	III	20209A	CORE: MATHEMATICS AND BIOSTATISTICS	4	25	75	100	6	3	THEORY
II	III	20209B	CORE: CELL BIOLOGY AND GENETICS	4	25	75	100	5	3	THEORY
II	III	20209P	CORE: PRACTICAL I - LAB IN BASIC BIOLOGICAL TECHNIQUES	4	40	60	100	5	6	PRACTICAL
II	IV	20209S1/ 20209S2/ 20209S3	*SKILL BASED SUBJECT: TRAINING IN CLINICAL MICROBIOLOGY/CLINICAL BIOCHEMISTRY/HOSPITAL MANAGEMENT	2	NA	100	100	-	-	PRACTICAL
II	IV	20200G	ENVIRONMENTAL STUDIES: ENVIRONMENTAL AWARENESS	2	25	75	100	4	3	THEORY
II	III	20209K	ONLINE COURSE	2	-	-	-	-	-	-

FI - 02  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

EI - 03

2020 - 21

Sem.	Part	Course Code	Course Name	Credits	MARKS			Hrs./Week	Exam Duration (Hrs.)	Category
					CA	TEE	TOTAL			
III	I	20300T	TAMIL III	3	25	75	100	4	3	THEORY
III	I	20300H	HINDI III							
III	I	20300F	FRENCH III							
III	I	20300M	MALAYALAM III							
III	II	20300E	ENGLISH III							
IV		20300A/	I BASIC TAMIL I/ADVANCED TAMIL I	3	100	NA		5	3	THEORY
		20300B								
			NON MAJOR ELECTIVE: PERSONALITY DEVELOPMENT & SOFT SKILLS	2	40	60	100		3	THEORY
III	III	20309N		4	25	75	100	6	3	THEORY
III	III	20309A	CORE: MOLECULAR BIOLOGY	4	25	75	100	6	3	THEORY
III	III	20309B	CORE: IMMUNOLOGY	4	25	75	100	4	3	THEORY
III	III	20309C	ALLIED: COMPUTER PROGRAMMING - PERL	-	-	-	-	4	-	PRACTICAL
III	III	20309P	CORE: PRACTICAL II - LAB IN BASIC BIOTECHNOLOGY							
III	IV	20300G2	SKILL BASED SUBJECT: PROFESSIONAL COMMUNICATION	2	25	75	100	2	3	THEORY
III	V	20309S	EXTENSION ACTIVITIES: NSS	1	Grade			-	-	-
IV	I	20400T	TAMIL IV	3	25	75	100	4	3	THEORY
IV	I	20400H	HINDI IV							
IV	I	20400F	FRENCH IV							
IV	I	20400M	MALAYALAM IV							
IV	II	20400E	ENGLISH IV							
IV	IV	20400A/	II BASIC TAMIL II/ADVANCED TAMIL II	3	25	75	100	5	3	THEORY
		20400B								
			NON MAJOR ELECTIVE: BASICS IN BUSINESS PROCESS OUTSOURCING	2	40	60	100		3	THEORY
IV	III	20409N		4	25	75	100	5	3	THEORY
IV	III	20409A	CORE: PLANT BIOTECHNOLOGY	4	25	75	100	5	3	THEORY
IV	III	20409B	CORE: THERAPEUTIC DRUGS	4	25	75	100	4	3	THEORY
IV	III	20409C	ALLIED: BIOINFORMATICS	4	25	75	100	4	3	THEORY
IV	III	20409P	CORE: PRACTICAL II - LAB IN BASIC BIOTECHNOLOGY	4	40	60	100	5	6	PRACTICAL

**DR G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

Sem.	Part	Course Code	Course Name	Credits	MARKS			Hrs./Week	Exam Duration (Hrs.)	Category
					CA	TEE	TOTAL			
IV	IV	20409S1/ 20409S2/ 20409S3	*SKILL BASED SUBJECT: COURSE IN BASIC COMPUTER APPLICATIONS/COMPUTER LANGUAGE/BIOSTATISTICS	2	NA	100	100	-	-	PRACTICAL
IV	IV	20400G1	VALUE EDUCATION : INDIAN SOCIETY, PEOPLE AND CULTURE	2	25	75	100	2	3	THEORY
V	III	20509A	CORE: MICROBIAL BIOTECHNOLOGY	4	25	75	100	6	3	THEORY
V	III	20509B	CORE: GENETIC ENGINEERING	4	25	75	100	6	3	THEORY
V	III		ELECTIVE: I	4	25	75	100	4	3	THEORY
V	III	20509P	CORE: PRACTICAL III - LAB IN ADVANCED BIOTECHNOLOGY	-	-	-	-	4	-	PRACTICAL
V	III	20509S	CORE: LAB PROJECT **	-	-	-	-	5	-	PROJECT
V	III	20509C	SKILL BASED SUBJECT: FOOD BIOTECHNOLOGY	4	25	75	100	5	3	THEORY
VI	III	20609A	CORE: ANIMAL BIOTECHNOLOGY	4	25	75	100	6	3	THEORY
VI	III		ELECTIVE: II	4	25	75	100	4	3	THEORY
VI	III	20609P	CORE: PRACTICAL III - LAB IN ADVANCED BIOTECHNOLOGY	4	40	60	100	10	6	PRACTICAL
VI	III	20609S	CORE: LAB PROJECT **	15	25	75	100	10	-	PROJECT
VI	IV	20609T1/ 20609T2/ 20609T3	*SKILL BASED SUBJECT: TRAINING IN NETWORKING/MULTIMEDIA/BIOANALYTICAL TECHNIQUES	2	NA	100	100	-	-	PRACTICAL
			<b>TOTAL</b>	<b>140</b>			<b>3800</b>			

EI - 04  
2020-21

*Handwritten signature*

**DR G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

EI - 05  
2020 - 21

Sem.	Part	Subject Code	Subject Name
<b>ELECTIVE I</b>			
V	III	20509U1	ELECTIVE I: MEDICAL BIOTECHNOLOGY
V	III	20509V1	ELECTIVE I: NANO BIOTECHNOLOGY
V	III	20509W1	ELECTIVE I: IPR & PATENTING
V	III	20509X1	ELECTIVE I: CANCER BIOLOGY
V	III	20509Y1	ELECTIVE I: DATABASE MANAGEMENT SYSTEM
<b>ELECTIVE II</b>			
VI	III	20609U1	ELECTIVE II: INDUSTRIAL CHEMISTRY
VI	III	20609V1	ELECTIVE II: ENZYME TECHNOLOGY
VI	III	20609W1	ELECTIVE II: BIOPHARMACEUTICALS
VI	III	20609X1	ELECTIVE II: HUMAN ANATOMY AND PHYSIOLOGY
VI	III	20609Y1	ELECTIVE II: COMPUTER NETWORKING AND PARTICIPATIVE JOURNALISM

*Handwritten signature*

Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)

COIMBATORE - 641014

B.Sc. (BIOTECHNOLOGY)

(Under Choice Based Credit System)

EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021

MAPPING OF COURSES WITH PROGRAMME OUTCOME LEVELS

Course Code	Course Title	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
20109A	CORE: MICROBIOLOGY	3	2	3	3	2	2	2	1	1	1
20109B	CORE: BIOCHEMISTRY AND ENZYMOLOGY	2	3	3	3		2		2		3
20109C	CORE: BIOANALYTICAL TECHNIQUES	3	3	3	3	3	2	3	3	2	3
20209A	CORE: MATHEMATICS AND BIOSTATISTICS										
20209B	CORE: CELL BIOLOGY AND GENETICS	3	3		1			1	1		1
20209S1/ 20209S2/ 20209S3	SKILL BASED SUBJECT: TRAINING IN CLINICAL MICROBIOLOGY/CLINICAL BIOCHEMISTRY/HOSPITAL MANAGEMENT										
20209P	CORE: PRACTICAL I - LAB IN BASIC BIOLOGICAL TECHNIQUES										
20309A	CORE: MOLECULAR BIOLOGY	3	3	3			3	1	2		
20309B	CORE: IMMUNOLOGY	3	3	3	3	1	1	2	2	2	3
20309C	ALLIED: COMPUTER PROGRAMMING - PERL	2	1		2	3	2		2		2
20409A	CORE: PLANT BIOTECHNOLOGY	3	3	3	3	3	2	3	3	2	3
20409B	CORE: THERAPEUTIC DRUGS	3	3		3		3				3
20409C	ALLIED: BIOINFORMATICS	3	2		1	3	1	2	2	1	
20409P	CORE: PRACTICAL II: - LAB IN BASIC BIOTECHNOLOGY										
20409S1/ 20409S2/ 20409S3	SKILL BASED SUBJECT: COURSE IN BASIC COMPUTER APPLICATIONS/COMPUTER LANGUAGE/BIOSTATISTICS										
20509A	CORE: MICROBIAL BIOTECHNOLOGY	3	3	3	3	1	1	2	2	2	3
20509B	CORE: GENETIC ENGINEERING	2	3	3	3		2		2		3
20509U1	ELECTIVE I: MEDICAL BIOTECHNOLOGY	2			3	1	2	2	2	3	
20509V1	ELECTIVE I: NANO BIOTECHNOLOGY	3	3		3		3				3
20509W1	ELECTIVE I: IPR & PATENTING	3	3	3	3	3	3	3	3	3	2
20509X1	ELECTIVE I: CANCER BIOLOGY	3	1	3	3	1	2	3	2	2	1
20509Y1	ELECTIVE I: DATABASE MANAGEMENT SYSTEM	3	2	1		2	1		1		1
20509C	SKILL BASED SUBJECT: FOOD BIOTECHNOLOGY	1	2	1				3	3	3	3

ET-06  
2020-21

Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)

COIMBATORE - 641014

B.Sc. (BIOTECHNOLOGY)

(Under Choice Based Credit System)

Course Code	Course Title	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010
20609A	CORE: ANIMAL BIOTECHNOLOGY		3	3	3	3	3		3	3	3
20609U1	ELECTIVE II: INDUSTRIAL CHEMISTRY	3	3	3	3	2	2	3	3	3	3
20609V1	ELECTIVE II: ENZYME TECHNOLOGY	2	2	3	3	3	3	3	2	3	2
20609W1	ELECTIVE II: BIOPHARMACEUTICALS	3	1	3	3	3	2	3	3	1	1
20609X1	ELECTIVE II: HUMAN ANATOMY AND PHYSIOLOGY	3	2	3	3	2	2	2	3	2	1
20609Y1	ELECTIVE II: COMPUTER NETWORKING AND PARTICIPATIVE JOURNALISM										
20609P	CORE PRACTICAL - III: LAB IN ADVANCED BIOTECHNOLOGY										
20609S	CORE: LAB PROJECT										
20609T1/ 20609T2/ 20609T3	SKILL BASED SUBJECT: TRAINING IN NETWORKING/ MULTIMEDIA/BIOANALYTICAL TECHNIQUES										

Indicators: 1. Reasonable 2. Significant 3. Strong

EI-07  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

\*Training in Clinical Microbiology / Clinical biochemistry/ Hospital management/ Course in Basic Computer applications/ Course in computer language/ Course in Biostatistics / Training in Networking / Multimedia / Bioanalytical Techniques -

**Internal evaluation only, report to be evaluated by not less than two faculty members.**

Break up of marks

**Training in Clinical Microbiology / Clinical biochemistry/ Hospital management/ Course in Basic Computer applications/ Course in computer language/ Course in Biostatistics/Training in Networking / Multimedia / Bioanalytical Techniques**

1. Content of the report	: 25 marks
2. Practical skills gained	: 15 marks
3. Application of scientific skills	: 25 marks
4. Instrumentation / Report preparation	: 10 marks
5. Presentation	: <u>25 marks</u>
<b>Total</b>	<b><u>100 Marks</u></b>

**\*\*Lab Project**

In the TEE the project report will be evaluated and viva voce test will be conducted jointly by the internal (research supervisor) and external examiner.

**Break up for CA**

1. Interaction frequency and attendance	: 5 marks
2. Timely submission of drafts and proofing	: 5 marks
3. Value Addition/ original ideas	: 10 marks
4. Application of concepts and work execution	: <u>5 marks</u>
<b>Total</b>	<b><u>25 marks</u></b>

**Break up for TEE (25 marks)**

1. Clarity of presentation	: 15 marks
2. Content of report	: <u>10 marks</u>
<b>Total</b>	<b><u>25 marks</u></b>

**Break up for TEE (50 marks)**

1. Methodology	: 10 marks
2. Literature review	: 10 marks
3. Dissertation preparation	: 10 marks
4. Results and discussion	: <u>20 marks</u>
<b>Total</b>	<b><u>50 marks</u></b>

Teaching hours for all theory subjects is allocated as 55 - 60 hours. Teaching hours are not same for all subjects.

EI - 09  
2020 - 21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FIRST	20109A	CORE: MICROBIOLOGY	4	Theory	-	100

**Objective of the Course:** To learn about the fundamentals of microbiology and various methods of screening of microbes.

**UNIT I: Introduction to Microbiology**

**(Teaching hours: 10)**

History - contribution of Leeuwenhoek, John Needham, Lazzaro Spallazani, Edward Jenner, Louis Pasteur, John Tyndall, Robert Koch and Joseph Lister. Microscopy: Bright field, dark field, phase contrast and electron microscopy (TEM and SEM). Staining techniques: Simple, Gram's, endospore and LPCB.

**UNIT II: Morphology of prokaryotic and eukaryotic cells**

**(Teaching hours: 10)**

**Ultra structure and general characteristics of prokaryotic and eukaryotic cells:** General classification of microbes – Whittaker five kingdom classification. Bacteria – *Escherichia coli*, fungi – *Saccharomyces cerevisiae*, *Aspergillus niger*, algae – *Chlamydomonas* sp. and *Nostoc* sp. - protozoa- *Plasmodium* sp. and *Trypanosoma* sp. and virus – T4 bacteriophage and Pox virus.

**UNIT III: Sterilization and disinfection**

**(Teaching hours: 10)**

Definitions – Sterilization: Physical methods: Filtration, Heat: steam, flaming, incineration, tyndallisation, dry heat – Radiation - ionising and non-ionising radiation. Chemical agents in sterilization: Phenolics, alcohol, halogens, heavy metals, quaternary ammonium compounds and aldehydes.

**UNIT IV: Culture media and Microbial growth**

**(Teaching hours: 15)**

Types of culture media. Culture techniques: pure culture, enrichment culture, roll tube culture, stab culture, agar slant culture, anaerobic culture, broth culture, shake culture, slide culture. Growth phases, measurement of growth, continuous growth, synchronous growth and diauxic growth. Effects of environmental factors on microbial growth.

**UNIT V: Applied Microbiology**

**(Teaching hours: 15)**

Microbial spoilage of fruits and vegetables. **Industrial production:** citric acid, beer and amylase. Water treatment: Drinking water and wastewater. **Systemic study of bacterial pathogens associated with diseases and their laboratory diagnosis and control:** *Vibrio cholera*, *Corynebacterium diphtheria*, *Staphylococcus aureus*, *Salmonella typhi*, *Giardia lamblia*, *Plasmodium vivax*, *Candida albicans*, *Aspergillus niger* and HIV. **Culture Depositories:** Microbial Type Culture Collection, Gene Bank and ATCC.

ET - 10  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	Students can get information and understand about History, Microscopy, Staining in microbiology.	K1 & K2
CO2	They can understand the Morphology of prokaryotic and eukaryotic cells and apply in the classification of organisms.	K1, K2 & K3
CO3	Learn the Definitions of Sterilization and analyze the Physical, Chemical methods then use appropriately.	K2, K3 & K4
CO4	Students can analyze the culture media and Culture techniques apply with understanding of Effects of environmental factors.	K3 & K4
CO5	Creating setup for the production of Industrial products and apply the knowledge in Systemic study of pathogens.	K2, K3 & K5

*Note: K1-Remembering; K2-Understanding; K3-Applying; K4 - Analysing; K5 Creating & Evaluating*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1		1			1			
CO2		2		2				1		
CO3	1		3	2	1	2				1
CO4	1	1	1		2		1		1	
CO5		1	2	3	2		2		1	1

*Indicators: 1. Reasonable 2. Significant 3.Strong*

<b>Text Books</b>				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Microbiology	Pelczar M J	Mc Graw Hill Publishing	2005, Sixth
2	Microbiology	Lansing M Prescott.	Mc Graw Hill Publishing	2017, Tenth
<b>Reference Books</b>				
S.No.	Title	Author	Publishers	Year of Publications
1	Microbiology : an introduction	Gerard J Tortora	Pearson Benjamin Cummings	2010
2	Medical microbiology	Ernest Jawetz	McGraw Hill Medical	2010
3	Principles of fermentation Technology	Whittaker	Aditya Books (P) Ltd	1997

**Pedagogy:** *Lecture, PPT presentation, Assignment, Discussion, Quiz*

EI - 11  
2020 - 21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FIRST	20109B	CORE: BIOCHEMISTRY AND ENZYMOLOGY	4	Theory	-	100

**Objective of the Course:** This paper presents the study of various biomolecules, their structure and properties.

**UNIT I: Carbohydrates**

**(Teaching hours: 11)**

Structure, classification and optical property; Chemical properties of monosaccharide; Structure and properties of disaccharides - sucrose, maltose and lactose. Polysaccharides - structure and chemical properties of starch, cellulose and glycogen.

**UNIT II: Lipids**

**(Teaching hours: 10)**

Classification and properties, Structure of fatty acids – saturated and unsaturated fatty acids, Reactions of Fatty acids; Compound Lipids: glycolipids and phospholipids, Derived lipids: Sterol and Cholesterol.

**UNIT III: Metabolism of carbohydrates & Lipid Metabolism**

**(Teaching hours: 12)**

Glycolysis, TCA cycle, Electron Transport chain, Oxidative phosphorylation, Gluconeogenesis. Biosynthesis and beta-oxidation of fatty acid: palmitic acid.

**UNIT IV: Amino acid, Proteins and Nucleic acid**

**(Teaching hours: 12)**

Structure and classification of amino acids, chemical reactions of amino acids due to carboxyl group and amino group. Peptides and peptide bond, Classification of Proteins; Levels of organization - primary structure - insulin, secondary structure- keratin and collagen, tertiary structure - myoglobin and quaternary structure – haemoglobin. Structure and Types of DNA and RNA

**UNIT V: Enzymes**

**(Teaching hours: 10)**

Enzymes as catalysts; International classification of enzymes; Basic principles and factors affecting enzyme activity; Enzyme kinetics: Michaelis Menten equation. Mechanism of enzyme regulation - allosteric enzymes; Active site, coenzymes, activators and inhibitors, isoenzymes.

FI-12  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	Students will understand and practice the various biomolecules, structures and properties. Students will study how to work in experiments including laboratory data and conduct of research	K1 & K2
CO2	Students will explain and describe the structure, classification and types of lipids	K1, K2 & K3
CO3	Students understand the foundational concepts of basis Biochemistry and how to demonstrate the metabolic pathways and regulation of biological and biochemical processes	K2 & K3
CO4	Introduce computer tools to students to educate and make the students up to date with the current scientific literature and draw their biochemical structures including amino acids, nucleic acids and proteins	K3 & K4
CO5	The students will gain knowledge and analyze the soluble and immobilized enzymes on current applications and future potential of enzymes. Complete understand of rate of reactions and order of reactions, and inhibitions and their kinetics and catalysis.	K4 & K5

Note: K1-Remembering; K2-Understanding; K3-Applying; K4 - Analysing; K5 Creating & Evaluating

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1		3								1
CO2	2	3		3						
CO3				3		1		1		
CO4		1		3						2
CO5			3	1		2		2		3

Indicators: 1. Reasonable 2. Significant 3.Strong

<b>Text Books</b>				
S.No.	Title	Author	Publishers	Publication Year & Edition
1.	Fundamentals of Biochemistry	A.C. Deb	New Central Book Agency, Kolkatta	2001 & Seventh
2.	Biochemistry	Donald Voet Judith G. Voet	J. Wiley & Sons	2010 & Fourth
<b>Reference Books</b>				
1.	Principles of Biochemistry	Albert L. Lehninger, David Lee Nelson, Michael M.	W.H. Freeman	2008
2.	Introduction to Enzyme and Coenzyme Chemistry	T. D. H. Bugg	John Wiley & Sons Inc	2012

**Pedagogy:** Lecture, PPT presentation, Seminar, E Books

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FIRST	20109C	CORE: BIOANALYTICAL TECHNIQUES	4	Theory	-	100

**Objective of the Course:** This paper aims to empower the students regarding the microscopic observation and analytical techniques involved in qualitative, quantitative analysis, separation and purification of biomolecules.

**UNIT I: Buffers and pH**

**(Teaching hours: 10)**

Laboratory Safety Guidelines. Various ways of expressing the concentrations of solutions - Molarity, Molality, Normality and Mole fraction. Methods of calculating pH from Henderson's Hasselbalch equation, Measurement of pH - Glass electrode - Standard hydrogen electrode, Reference electrode, pH indicators and Buffer solution.

**UNIT II: Centrifugation & Colorimetry**

**(Teaching hours: 12)**

Centrifugation - Principles and applications – preparative centrifuge, analytical centrifuge; different types of rotors, determination of molecular weight by sedimentation velocity, conversion of rpm to g, separation of organelles. Colorimetry: Colour and absorption spectra, Beer Lambert's Law, Principle and application.

**UNIT III: Spectrophotometry, Fluorimetry & Chromatography**

**(Teaching hours: 12)**

Spectrophotometry: Instrumentation, principles and application of UV-Vis, mass spectrometry. Fluorimetry: Instrumentation, principle and application. Chromatography: Principle, materials, methods and applications: Paper chromatography, thin layer chromatography, Gel permeation chromatography, ion exchange chromatography, affinity chromatography, GC and HPLC.

**UNIT IV: Electrophoresis**

**(Teaching hours: 12)**

Principle, materials, methods and applications: Paper electrophoresis, Agarose gel electrophoresis, Poly acrylamide gel electrophoresis, Immunoelectrophoresis, Isoelectric focusing.

**UNIT V: Tracers and other techniques:**

**(Teaching hours: 10)**

Radioactive decay, Units of radio activity, detection and measurement of radioactivity, Geiger-Muller counter, Scintillation counter, Auto radiography, application of radio isotopes in Biological and medical sciences.

EI - 14  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**

**COIMBATORE - 641014**

**B.Sc. (BIOTECHNOLOGY)**

**(Under Choice Based Credit System)**

**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	From this course the students understand the basics of analytical techniques and Acquire knowledge about calculations and conversions	K1 & K2
CO2	It briefly explains the basics of Characterize certain functionalities of biomolecules by using the analytical techniques for centrifugation and Colorimetry	K1 & K3
CO3	Analyse the principles, instrumentation and applications of various bioanalytical techniques and characterize certain functionalities of biomolecules by using spectroscopic Fluorimetric & Chromatographic techniques.	K2 & K4
CO4	Employ the knowledge for the separation of proteins/peptides by selecting appropriate separation techniques and assimilate the principles and Explain the theoretical principles of electrophoretic and some electro analytical techniques and some of their applications.	K4 & K5
CO5	Explain the theoretical principles of radioactivity and appreciate the uses of radioisotopes.	K3 & k4

*Note: K1-Remembering; K2-Understanding; K3-Applying; K4 - Analysing; K5 Creating & Evaluating*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	1					1		
CO2	2	3	2	3		2	3		2	3
CO3	3	3	2	3	3		3	3	2	2
CO4	2	3	3	2	1		3	2		1
CO5	2	3	2	1	2	2	3		2	2

*Indicators: 1. Reasonable 2. Significant 3.Strong*

Text Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Bioinstrumentation	L. Veerakumari	MJP publishers	2011 & First
2	Bioanalytical Techniques	Abhilasha Shourie	Shilpa S. Chapadgaonkar, Publisher	2015 & Seventh
3	Principles and Techniques in Practical Biochemistry	Wilson and Walker	Cambridge University Press	2000 & Fifth

EI-15  
2020-21

Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)  
COIMBATORE - 641014  
B.Sc. (BIOTECHNOLOGY)  
(Under Choice Based Credit System)

Reference Books				
S.No.	Title	Author	Publishers	Year of Publications
1	Cell and Molecular Biology: Concepts and Experiments	Karp G.	John Wiley & Sons. Inc	2010
2	Physical Biochemistry - Application to biochemistry and molecular biology	Freifelder D.M	W.H. Freeman	2006
3	Cell and Molecular Biology: Concepts and Experiments	C. Neal Stewart	John Wiley & Sons Inc	2016

*Pedagogy: Teaching / learning methods are Lecture, PPT presentation & Assignment)*



**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FIRST & SECOND	20109P & 20209P	CORE: PRACTICAL I - LAB IN BASIC BIOLOGICAL TECHNIQUES	4	Practical	-	-

**Objective of the Course:** The scope of this work is to make the students to understand the basic techniques of chemistry, biochemistry, cell biology, microbiology and genetics in detail.

1. Units of volume, weight, density and concentration measurements and their range in biological measurements
2. Preparation of buffers - PBS, acetate, Tris HCl and citrate
3. Verification of Beer Lamberts Law

### **I CHEMISTRY**

1. Determination of percentage of copper in the given solution using colorimetric method
2. Determination of acid value.
3. Determination of iodine value.
4. Determination of saponification value of oil.
5. Analysis of water samples
  - a. Determination of total hardness of water by complexometry.
  - b. Estimation of soluble chloride in water sample
  - c. Determination of sulphide in water sample
  - d. Determination of percentage of copper in water sample by iodometric method

### **II BIOCHEMISTRY**

1. Estimation of carbohydrates- DNS method
2. Estimation of proteins - Lowry's method
3. Estimation of lipids- Vanillin method
4. RNA estimation- Orcinol method
5. DNA estimation - Diphenyl amine method
6. Enzyme assay for amylase

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**III CELL BIOLOGY**

1. Plant cell types
2. Estimation of chlorophyll pigment.
3. Separation of chlorophyll pigments by paper chromatography.
4. Demonstration of animal handling for experimental purposes

**IV GENETICS**

1. Mitosis- all stages in onion root tip
2. Meiosis- stages in *Tradescantia*

**V MICROBIOLOGY**

1. Microscopy- care and use of microscope
2. Sterilization
3. Sample collection - clinical sample urine and blood
4. Culture media preparation
5. Staining: simple, differential staining
6. Staining of fungi: Lactophenol cotton blue staining
7. Culture Techniques: Inoculation and development of pure culture
8. Biochemical identification of bacteria
9. Maintenance and storage of bacterial strains

**Course Outcome mapping with Knowledge level**

Course outcome	CO Statement	Knowledge level
CO	This Practical focus on the basic tools that the Biotechnology students should learn in the First year. Students will get familiarized with basic chemistry and biochemistry, will get the advanced application based knowledge on Cell Biology & Genetics. Will carry out the all the possible introductory techniques in Microbiology	K1, K2, K3, K4 & K5

*Note: K1- Remembering; K2 – Understanding; K3 – Applying; K4 – Analyzing; K5 – Creating & Evaluating.*

**Course Outcome mapping with Programme outcome:**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO	2	3	3	3		2		3		1

*Indicators: 1. Reasonable 2. Significant 3.Strong*

E I - 18  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

<b>Reference Books</b>				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Practical chemistry	Prof. A.O.Thomas	Scientific Book center - Cannanore, Kerala	1989 & Third
2	Practical genetics	Philip MacDonald Sheppard	Wiley	1973 & First
3	Cell Biology: Laboratory Manual	Mary L. Ledbetter	RonJon Publishing	1993 & Second
4	Laboratory Manual of Biochemistry	J. Jayaraman	Willy Eastern	1998 & Second
5	Microbiology: A Laboratory Manual	Chad T. Welsh; James G. Cappuccino	Benjamin Cummings	2016 & Sixteenth

**Pedagogy:** Lecture, PPT, Demo & Hands on training



EI-19  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
SECOND	20209A	CORE: MATHEMATICS AND BIOSTATISTICS (EXCLUDING DERIVATIONS)	4	Theory	90%	10%

**Objective of the Course:** To expose students to biostatistical tools used in scientific research and also to develop a basic understanding of matrices, differentiation and integration, statistical measures and testing, which is a very useful modeling tool for computer programming?

**UNIT I: Matrices**

**(Teaching hours: 10)**

Types of matrices, inverse of a matrix, characteristics equation of a matrix, Eigen value of a matrix. Solutions of simultaneous linear algebraic equations in three variables.

**UNIT II: Differentiation**

**(Teaching hours: 11)**

Standard results, function of function of rule, logarithmic functions, implicit functions, functions with respect to another function, maxima and minima of simple problems.

**UNIT III: Integration**

**(Teaching hours: 10)**

Standard results, integration by substitution type I, integration by substitution type II, integration by substitution type III, integration by parts.

**UNIT IV: Statistical Measures and Graphs**

**(Teaching hours: 12)**

Introduction, collection of data, classification of data, tabulation of data, uses of statistics. Measures of central tendency: mean, median, mode. Graphical representation of data: histogram, frequency curve, frequency polygon, cumulative frequency curves.

**UNIT V: Measures of Dispersion**

**(Teaching hours: 12)**

Standard deviation, variance, coefficient of variation. correlation: types of correlation, Karl Pearson's coefficient of correlation, spearman's rank correlation. tests of significance: students t-test -test based on t-distribution for single mean and difference of two means, Chi test for goodness of fit.

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course outcome	CO Statement	Knowledge level
CO1	Basic definition of matrix, determinants and perform various operations on it.	K1 & K2
CO2	To understand the concepts of differentiation and apply them in various functions.	K1, K2 & K3
CO3	To understand the integration concepts and apply them in various types.	K1, K2 & K3
CO4	To find out appropriate statistical methods such as Mean, median, mode and apply them in various data analysis problems, Graphical representation.	K2, K4 & K5
CO5	To find out appropriate statistical methods like correlation, regression and apply them in various data analysis problems.	K1, K2, K3 & K4

*Note: K1- Remembering; K2 – Understanding; K3 – Applying; K4 – Analyzing; K5 – Creating & Evaluating.*

**Course Outcome mapping with Programme outcome:**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1			3							
CO2			3	1						
CO3			3	1						
CO4			3	1		2				
CO5			3	1		2				

*Indicators: 1. Reasonable 2. Significant 3.Strong*

Reference Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Business mathematics and statistics	P R Vittal	Published by Margham	2012 & Sixth
2	Statistical Methods	S.P Gupta	Sultan chand and sons	2012
3	Introduction to biostatistics and research methods	P S S Sundar Rao and J Richard	Published by PHI Private Limited	2012 & Fifth
4	An Introduction to Biostatistics	N Gurumani	MJP publications	2015 & Second

*Pedagogy: Lecture, Assignment.*

ET-21

2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)****COIMBATORE - 641014****B.Sc. (BIOTECHNOLOGY)****(Under Choice Based Credit System)****EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory / Practical	Problems %	Theory %
SECOND	20209B	CORE: CELL BIOLOGY AND GENETICS	4	Theory	-	100

**Objective of the Course:** To learn about the fundamentals of cell biology and genetics.

**UNIT I: Cell and its Organelles****(Teaching hours: 12)**

Discovery of cells, development of cell theory. Classification of cells. Cell organization- prokaryotes and eukaryotes. Endoplasmic reticulum, Golgi complex, Vacuole, Mitochondria, Chloroplast, Ribosome, Lysosome, Peroxisome, Nucleus, Nuclear envelope with nuclear pore complex, nucleolus, nucleoplasm, and chromatin. Cytoskeleton structures (Microtubules, Microfilaments and Intermediate filaments). Cilia, flagella- structure and function.

**UNIT II: Membrane Structure, Energy generation and Cellular Division****(Teaching hours: 10)**

Ultra structure of the plasma membrane: Models-Sandwich, Fluid mosaic model. Energy generation in mitochondria and chloroplast. Introduction to cell cycle, mitosis, meiosis and crossing over.

**UNIT III: Cellular Events and Fundamentals of Cancer****(Teaching hours: 12)**

Cell to cell signaling, Nerve cell and transmission of nerve impulses, Muscle cell- types and contraction, Erythropoiesis- genetic and molecular basis of erythrocyte differentiation, morphological specialization of red blood cells. Apoptosis – Intrinsic and Extrinsic pathway.

**UNIT IV: Mendelian Principles and Gene Interactions****(Teaching hours: 12)**

Segregation, independent assortment. Non-Mendelian inheritance: dominance relations- complete dominance, incomplete dominance, over dominance and co-dominance. Multiple alleles. Chromosomal theory of inheritance, linkage and crossing over- types, mechanism and significance. sex linkage and sex determination. Chromosomal aberrations- changes in structure and number.

**UNIT V: Microbial, Population and Evolutionary Genetics****(Teaching hours: 10)**

Conjugation, transformation and transduction. Gene frequency and Hardy Weinberg's Equilibrium; evolutionary genetics, somatic cell genetics and Genetic counseling.

ET-22  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	To understand the structure of prokaryotic and eukaryotic cells especially organelles, its structure and its function	K1 & K2
CO2	To understand how the cellular components are used to generate and utilize energy; and also to understand the cellular components underlying cellular division	K1 & K2
CO3	To know about the cellular events and fundamentals of cancer	K1, K2 & K4
CO4	To deal with the basic concepts of classical genetics and role of genetic mechanisms in evolution	K1, K2&K4
CO5	To provide the basic knowledge in microbial, population and evolutionary genetics	K2, K3 &K5

*Note: K1-Remembering; K2 –Understanding; K3 –Applying; K4 –Analysing; K5 –Creating & Evaluating*

**Course Outcome mapping with Programme Outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1					1	1		1
CO2	3	2		1			1	1		1
CO3	1	2					1	1		1
CO4	3	3		1			1	1		1
CO5	2	3		1			1	1		1

*Indicators: 1. Reasonable 2. Significant 3.Strong*

Text Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Molecular Cell Biology	Lodish	W. H. Freeman	2014 & Seventh
2	Genetics	Strickberger	Prentice Hall of India Learning	2008 &Third
3	Principles of Genetics	Gardner	John Wiley & Sons	1991 & Eighth
Reference Books				
S.No.	Title	Author	Publishers	Year of Publications
1	The Cell- A Molecular Approach	Geoffrey.M. Cooper,	Sinauer Associates	2015
2	Cell and Molecular Biology	Gerald Karp, Janet Iwasa and Wallace Marshall	Wiley international	2016
3	Genetics	Peter Russell	Pearson education	2003

**Pedagogy:** Lecture, PPT presentations

ET-23  
2020-21

Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)  
COIMBATORE - 641014  
B.Sc. (BIOTECHNOLOGY)  
(Under Choice Based Credit System)

EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
THIRD	20309A	CORE: MOLECULAR BIOLOGY	4	Theory	-	100

**Objective of the Course:** This paper helps the student understand the patterns of gene expression and regulation and how a cell works.

**UNIT I: Cell Cycle Regulation and Chromosomes** (Teaching hours: 10)

Stages of cell cycle, molecular aspects of mitosis and meiosis Regulation – Cyclin Dependent protein kinase and cyclins.

**Chromosomes:** Fine structure, organization and types.

**UNIT II: DNA Replication** (Teaching hours: 11)

Enzymes, proteins and replication mechanism in prokaryotes and eukaryotes; Recombination models and molecular mechanism: Holliday junction model and Double strand break model. DNA repair mechanisms – Excision repair and SOS repair.

**UNIT III: Transcription** (Teaching hours: 12)

Promoters, enzymes, mechanism in prokaryotes and eukaryotes; Processing of rRNA, tRNA and mRNA in prokaryotes and eukaryotes and transport of mRNA.

**UNIT IV: Translation and Transposons** (Teaching hours: 11)

Genetic code, factors and mechanism in prokaryotic and eukaryotic cells; Post translational modifications. Regulation of gene expression - prokaryotic and eukaryotic cells.

**Transposons:** simple and complex in prokaryotic and eukaryotic systems; Biology of T4 and Lambda phage.

**UNIT V: Mutation and Cancer** (Teaching hours: 12)

Gene mutation- types, forward, reverse and suppressors; classification based on phenotype; Mutagenesis- spontaneous and induced; Analysis of mutants - specific locus test, filtration enrichment and replica plating.

**Cancer:** Genetic basis, role of oncogenes, tumour suppressor genes and carcinogens.

2/2

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)  
COIMBATORE - 641014  
B.Sc. (BIOTECHNOLOGY)  
(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	Analyse the main structural elements and processes that participate in reproduction, growth, maintenance and regulation of the Cell cycle and Chromosome organization	K2
CO2	The students understand the concept and mechanism of the Replication of DNA and enzymology involved in replication of prokaryotes and eukaryotes	K2
CO3	The students understand the concept and mechanism of the Transcription of RNA enzymology involved in transcription of prokaryotes and eukaryotes	K2
CO4	The students understand the concept and mechanism of the Translation of proteins in prokaryotes and eukaryotes and understanding the mechanism and working of Transposons	K2
CO5	Explain the emergence of mutations in genome and their influence on the survival of individuals and importance of Cancer causing and suppressing genes and analyzing its importance and ability of the genes	K2, K3 & K4

*Note: K1-Remembering; K2 – Understanding; K3 – Applying; K4 – Analysing; K5 – Creating & Evaluating*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3								
CO2	1	3						1		
CO3	1	3	2					1		
CO4	1	3	3					1		
CO5	3	2	2			3	1	2		

*Indicators: 1. Reasonable 2. Significant 3.Strong*

Text Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Genomes 2	T A Brown.	Sultan Chand & Son Garland Science Publishing, New York	2002 & Two
2	Genes X	Benjamin Lewin.	Oxford University Press, U.K.,	1997 & Eight
Reference Books				
S. No.	Title	Author	Publishers	Year of Publications
1	Cell and Molecular Biology	Gerald Karp.	John Wiley,	2015
2	Molecular Cell Biology	Lodish	Scientific American Books	1994

**Pedagogy:** Lecture, PPT presentation, Assignment

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
THIRD	20309B	CORE: IMMUNOLOGY	4	Theory	-	100

**Objective of the Course:** To gain the basic knowledge in immunology, learn about antigens and antibodies and understand their interactions.

**UNIT I: Overview of immune system**

**(Teaching hours: 12)**

Immunity, types of immunity- innate and adaptive immunity. Humoral and cell mediated immunity, Hematopoiesis- differentiation and regulation. Cells of the immune system: Macrophages, B & T-Lymphocytes, Dendritic cells, Natural Killer cells, LAK, Eosinophils, Neutrophils, Mast cells. Organs of the Immune system: Bone Marrow, Thymus, Spleen, Lymph node, MALT, CALT.

**UNIT II: Antigen and Antibody**

**(Teaching hours: 12)**

Antigen Biology- Antigen, Antigenicity, Immunogenicity-Factors, epitopes, haptens, adjuvants, Super antigen. Antibody: Classes, structure & function of antibody (IgG, IgM, IgE, IgA, IgD). Antigen - Antibody interaction: agglutination, precipitation, RIA, Western blotting, ELISA. MHC- types, structure and function (Class I & II). Antigen Processing and Presentation: Pathways and the role of APC's.

**UNIT III: Effector Mechanism**

**(Teaching hours: 11)**

Cytokines - Properties and function. Complement: Classical and Alternative Pathway. T cell and B cell Receptor. Transplantation Immunology: Immunologic basis of graft rejection, graft versus host reaction.

**UNIT IV: Hypersensitivity reactions**

**(Teaching hours: 10)**

Types, autoimmune diseases - organ specific, systemic auto immune diseases. Immunodeficiency diseases - SCID, Leukemia and AIDS.

**UNIT V: Vaccine technology**

**(Teaching hours: 10)**

Preparation and production of Monoclonal antibodies, purification, application of MAbs in diagnosis and therapy. Vaccines, Catalytic antibodies, Chimeric antibodies.

EI-26  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	The students will learn about the cellular interactions and activation of immune cells in response to foreign antigen and cytokines. The generation of immune memory and tolerance; and it also clearly explains about the importance of phagocytosis and natural killer cells.	K1 &K2
CO2	It elucidates the genetic basis for immunological diversity and the generation of adaptive immune responses. It gives an outline key event and cellular players in antigen presentation, and how the nature of the antigen will shape resulting effector responses, understand how immunodeficiencies related to disease. It mainly explain the basis of allergy and allergic diseases.	K2&K3
CO3	From this course the students understand the role of cytokines in immunity and immune cell activation; and be able to identify and characterize cytokines of particular immune importance	K2&K4
CO4	This explains about the Differentiate mechanisms that lead to beneficial immune responses and immune disorders and Apply key immunologic concepts and methods to diagnose immune disorders.	K2&K4
CO5	To identify the main mechanisms of inflammation and helps to understand the principles governing vaccination and the mechanisms of protection against disease	K4&K5

Note: K1-Remembering; K2 –Understanding; K3–Applying; K4 –Analysing; K5 –Creating & Evaluating.

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	2	3	2	-	1	2	2	1	1
CO2	2	3	2	2	1	-	1	1	1	3
CO3	2	3	2	3	1	1	2	1	2	2
CO4	3	3	2	2	1	1	2	2	2	2
CO5	2	3	3	2	1	-	1	1	2	1

Indicators: 1. Reasonable 2. Significant 3.Strong

Text Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Immunology	Kuby	Freeman company	2002 & Sixth
2	Fundamental of Immunology	Paul	Lippencott Raven	2008 & Sixth
Reference Books				
S.No.	Title	Author	Publishers	Year of Publications
1	Immunology: An introduction	I R Tizard,	Saunders College publishers	1995
2	Vaccines	Stanley	BMA Medical Book Awards Highly Commended in Public Health	2011
3	Cellular and Molecular Immunology	Abul K. Abbas, Andrew H. H. Lichtman, Shiv Pillai	Elsevier Health Sciences	2014

**Pedagogy:** Lecture, PPT presentation, Assignment

Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)  
COIMBATORE - 641014  
B.Sc. (BIOTECHNOLOGY)

(Under Choice Based Credit System)

EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021

Semester	Course Code	Course Title	Credits	Theory / Practical	Programs %	Theory %
THIRD	20309C	ALLIED: COMPUTER PROGRAMMING - PERL	4	Theory	20	80

**Objective of the course:** To understand fundamentals in computers and to introduce the computer programming, the PERL.

**UNIT I: Fundamentals of Computing Basics**

(Teaching Hours: 11)

Introductory concepts: Operating system, Types of languages – High level, Low level languages, Algorithm & flow chart. Definitions of terms: Compiler, Linker, Loader, Interpreter. Applications of Computers

**UNIT II: The Internet and Intro to PERL**

(Teaching hours: 12)

Internet terminologies: WWW, FTP, HTML, HTTP. Scripting language. Interpreted Language. About PERL. Why PERL?. Basic structure of Perl language – print command – First PERL program – Executing your code. Literals: Numbers and Strings, Operators, Scalar data, Array data, Hash data. Variables in PERL: Scalars, Arrays and Hashes.

**UNIT III: Data Structures in PERL**

(Teaching hours: 12)

Scalar Variable: Function list - chomp, chop, length, chr, index, uc, ucfirst, lc, lcfirst. Array Variable: Creating an array, Use of range operator in an array, Adding and removing elements, getting the number of elements in an array, Accessing elements in an array. Function list - reverse, sort, join, split, pop, push, shift, unshift. Hash Variable: Printing hash data, accessing and removing elements, Function list - keys, values, delete, each, exists

**UNIT IV: Control Structures and Regular Expressions**

(Teaching hours: 10)

Control Structures: *if, else, elsif, switch, while, until, do...while, for* and *for...each*. (Statements associated with loops – *next, last, redo, goto, continue*) Regular expressions: Simple string comparisons, Matching, Substitutions, and Translations. Special characters in patterns.

**UNIT V: Simple Programs**

(Teaching hours: 10)

1. Program to store DNA sequence
2. Program to concatenate DNA fragments
3. Program to print the codons
4. Program to remove the last character from protein sequence
5. Program to find the length of the protein sequence
6. Program to remove residues from the end of the protein sequence
7. Program to remove residues from the beginning of the protein sequence

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	To demonstrate the fundamental understanding of computing and programming language concepts	K1 & K2
CO2	To provide the knowledge in utilizing web technologies and introduction to PERL	K1 & K2
CO3	To understand the data structures in PERL and to improve the logical skills	K1, K2 & K3
CO4	To know the use of control structures and regular expressions in PERL programming	K1, K2 & K3
CO5	To demonstrate the problem solving skills	K2, K4 & K5

*Note: K1-Remembering; K2-Understanding; K3-Applying; K4 - Analysing; K5 - Creating & Evaluating.*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2				2					
CO2	2				2					
CO3				2	3	2		2		2
CO4				2	3	2		2		2
CO5		1		1	3	2				

*Indicators: 1. Reasonable 2. Significant 3. Strong*

Text Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Learning Perl	Randal L. Schwartz, Tom Phoenix & braindfoy	O'Reilly	2008 & Fifth
2	<a href="https://www.perl.org/books/beginning-perl">https://www.perl.org/books/beginning-perl</a>	-	-	-
Reference Books				
S.No.	Title	Author	Publishers	Year of Publications
1	Genomic PERL: From Bioinformatics Basics to Working Code	Rex A Dwyer	Cambridge University Press	2003
2	Bioinformatics, Biocomputing and PERL	Michael Moorhouse and Paul Berry	John Wiley and Sons Ltd	2004
3	Beginning Perl for Bioinformatics	James & Tisdall	O'Reilly & Associates	2001

*Pedagogy: Lecture, PPT presentation, seminar, assignment*

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
THIRD & FOURTH	20309P & 20409P	CORE: PRACTICAL II - LAB IN BASIC BIOTECHNOLOGY	4	Practical	-	-

**Objective of the Course:** On successful completion the subject, student should have understood basic techniques in Immunology, PTC, Enzyme technology and Bioinformatics.

### I IMMUNOLOGY

1. Preparation of serum from blood
2. Preparation of antibodies
3. ABO blood grouping
4. Radial immuno diffusion
5. Ouchterlony double diffusion
6. Immuno electrophoresis
7. Rocket Immunoelectrophoresis
8. Osmotic fragility of RBC's
9. RBC and WBC count
10. Differential leukocyte count by Leishmann's staining

### II BIOPROCESS TECHNOLOGY

1. Isolation and preservation of industrially important microorganisms
2. Demonstration of Fermentor: Batch and Continuous
3. Citric acid production
4. Penicillin production
5. Amylase production
6. SCP production
7. Lipase Production
8. Protease Production

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**III PLANT BIOTECHNOLOGY**

1. Composition and preparation of MS medium
2. *in vitro* seed germination
3. Micro propagation: single node culture
4. Callus induction and regeneration
5. Somatic embryogenesis and synthetic seeds
6. Embryo culture
7. Anther culture
8. Cell suspension culture

**IV BIOINFORMATICS**

1. Retrieving gene sequence, protein sequence and an article
2. Finding similar sequences
3. Sequence alignment - pairwise and multiple sequence alignment
4. Phylogenetic analysis
5. Retrieving protein structure from structure database and molecular visualization

**Course Outcome mapping with Knowledge level**

Course outcome	CO Statement	Knowledge level
CO	<p>Practical gives a broad knowledge and Hands on training in all techniques given.</p> <ul style="list-style-type: none"> <li>➤ An ability to apply knowledge of immunology in health and diagnostic purposes</li> <li>➤ Students will be able to explain the steps involved in the production of bioproducts by employing modern biotechnology</li> <li>➤ Develop skills for application of tissue culture techniques in plant breeding and knowledge about the plant tissue culture and transgenic plants.</li> <li>➤ Students gains the ability to analyze and interpret computational data by visiting NCBI and PubMed etc.,</li> </ul>	K2,K3,K4 & K5

*Note: K1- Remembering; K2 – Understanding; K3 – Applying; K4 – Analyzing; K5 – Creating & Evaluating.*

**Course Outcome mapping with Programme outcome:**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO	3	2	3	3	3	3	2	3	1	3

*Indicators: 1. Reasonable 2. Significant 3.Strong*

EI - 31  
2020 - 21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

Reference Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Laboratory Manual on Biotechnology	Prof. P M Swamy	Rastogi Publications	2008 & First
2	General Microbiology: Laboratory Manual	Robert F. Boyd	Times Mirror/Mosby College Pub	1984 & Second
3	Microbial Technology: Fermentation Technology	Henry J. Pepler, D. Perlman	Academic Press	1979 & Second
4	Practical Immunology	Frank C. Hay, Olwyn M. R. Westwood, Paul N. Nelson, Leslie Hudson	Blackwell Publishing	2008 & Fourth
5	Plant Tissue Culture Concepts and Laboratory Exercise	Robert Nicholas Trigiano, Dennis John Gray	CRC Press	2000 & Second
6.	<a href="https://www.ncbi.nlm.nih.gov">https://www.ncbi.nlm.nih.gov</a>	-	-	-
7.	<a href="https://www.ncbi.nlm.nih.gov/gene">https://www.ncbi.nlm.nih.gov/gene</a>	-	-	-
8.	<a href="https://www.ncbi.nlm.nih.gov/protein">https://www.ncbi.nlm.nih.gov/protein</a>	-	-	-
9.	<a href="https://www.ncbi.nlm.nih.gov/pubmed/">https://www.ncbi.nlm.nih.gov/pubmed/</a>	-	-	-
10.	<a href="http://blast.ncbi.nlm.nih.gov">http://blast.ncbi.nlm.nih.gov</a>	-	-	-
11.	<a href="https://www.ebi.ac.uk/Tools/msa/clustalo/">https://www.ebi.ac.uk/Tools/msa/clustalo/</a>	-	-	-

**Pedagogy:** Lecture, PPT, Demo & Hands on training



**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FOURTH	20409A	CORE: PLANT BIOTECHNOLOGY	4	Theory	-	100

**Objective of the Course:** To provide the student knowledge on the basic classification of Plant Kingdom, fundamentals of plant tissue culture techniques and its applications in agriculture.

(Teaching hours: 11)

**UNIT I: Classification of Plant Kingdom**

Systematics: Two Kingdom and Five Kingdom Systems - Salient features of various Plant Groups (Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms) - Viruses - Bacteria - Algae : Spirogyra - Fungi : Mucor - Bryophyta : Riccia - Pteridophyta : Nephrolepis - Gymnosperms : Cycas

(Teaching hours: 10)

**UNIT II: Basics of Plant tissue culture**

History of Plant Tissue Culture, Concepts of cellular Totipotency. Laboratory organization and Safety measures, Sterilization techniques, Surface sterilization of explants, Media Preparation- Media formulation, Nutrients Composition, Growth regulators – Solid and Liquid medium.

(Teaching hours: 12)

**UNIT III: Culturing Techniques**

Establishment of Callus culture and Cell Suspension culture - its maintenance and limitations. Isolation and culture of Plant Protoplast, Maintenance, Viability and its applications; Anther and Pollen Culture – Applications and limitations, Ovule/Ovary Culture, Zygotic embryogenesis, Molecular aspects of Somatic Embryogenesis and its applications.

(Teaching hours: 11)

**UNIT IV: Organ Culture and Micro propagation**

Principles and applications of Embryo culture and rescue; Endosperm culture, Methods of Micro propagation its applications and Limitations, Shoot tip and Meristem culture, Artificial seed production, Simple Freezing method, Encapsulation, Protocol for cryopreservation and restoration.

(Teaching hours: 11)

**UNIT V: Application of Transgenic plants**

Herbicide resistance, drought tolerance, salt tolerance, disease resistance, pest resistance, insect resistance (Bt cotton); Symbiotic nitrogen fixation in legumes by Rhizobia (nif); edible vaccines; Antisense RNA technology; Application of PTC in crop improvement – secondary metabolite production, Commercial micropropagation and phytoremediation.

FI-33  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)  
COIMBATORE - 641014  
B.Sc. (BIOTECHNOLOGY)  
(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course outcome	CO statement	Knowledge level
CO1	The course provides the fundamentals of classification of plant kingdom and its importance	K1&K2
CO2	Students will learn the history, laboratory organization and safety measures, sterilization	K1, K2&K3
CO3	The student will understand the basic concepts, principals and technical advances behind the in vitro culture of plant cells	K2&K3
CO4	Students will acquire knowledge of advances in principles, applications, methodology and protocol for organ culture and micro propagation	K3&K4
CO5	The student will get exposure to wide applications of plant transformation for improving the productivity and performance of plants under biotic and abiotic stresses.	K4&K5

*Note: K1-Remembering; K2 - Understanding; K3–Applying; K4– Analysing; K5 – Creating & Evaluating.*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	1	-	-	-	-	1	-	-
CO2	2	3	2	3	-	2	3	-	2	3
CO3	3	3	2	3	3	-	3	3	2	2
CO4	2	3	3	2	1	-	3	2	-	1
CO5	2	3	2	1	2	2	3	-	2	2

*Indicators: 1. Reasonable 2. Significant 3.Strong*


Text Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	The Plant Kingdom: A Guide to Plant Classification and Biodiversity	Theresa Greenaway	Raintree Steck-Vaughn,	2012 & Third
2	An Introduction to Plant Tissue Culture by. Published by New Delhi.	M.K. Razdan	Oxford and IBH Publishing Co.,	2003 & Second
3	Plant Cell and Tissue Culture - A Tool in Biotechnology : Basics and Application	Karl-Hermann Neumann , Ashwani Kumar , Jafargholi Imani	Publisher Springer-Verlag Berlin and Heidelberg GmbH & Co. KG	2010. & First

EI-34  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

<b>Reference Books</b>				
S.No.	Title	Author	Publishers	Year of Publications
1	Plant Tissue Culture: Theory and Practice by S S Bhojwani and M.K. Razdan, Elsevier Publications, Netherlands, 2004.	Timir Baran Jha and Biswajit Ghosh	Universities Press Pvt.Ltd	2007
2	Plant Biotechnology and Transgenic Plants	Kirsi-Marja Oksman-Caldentey and Wolfgang H Barz	Marcel Dekker, Inc	2002
3	Plant Biotechnology and Genetics: Principles, Techniques, and Applications,	C. Neal Stewart	John Wiley & Sons Inc	2016

*Pedagogy: Lecture, PPT presentation & Assignment*



**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FOURTH	20409B	CORE: THERAPEUTIC DRUGS	4	Theory	-	100

**Objective of the Course:** Upon completion of the course, students will be able to know the basics, classification, administration and mode of action of various drug sources. Gain knowledge on different types of medical systems available.

**UNIT I: Introduction To Drugs** **(Teaching hours:11)**

Definition, History and development. Terminologies – Pharmacology, Pharmacodynamics, Pharmacognosy and Pharmacokinetics. Drug Classification – On the basis of Chemical Structure, Drug action, Pharmacological Effect and Molecular Targets.

**UNITII: ADME** **(Teaching hours: 11)**

Sources of drugs – Natural and Synthetic, Different modes of drug Administration, Fate of drug after administration: Definition and concept of absorption, distribution, metabolism and elimination of drug. Bioavailability and half life of drug.

**UNIT III: Siddha System of Medicine** **(Teaching hours:11)**

Basic Concepts, Pancheekaranam theory and its uniqueness in Siddha, Materia Medica, Special therapies of Siddha Medicine. **Ayurvedic System of Medicine:** Principles, Three Dhosa Theory, Factors responsible for increase in three dhosas, Principles of treatment **Allopathic and Integrated system of medicine:** Definition, History and Applications.

**UNIT IV: Diabetes Mellitus** **(Teaching hours:12)**

Definition, Types, Causes, Control measures, Symptoms and Diagnosis: Complications of Diabetes: Acute – Diabetic Ketoacidosis, Chronic: Micro vascular and Macro vascular diseases. Hypercholesterolemia: Definition, Causes – Diet and Genetics, Diagnosis. Complications: Central Obesity and Atherosclerosis.

**UNIT V: Therapeutics for Diabetes and Hypercholesterolemia** **(Teaching hours:12)**

Glycemic and Cholesterol control by diet, **Mode of action, Interaction and Side effects** – Classification of Anti-diabetic drugs Metformin, sulfonyl urea and Insulin therapy; Cholesterol Lowering Medications: Statins. Impact of Siddha and Ayurvedic medicine on both the conditions, **Medicinal plants as drug for treatment** – *Azadirachta indica* (Vembu), *Emblica officinalis* (Nelli), *Aloe barbadensis* (Sotru katalai), *Catharanthus roseus* (Nithya Kalyani) and *Ocimum sanctum* (Tulsi).

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	Helps in correlating between pharmacology of a disease and its mitigation or cure. Knowledge about the mechanism pathways of different class of medicinal compounds.	K1 & K2
CO2	To understand the drug metabolic pathways, adverse effect and therapeutic value of drugs	K2 & K3
CO3	To know the structural activity relationship of different class of Siddha and Ayurveda drugs.	K1 & K4
CO4	Well acquainted with studying diseases like Diabetes Mellitus and Hyper cholesterolemia	K2&K5
CO5	Classification of Diabetic Drugs and Applications and uses of medicinal plants	K2, K3 & K4

*Note: K1- Remembering; K2 – Understanding; K3 – Applying; K4 – Analysing; K5 – Creating & Evaluating.*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2		3						2
CO2	3	2		2						2
CO3	3	3		3						2
CO4	2	2		2		3				1
CO5	3	2		3		3				3

*Indicators: 1. Reasonable 2. Significant 3.Strong*

<b>Text Books</b>				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Drug-like Properties: Concepts, Structure Design and Methods: from ADME to Toxicity Optimization	Li Di and Edward H.Kerns,	Academic Press, Cambridge	2014 & Second
2	Textbook of Diabetes	Richard I. G. Holt, Clive Cockram, Allan Flyvbjerg, Barry J. Goldstein, W	Wiley - Blackwell	2010 & Fourth
<b>Reference Books</b>				
S. No.	Title	Author	Publishers	Year of Publications
1	Ashton Medicinal Plants for Diabetes - 2013. Published by	Aaron Matas,	Lulu press,	2013

*Pedagogy: Lecture, PPT presentation, Assignment*

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory / Practical	Problems %	Theory %
FOURTH	20409C	ALLIED: BIOINFORMATICS	4	Theory	-	100

**Objective of the course:** To acquire basic knowledge in the field of biological databases and biological information technology in the context of biotechnology applications.

**UNIT I: Biological Databases**

**(Teaching hours: 12)**

History of Bioinformatics, scope and applications of Bioinformatics. Biological data used in Bioinformatics, Biological databases – features, types and classification with respect to the sequence: Primary nucleic acid sequence databases: NCBI-GenBank, DDBJ and EMBL; Primary protein sequence databases: PIR, Swiss-Prot; Secondary databases: SMART and PFam; Composite databases: OWL. Other popular resources in NCBI: PubMed, OMIM, Entrez.

**UNIT II: Sequence Alignment & Similarity Searching**

**(Teaching hours: 12)**

Definitions: homology, similarity, identity and gaps. Local and global alignment: Needleman Wunsch and Smith Watermann Algorithm. Pairwise sequence alignment: methods, significance, limitation and tools. BLAST: List, extent, e-value and p-value, principles of BLAST search, types of BLAST.

**UNIT III: Multiple Sequence alignment**

**(Teaching hours: 11)**

Multiple sequence Alignment: Methods, significance and tools: ClustalX and ClustalW. Conserved Domains: Databases of conserved domains: PRINTS and BLOCKS. Integrated multiple sequence alignment: InterPro and MetaFam.

**UNIT IV: Phylogenetic Analysis & Molecular Visualization**

**(Teaching hours: 11)**

Phylogenetic Trees: Node, internode, cladogram, phylogram, dendrogram, phenotypic and gene trees; Phylogenetic analysis methods; Applications of phylogeny. Difference between offline, online tool, academic licensed software and commercial software. RasMol and QMol: Importance of molecular visualization.

**UNIT V: Protein Structure: Databases and Prediction Methods**

**(Teaching hours: 11)**

Structural Databases: ProteinData Bank. Protein Structure Classification Databases: SCOP and CATH. Protein Structure Modeling: Comparative modeling, Abinitio Prediction, Threading. Protein Folding. Molecular Docking.

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	To get introduced to the history, scope and importance of Bioinformatics and its significance in biological data analysis	K1, K2 & K3
CO2	To provide the clear knowledge in pairwise sequence alignment, methods and its analysis using tools	K2, K3 & K4
CO3	To provide the clear knowledge in multiple sequence alignment, methods and its analysis using tools	K1, K2 & K4
CO4	To make them understand about phylogenetic analysis methods & molecular visualization tools	K2, K3 & K4
CO5	To demonstrate the overview about biological macromolecular structures and structure prediction methods	K2, K3 & K4

*Note: K1- Remembering; K2 –Understanding; K3–Applying; K4 –Analysing; K5 – Creating & Evaluating*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2		1	3					
CO2	2	2		1	3	1	2	2	1	
CO3	2	2		1	3	1	2	2	1	
CO4	2	2		1	3	1	2	2	1	
CO5	2	2		1	3		2	2	1	

*Indicators: 1. Reasonable 2. Significant 3.Strong*

Text Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Bioinformatics Sequence and Genome Analysis	David W. Mount	Cold Spring Harbor Laboratory Press	2004 & Second
2	Bioinformatics Methods and Applications: Genomics, Proteomics and Drug Discovery	Rastogi S C., NamitaMendiratta, ParagRastogi	Prentice Hall of India Private Limited	2013 & Fourth
Reference Books				
S.No.	Title	Author	Publishers	Year of Publications
1	Bioinformatics Methods and Applications: Genomics, Proteomics and Drug Discovery	Rastogi S C., NamitaMendiratta, ParagRastogi	Prentice Hall of India Private Limited	2013
2	Bioinformatics and Functional Genomics	Jonathan Pevsner	John Wiley	2015
3	Bioinformatics Sequence and Genome Analysis	David W. Mount	Cold Spring Harbor Laboratory Press	2004
4	Introduction to Bioinformatics	Attwood, T.K. and D.J. Pary Smith	Addison Wesley Longman Limited	2012

**Pedagogy:** Lecture, PPT presentation, seminar, assignment

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FIFTH	20509A	CORE: MICROBIAL BIOTECHNOLOGY	4	Theory	-	100

**Objective of the Course:** To learn about the different concepts and basics of knowledge about microorganisms and their applications in the production of various products for industrial and commercial uses.

**UNIT I: Fermentation and fermentor**

**(Teaching hours: 10)**

Historical perspective; medium formulation and sterilization; Types of fermentation: ethanolic and lactic acid fermentation, solid state and submerged fermentation; Basic functions of fermentor, Types of fermentor, Design of different parts of fermentor.

**UNIT II: Microbial food products**

**(Teaching hours: 12)**

Alcoholic beverages: Wine, distilled spirit, cider; Dairy products: Cheese, butter, yoghurt; Plant products: Bread, soy sauce, sauerkraut, coffee beans, cocoa, tofu and preserved olives; Food preservatives and supplements: Nisin, Ascorbic acid, vinegar, carotenoids, cobalamin, riboflavin.

**UNIT III: Microbial enzymes and industrial solvents**

**(Teaching hours: 12)**

Commercial microbial enzyme production process; Microbial enzymes and its applications: proteases, lipases, carbohydrases, miscellaneous enzymes; Organic solvents: ethanol, butanol; Fuels: methane, hydrogen; Amino acids: glutamic acid, lysine; Exopolysaccharides: xanthan gum

**UNIT IV: Microbial health care products**

**(Teaching hours: 12)**

Antibiotics: penicillin, streptomycin, tetracycline; Bacterial vaccines, live, attenuated, inactivated, recombinant, DNA vaccines; Therapeutic proteins: DNase, erythropoietin, human growth hormone, insulin, interferons, interleukins, Tissue plasminogen activators, collagen.

**UNIT V: Microbes and environment**

**(Teaching hours: 10)**

Bioelectricity, biomining, biogas, biofertilizers, biopesticides, biofuels, bioplastics: source, production, advantages and application.

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	From this course the students understand the role of fermentation and types of fermentor and its Importance	K1&K2
CO2	Students will gain basic information of microbial food products and its conception	K1 & K3
CO3	Students will understand the different processes involved in microbial enzymes and industrial solvents and its techniques	K2, K3 & K4
CO4	Students will develop and assess the conditions for efficient and sustainable design, methodology and preservation of microbial health care products	K2 & K5
CO5	Integrating scientific and technological knowledge on the use and application of microbes and environment	K4& K5

Note: K1-Remembering; K2-Understanding; K3-Applying; K4-Analysing; K5 - Creating & Evaluating.

**Course Outcome mapping with Programme Outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	2	3	2	-	1	2	2	1	1
CO2	2	3	2	2	1	-	1	1	1	3
CO3	2	3	2	3	1	1	2	1	2	2
CO4	3	3	2	2	1	1	2	2	2	2
CO5	2	3	3	2	1	-	1	1	2	1

Indicators: 1. Reasonable 2. Significant 3.Strong

Text Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Principles of Fermentation Technology	P.F. Stanbury and A. Whitaker	Pergamon press	2016& Third
2	Microbial Biotechnology: Fundamentals of Applied Microbiology	Alexander N. Glazer, Hiroshi Nikaido	Cambridge University Press	2007 & Second
3	Industrial Microbiology: An Introduction	Michael J Waiets, Neil N Morgan, John S Rockey and Gary Higton	Black Well Science Ltd	2001 & First
Reference Books				
S.No.	Title	Author	Publishers	Year of Publications
1	Microbial Biotechnology	Timir Baran Jha and Biswajit Ghosh	Universities Press Pvt.Ltd	2007
2	Industrial Microbiology	Kirsi-Marja Oksman Caldentey and Wolfgang H Barz	Marcel Dekker, Inc	2016
3	Plant Biotechnology and Genetics: Principles, Techniques, and Applications	C. Neal Stewart	John Wiley & Sons Inc	2016

Pedagogy: Lecture, PPT presentation & Assignment

ET - 41  
2020-21

Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)  
COIMBATORE - 641014  
B.Sc. (BIOTECHNOLOGY)  
(Under Choice Based Credit System)

EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FIFTH	20509B	CORE: GENETIC ENGINEERING	4	Theory	-	100

**Objective of the Course:** This paper provides the student a thorough knowledge in principles and methods in genetic engineering, vectors in gene cloning, transformation in higher organisms.

**UNIT I: DNA modifying enzymes**

**(Teaching hours: 10)**

DNA modifying enzymes and their uses: Nucleases, Restriction enzymes, DNA ligases, DNA Polymerase, Methylase, *Taq* Polymerase, Reverse Transcriptase, Terminal Transferases, Polynucleotide kinases; Alkaline phosphatase. Sticky ends; Blunt ends; Linkers, Adapters and Homopolymer tailing.

**UNIT II: Cloning vectors and their application**

**(Teaching hours: 12)**

Biology and construction of plasmid vectors: pBR322, pUC vectors; Bacteriophage vectors: phagemids, cosmids, shuttle vectors; Expression vectors; M13 vectors; viral vectors: SV40 and retroviral vectors; Artificial chromosomes - PAC, BAC, YAC; Construction of Vectors for the desired gene. Ti plasmid for plant transformation.

**UNIT III: Basic Recombinant DNA Techniques**

**(Teaching hours: 11)**

Construction of a recombinant molecule. Genetic transformation: Physical and Chemical methods in bacteria; transformation of plants by *Agrobacterium* and biolistic method; Animal transformation by microinjection and liposome mediated transfer method. Identifying the clones of interest: Screening by nucleic acid hybridization, Blotting techniques: Southern; Northern; Western and South-western. Selection of transformants - Marker genes and reporter genes.

**UNIT IV: Advanced Recombinant Techniques**

**(Teaching hours: 12)**

Construction of genomic libraries (Shotgun cloning), Construction of cDNA libraries. PCR: Methods and types; DNA sequencing, Human genome project; Site directed Mutagenesis; RNA interference; DNA microarray; DNA profiling: Polymorphism analysis by RFLP, RAPD, AFLP, RACE; minisatellites, microsatellites, Single nucleotide polymorphism.

**UNIT V: Applications**

**(Teaching hours: 10)**

Gene therapy: cystic fibrosis; DNA forensics; Vaccines; Recombinant hormones: Insulin and Growth hormone, Blood factor: Factor VIII and tissue plasminogen activator; interferons and interleukins.

EI - 42  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	The students will have knowledge of tools and strategies used in genetic engineering.	K1 & K2
CO2	This course exposes students to the applications of cloning vectors in biological research.	K1, K2 & K3
CO3	The course includes a description of the fundamental techniques of genetic engineering that serve as tools for obtaining and manipulating nucleic acids	K2 & K3
CO4	Advanced techniques exposed to students which can make them apply the knowledge of genetic engineering in problem solving and in practice	K3 & K4
CO5	Students will acquire knowledge of advances in biotechnology-healthcare, agriculture and environment cleanup via recombinant DNA technology.	K4 & K5

*Note: K1-Remembering; K2 –Understanding; K3 –Applying; K4 –Analysing; K5 –Creating & Evaluating*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1		3								1
CO2	2	3		3						
CO3				3		1		1		
CO4		1		3						2
CO5			3	1		2		2		3

*Indicators: 1. Reasonable 2. Significant 3.Strong*

<b>Text Books</b>				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Principles of Gene Manipulation	S. B. Primrose, R. M. Twyman and R.W. Old	Wiley-Blackwell Scientific Publications	2001 & Sixth
2	Genetic Engineering: Concepts and Applications	R. Suganthi and C.S. Shobana	Kalaikathir Achchagam	2013 & First
<b>Reference Books</b>				
S.No.	Title	Author	Publishers	Year of Publications
1	Gene Cloning and DNA Analysis. An Introduction	T. A. Brown	Blackwell Scientific Publications	2010 & Sixth
2	From Genes to Clones: Introduction to gene technology.	Winnacker, E.L.	VCH publisher s	1987 & First

**Pedagogy:** *Lecture, PPT presentation, e-content seminar, Assignment, Quiz, Group Discussion*

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FIFTH	20509U1	ELECTIVE I: MEDICAL BIOTECHNOLOGY	4	Theory	-	100

**Objective of the Course:** This course has been designed to provide the student insights into these invaluable areas of biotechnology, which play a crucial role in determining its future use and applications in medicine.

**UNIT I: Introduction of Medical Biotechnology and drug discovery (Teaching hours: 12)**

Worldwide market in medical biotechnology, revolution in diagnosis, approaches of therapy, FDA: Organization chart and regulatory measures for drug discovery: Investigational new drug. Overview, rational drug design, combinatorial chemistry in drug development, computer assisted drug design, role of bioinformatics in genome based therapy, antisense DNA technology for drug designing.

**UNIT II: Vaccine technology (Teaching hours: 12)**

Subunit vaccines, drawbacks of existing vaccines, criteria for successful vaccine, peptide vaccine, minicells as vaccines, impact of genetic engineering on vaccine production, viral vector vaccines and AIDS vaccine chiral technology: Principle and applications.

**UNIT III: Stem cells in therapy (Teaching hours: 11)**

Therapeutic proteins, interleukins, interferons: principle, Production and applications, Gene Therapy: Basic approaches to gene therapy, vectors used in gene therapy, applications of gene therapy in cancer, genetic disorders and AIDS. Therapeutic Cloning.

**UNIT IV: Nutraceuticals and Biosensors in clinical diagnosis (Teaching hours: 11)**

Fast-based nutraceutical technology of typical food / food products (bread, cheese, idli, agro-products (oilseeds) and Food derived bioactive peptides. Use of nucleic acid probes and antibodies in clinical diagnosis and tissue typing.

**UNIT V: Clinical trials (Teaching hours: 10)**

Phase - I, II and III trial Norms: ICMR guidelines for design and conducting clinical trials, licensing procedure in India.

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	This course deals with market value for medical biotechnology and overview of drug designing and drug discovery which is the basic for entrepreneurship in biotechnology market.	K1, K3 & K5
CO2	The students learn about production of various vaccines which is the current trend in medical biotechnology	K2 & K5
CO3	This course deals with basics and production of recombinant proteins which is the blooming area of medical biotechnology	K1, K4 & K5
CO4	This course emphasizes on probes for biosensors and also nutraceuticals which enables the students to develop their entrepreneurial skills	K2, K4 & K5
CO5	The students can develop their knowledge in clinical trials which increases their understanding and social responsibility in this field.	K1 & K3

*Note: K1-Remembering; K2 –Understanding; K3 –Applying; K4 –Analysing; K5 –Creating & Evaluating.*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	-	2	-	1	2	-	-	-	-
CO2	1	-	-	3	-	2	-	1	1	-
CO3	1	-	-	3	-	-	2	2	1	-
CO4	1	-	-	3	-	-	2	2	1	-
CO5	2	-	3	-	1	1	-	2	3	-

*Indicators: 1. Reasonable 2. Significant 3.Strong*

<b>Text Books</b>				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Medical Biotechnology: Achievements, Prospects and Perceptions	Albert Sasson	United Nations University Press	2006 & First
2	Microbial Biotechnology- Principles and Applications	Lee Yaun Kun	World Science publications	2006 & First
<b>Reference Books</b>				
S.No.	Title	Author	Publishers	Year of Publications
1	Genetic techniques for Biological Research	Michels	Wiley Publications	2002
2	Microbial Biotechnology - Fundamentals of Applied Microbiology	Glazer AN, Nikaido H.	WH Freeman, New York	2015
3	Methods in Biotechnology and Bioengineering	Vyas	CBS publications	2002
4	Lipidomics of Stem Cells	Pebay, Alice, Wong, Raymond CB	Humana Press	2017

*Pedagogy: Lecture, Assignment, Seminar*

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)****COIMBATORE - 641014****B.Sc. (BIOTECHNOLOGY)****(Under Choice Based Credit System)****EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FIFTH	20509V1	ELECTIVE I : NANOBIOTECHNOLOGY	4	Theory	-	100

**Objective of the Course:** The paper is framed to provide the principles, technology and applications of nano materials in Biology to the students.

**UNIT I: Introduction to Nanotechnology****(Teaching hours: 11)**

Definition, history of nanomaterials, classification of nanomaterials, Properties of nanomaterials, concept of nanoscale engineering: size and confinement effects.

**UNIT II: Synthesis and Characterization of Nanoparticles****(Teaching hours: 12)**

Strategies for nano architecture, bottom up, top down and functional approaches; Chemical and physical synthesis of nanoparticles, characteristics of nanoparticles, Characterization of nanoscale materials using UV spectroscopy, SEM, TEM, AFM/STM, XRD and FTIR.

**UNIT III: Interlinking Biology with Nanotechnology****(Teaching hours: 11)**

Bionanomaterials: DNA, protein and lipids based nanostructures- synthesis, characterization and applications; Bionanopores, Biological synthesis of nanoparticles and mechanism: bacteria, fungi, yeast and plants; Molecular Self assembly in biology.

**UNIT IV: Biological Functionalisation of Nanomaterials****(Teaching hours: 11)**

DNA/protein-gold nanoparticle conjugates; DNA nanostructures for mechanics and computing; DNA as smart glue, DNA analyzer as biochips; Biologically inspired nanocomposites; Peptide nanostructures and their applications: electronics, antibacterial agents

**UNIT V: Application of Nanobiotechnology****(Teaching hours: 11)**

Antimicrobial activity of nanoparticles- mechanism; Nanoanalytics- Quantum dots - Bioconjugates in cell and tissue imaging; Diagnosis of cancer and other diseases using bionano systems; Drug and gene delivery; Protein targeting-targeting signals, translocation and sorting; Micelles for drug delivery; Proteins and DNA coupled nanoparticles for biosensors; Nanotechnology in agriculture.

EI - 46  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	Basic Knowledge and generation in Nanobiotechnology	K1 & K2
CO2	Physical Characterization of nanoparticles	K2 & K3
CO3	To enhance the technical competence of identifying, analyzing and creating appropriate engineering of biological nanoparticles.	K1 & K4
CO4	New product development.	K2 & K5
CO5	Improving efficiency of existing systems by developing innovative low cost solutions.	K2 & K4

*Note: K1-Remembering; K2 –Understanding; K3 –Applying; K4 –Analysing; K5 –Creating & Evaluating*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2		3						2
CO2	3	2		2						2
CO3	3	3		3						2
CO4	2	2		2		3				1
CO5	3	2		3		3				3

*Indicators: 1. Reasonable 2. Significant 3.Strong*

<b>Text Books</b>				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Drug-like Properties: Concepts, Structure Design and Methods: from ADME to Toxicity Optimization	Li Di and Edward H.Kerns,	Academic Press, Cambridge,	2014 & Second
2	Textbook of Diabetes	Richard I. G. Holt, Clive Cockram, Allan Flyvbjerg, Barry J. Goldstein, W	Wiley - Blackwell	2010 & Fourth
<b>Reference Books</b>				
S. No.	Title	Author	Publishers	Year of Publications
1	Ashton Medicinal Plants for Diabetes - 2013. Published by	Aaron Matas,	Lulu press,	2013

**Pedagogy:** Lecture, PPT presentation, Assignment

EI - 47  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FIFTH	20509W1	ELECTIVE I: IPR AND PATENTING	4	Theory	-	100

**Objective of the Course:** Students are exposed to the basic of IPR including application and obtaining a patent - the significance, knowledge about the copyright and designs. Students also learn about the IPR laws of India and Biotechnology and patents and case studies.

**UNIT I: Basic concepts of Intellectual Property**

**(Teaching hours: 10)**

Introduction to intellectual property rights; Intellectual property laws; Trade related aspects of Intellectual Property Rights; Forms of IPR like patent, design, copyright and bioethics.

**UNIT II: Patents**

**(Teaching hours: 12)**

Introduction to patent law and conditions for patentability; Procedure for obtaining patents; rights of a patentee; patent infringements; Biotechnology patents and patents on computer programs; patents from an international perspective.

**UNIT III: Copyright**

**(Teaching hours: 10)**

Registration procedure and copyright authorities; assignment and transfer of copyright, copyright infringement and exceptions to infringement; Software copyright.

**UNIT IV: Designs**

**(Teaching hours: 11)**

Introduction to the law on industrial designs; registration and piracy; International perspective; registration, commercial exploitation and infringement.

**UNIT V: IPR laws**

**(Teaching hours: 12)**

Rights/protection, infringement or violation, remedies against infringement: civil and criminal; Indian Patent Act 1970 and TRIPS; major changes in Indian patent system as post TRIPS effects; contents of patent specification and the procedure for patents; obtaining patents; geographical indication; WTO; detailed information on patenting biological products; Plant breeders' and farmers' rights; Biodiversity; Budapest treaty; Appropriate case studies.

EI - 48  
2020 - 21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)  
COIMBATORE - 641014  
B.Sc. (BIOTECHNOLOGY)  
(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.	K1 & K2
CO2	To disseminate knowledge on patents, patent regime in India and abroad and registration	K2 & K4
CO3	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development	K2 & K3
CO4	To disseminate knowledge on trademarks and registration aspects, Industrial designs, piracy	K4
CO5	To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects, IPR laws in detail, TRIPS	K3, K4 & K5

Note: K1-Remembering; K2 -Understanding; K3 -Applying; K4 -Analysing; K5 -Creating & Evaluating

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	3	3	2	2	2	3	2
CO2	3	2		2			2	2		1
CO3		3	2	3	2	3	3	2	3	1
CO4	3	2	3	3				3		1
CO5	3	3	3	2	3	2	3	2	3	1

Indicators: 1. Reasonable 2. Significant 3. Strong

Text Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Intellectual property rights in India	Ahuja VK	Lexis Nexis	2015 & First
2	Unfolding Intellectual property rights	Parentek Innovations	Notion press	2019 & First
Reference Books				
S.No.	Title	Author	Publishers	Year of Publications
1	An Introduction to IPR	Venkataraman M		2014

**Pedagogy:** Lecture, PPT presentation, Assignment

FI - 49  
2020 - 21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FIFTH	20509X1	ELECTIVE I: CANCER BIOLOGY	4	Theory	-	100

**Objective of the Course:** To learn the basics and advanced processes of molecular and genetic basis of cancer.

**UNIT I: Introduction to cancer** **(Teaching hours: 11)**

Definition, Cell cycle regulation: intra and extra cellular control of cell division, programmed cell death (apoptosis): intrinsic and extrinsic pathways of cell death. Necrosis, malignancies, angiogenesis; Clinical significances of invasion, Metastatic cascade, Three step theory of invasion.

**UNIT II: Causes of cancer** **(Teaching hours: 11)**

Carcinogens, Chemical carcinogenesis; irradiation carcinogenesis; viral carcinogenesis. oxygen free radicals, aging and cancer; genetic susceptibility and cancer; DNA repair defects and their relationship to cancer, mutagens, and mutations.

**UNIT III: Epidemiology and Etiology of cancer and Cancer Diagnosis** **(Teaching hours: 10)**

Benign and Malignant Tumor, Different Forms of cancer: lung, liver, prostate, breast, colorectal and cervical - Causes, Symptoms and Diagnosis. Biochemical, Imaging and Biopsy – Principle and Procedures. Awareness and challenges faced by cancer patients.

**UNIT IV: Molecular genetics of Cancer** **(Teaching hours: 11)**

Oncogenes, p53, Mechanisms of oncogene activation, Role of growth factors and receptors in carcinogenesis - G – Protein - Linked receptors, RAS signaling in cancer, Familial cancer syndromes and the discovery of tumor suppressors, Heat shock protein-mediated events.

**UNIT V: Tumor Immunology and Cancer Therapy** **(Teaching hours: 12)**

Mechanism of the Immune Response to Cancer: Antigen Presenting Cells; Antigen Processing; T Lymphocytes and T Cell Activation: Cell- Mediated Cytotoxicity. Different forms of therapy, Chemotherapy, Radiation Therapy, Immuno therapy, Applications of new technologies in prevention: gene therapy and Stem cell therapy.

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)  
COIMBATORE - 641014  
B.Sc. (BIOTECHNOLOGY)  
(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	The students learn about the basics of cell and cancer and the cell's response to cancer invasion	K1 & K2
CO2	This course deals with the different modes and causes of cancer which can improve the student's self awareness.	K2 & K4
CO3	This course deals with the symptoms and methods of cancer diagnosis and advanced equipments available for cancer diagnosis	K3 & K5
CO4	This course deals with the molecular genetics and signaling pathways involving cancer cells which gives the strong knowledge about designing cancer drugs.	K2 & K4
CO5	This course deals about the immune response for cancer and the current therapies for cancer treatment	K3 & K5

*Note: K1- Remembering; K2 –Understanding; K3 –Applying; K4 –Analysing; K5 –Creating & Evaluating*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	-	-	1	-	-	2	-	-
CO2	3	1	-	-	1	-	-	-	2	1
CO3	-	-	3	3	1	-	3	-	2	1
CO4	3	1	-	-	1	2	-	2	-	-
CO5	-	-	-	3	1	-	3	2	-	1

*Indicators: 1. Reasonable 2. Significant 3.Strong*

<b>Text Books</b>				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Cancer Biology	Raymond W. Ruddon	Oxford University Press	2007 & Fourth
2	Molecular Biology of Cancer	F.Macdonald, C.H.J Ford, and A.G Casson	Garland science/ Bios scientific Publishers.	2006 & First
<b>Reference Books</b>				
S.No.	Title	Author	Publishers	Year of Publications
1	The Biology of Cancer	Weinberg. Robert A	Garland Science	2007
2	Molecular Biology of Cancer; Mechanisms, targets and therapeutics	Lauren Pecorino	Oxford University press	2008

*Pedagogy: Lecture, Assignment, Seminar*

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory / Practical	Programs %	Theory %
FIFTH	20509Y1	ELECTIVE I: DATABASE MANAGEMENT SYSTEM	4	Theory	-	100

**Objective of the Course:** To inculcate students about basics concepts in Database Management Systems & its model, Structured Query Language, RDBMS and advances in DBMS.

**UNIT I: Introduction to Database Systems**

**(Teaching hours: 11)**

File Management System (FMS) – Database Management System (DBMS) – FMS versus DBMS – Overview of Database Management – Introduction to SQL.

**UNIT II: DBMS Models**

**(Teaching hours: 11)**

The Hierarchical Model – Network Model – Relational Model – Database System Architecture.

**UNIT III: SQL**

**(Teaching hours: 11)**

DDL – Create – Alter – Drop. DML – Insert – Update – Delete – Select. DCL – Commit – Roll Back – Save point. Aggregate Functions, Order by clause, Group by clause, Having. Clause.

**UNIT IV: The Relational Model**

**(Teaching hours: 11)**

Relational Database Characteristics - Relational Databases Primer – Relational Algebra – Database Integrity – Keys – Views.

**UNIT V: Advances in DBMS**

**(Teaching hours: 11)**

Deductive Databases – Internet and DBMS – Multimedia Databases - Mobile Databases.

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	To provide the fundamental knowledge in database systems	K1 & K2
CO2	To develop an understanding about essential of DBMS Models	K1 & K2
CO3	To understand the basic concepts of structures and query language	K1, K2 & K3
CO4	To describe the fundamental elements of relational database management systems	K1 & K2
CO5	To provide the basic knowledge in DBMS advances	K2, K3 & K4

*Note: K1-Remembering; K2-Understanding; K3 -Applying; K4 -Analysing; K5 -Creating & Evaluating*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3							1		1
CO2	3	2	1		2	1		1		1
CO3	3	2	1		2	1		1		1
CO4	3	2	1					1		1
CO5	3				2	1		1		1

*Indicators: 1. Reasonable 2. Significant 3. Strong*

<b>Text Books</b>				
S.No	Title	Author	Publishers	Publication Year & Edition
1	Introduction to Database Management Systems	AtulKahate	Pearson Education	2006 & First
2	Oracle SQL and PL/SQL Handbook	John Adolph Palinski	Pearson Education	2003 & First
<b>Reference Books</b>				
S.No	Title	Author	Publishers	Year of Publications
1	Introduction to Database Management Systems	AtulKahate	Pearson Education	2006
2	Oracle SQL and PL/SQL Handbook	John Adolph Palinski	Pearson Education	2003

*Pedagogy: Lecture, PPT presentation, seminar, assignment*

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FIFTH & SIXTH	20509P & 20609P	CORE: PRACTICAL III - LAB IN ADVANCED BIOTECHNOLOGY	4	Practical	-	-

**Objective of the Course:** On successful completion of the subject student should have understood the molecular techniques in genetic engineering, Animal cell culture, and basics of biopharmaceutical practicals. Advanced techniques incorporated gives good exposure for the students in their real time application.

### **I MOLECULAR BIOLOGY**

1. Growth curve of bacteria
2. Phage titration
3. Isolation of genomic DNA from plant and bacteria
4. Agarose gel electrophoresis
5. Isolation of plasmid DNA from bacteria
6. Restriction digestion and ligation of Lambda phage DNA
7. Bacterial transformation, expression and selection
8. Immobilization of cells and enzymes

### **II ANIMAL BIOTECHNOLOGY**

1. Preparation of Animal cell culture media
2. Primary cell culture (Chicken Fibroblast)
3. Isolation of genomic DNA from animal Tissue

### **III BIOPHARMACEUTICALS**

1. Plant Sample – Collection, Solvent and Aqueous Extraction, Processing
2. Qualitative Phytochemical analysis
3. Quantitative Phytochemical Analysis
4. Antimicrobial Assay – Disc Diffusion Method and Well Diffusion Method
5. Antioxidant Assay



**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)  
COIMBATORE - 641014  
B.Sc. (BIOTECHNOLOGY)  
(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course outcome	CO Statement	Knowledge level
CO	<ul style="list-style-type: none"> <li>➤ Students will know the life with molecular functionalities and able to isolate different types of DNA, and performs PCR, Restriction, Ligation and Transformation protocols</li> <li>➤ Students performs practical related to animal cell and tissue culture using Chick embryo and understands the basics in the ATC.</li> <li>➤ An understanding of production processes and planning in herbs based drugs The ability to practice bio pharmaceuticals and various applications</li> </ul>	K2,K3,K4 & K5

*Note: K1- Remembering; K2 – Understanding; K3 – Applying; K4 – Analyzing; K5 – Creating & Evaluating.*

**Course Outcome mapping with Programme outcome:**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO	3	3	3	3	1	3	3	3	3	3

*Indicators: 1. Reasonable 2. Significant 3.Strong*

Reference Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	An Introduction to Practical Biotechnology	S Harisha	Firewall Media	2005 & First
2	Genetic Engineering Principles and Practice	Sandhya Mitra	Macmillan India	1996 & First
3	Animal Cell Culture: A Practical Approach	R. Ian Freshney	IRL Press	2006 & Fifth
4	Biopharmaceutics and Pharmacokinetics - A Practical Manual	Venkateswaramurthy N, D.Dhachinamoorthi	Pharmamed Press/bsp Books	2010 & First

**Pedagogy:** Lecture, PPT, Demo & Hands on training

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
FIFTH	20509C	SKILL BASED SUBJECT: FOOD BIOTECHNOLOGY	4	Theory	-	100

**Objective of the Course:** To impart knowledge and skills related to basic food chemistry and to make the student to understand the causes of food borne illness and predict the micro organism that can spoil a given food, when prepared, processed and stored

**UNIT I: Food chemistry**

**(Teaching hours: 12)**

Functional properties of sugars and polysaccharides, Proteins and Amino acids, Lipids, Vitamins and Minerals in food, Maillard browning reaction. Enzymatic browning in foods and industrial applications of enzymes. Water in food, water activity and shelf life of food. Natural food flavours, extraction methods and characterization. Pigments in food and their industrial applications.

**UNIT II: Food Additives**

**(Teaching hours: 11)**

Various additives such as preservatives, antioxidants, emulsifiers, sequesterants, humectants, stabilizers, colours, sweeteners, acidulants with respect to chemistry, food uses and functions in formulations.

**UNIT III: Food Fermentation and Food Borne Diseases**

**(Teaching hours: 11)**

Food Fermentation: Sauerkraut, Oriental Fermented foods, Food borne infections and intoxication- Bacteria, Viruses, Protozoan- toxins. Food spoilage causes and prevention Raw material cleaning, sorting and grading of foods. Mixing, emulsification

**UNIT IV: Packaging**

**(Teaching hours: 11)**

Functions of packaging, type of packaging materials, methods of packaging and equipment used, barcodes & other marking, packaging regulations, packaging and food preservation, disposal of packaging materials, rigid and semi rigid containers, flexible containers; sealing equipment, labeling, aseptic and shrink packaging.

**UNIT V: Malnutrition**

**(Teaching hours: 11)**

Causes and effect of malnutrition on the vulnerable section of the society, effect of malnutrition on national development. Measures to combat malnutrition – National nutrition policy and programmes. Importance of therapeutic nutrition, Role of ICDS, WHO, UNICEF, NIN, NFI, CFTRI, FTRI, NNMB in combating malnutrition.

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)  
COIMBATORE - 641014  
B.Sc. (BIOTECHNOLOGY)  
(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	The students will understand the importance of nutritional values in food and food chemistry. The students will understand the industrial enzymes in food and applying in food industries	K2, K3 & K4
CO2	The students will come to know the food additive which will be used in all food materials in daily life	K1 & K2
CO3	The course deals with the pathogens involved in food and causing various diseases and understanding the keen knowledge on fermented foods	K2 & K3
CO4	The students gain knowledge on packaging of foods and evaluate the stability of packing materials which we use to pack foods	K3 & K5
CO5	To impart the knowledge of food safety issues, surveillance and monitoring techniques, impact of malnutrition and methods to overcome and reduce malnutrition.	K1, K2, K3 & K4

Note: K1- Remembering; K2 – Understanding; K3 – Applying; K4 – Analysing; K5 – Creating & Evaluating.

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3					2			
CO2		3					3			
CO3		3	2			3		1		
CO4								3		
CO5	2	2				3			3	

Indicators: 1. Reasonable 2. Significant 3.Strong

Text Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Food science	Potter Norman N, Hotchkiss Joseph,	CBS Publications,	2005 & First
2	Food processing Technology: Principles and Practice	P. Fellow, Wood	Head publishing Limited, Cambridge, England.	2000 & First
Reference Books				
S.No.	Title	Author	Publishers	Year of Publications
1	Food Microbiology	Frazier	Tata McGraw Hill,	2007
2	Nutrition and Dietetics	Joshi S.A.,	Tata Mc Graw Hill Publishing Co. Ltd,	2010

Pedagogy: Lecture, Assignment

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
SIXTH	20609A	CORE: ANIMAL BIOTECHNOLOGY	4	Theory	-	100

**Objective of the Course:** To study the basic concepts in basic Zoology, cell growth and differentiation and Animal tissue culture, students gain knowledge on different media used in ATC and cell culture, cell transformation and transgenesis.

**UNIT I: Animal Classification**

**(Teaching hours: 11)**

Classification Binomial Nomenclature – Invertebrate and Chordata, **Invertebrate** Arthropods (Cockroach), Poriferons (sponges), mollusks (snail), cnidarians (corals), nematodes (worms), Echinoderms. **Chordates**- Pisces (shark), Amphibians (frog), Reptiles (Calotes or Garden lizard), Aves (pigeon), mammalian (rabbit)

**UNIT II: Developmental Biology**

**(Teaching hours: 11)**

Cell growth and differentiation, Gametes: structure, gametogenesis spermatogenesis, oogenesis, fertilization, cleavage: types of cleavage, blastulation, gastrulation.

**UNIT III: Animal tissue culture**

**(Teaching hours: 12)**

Laboratory design and maintenance of ATC laboratory. Animal House and Ethics, Tissue culture media – types and preparation, Role of media components in growth and culture of cells. Growth phase, cell-cell interaction and cell adhesion. Types of contaminants: Physical, chemical and biological. Cryopreservation of animal cells.

**UNIT IV: Types of cell culture**

**(Teaching hours: 12)**

Primary and established cultures, three-dimensional cultures. Trypsinization and types, passaging, characterization of cultured cells, counting of cells: live and dead cells. Flow cytometry: introduction, principle and applications. Toxins and cytotoxic assays

**UNIT V: Cell transformation and Transgenesis**

**(Teaching hours: 10)**

Physical, Chemical, Biological methods of manipulation of cells, study of genetic regulation using animal cells. **Transgenesis:** Transgenic animals, production of transgenic mice, cattle, fish. Gene targeting, gene silencing and gene knock-out.

FI -58  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	The students will understand the basic knowledge of animal kingdom and habits and behavior of animals	K1 & K2
CO2	The students will come to know the process of gametogenesis and development of an organism from an embryo	K2 & K4
CO3	The course will describe as to how animal cell culture, types of media is carried out for research and diagnostic purposes.	K1 & K3
CO4	The students gain knowledge on various cell cultures and use of culture for different purposes	K3, K4 & K5
CO5	How transgenic animals are generated, what are the pros and cons along with ethical issues associated with transgenesis.	K2, K3, K4 & K5

*Note: K1- Remembering; K2 – Understanding; K3 – Applying; K4 – Analysing; K5 – Creating & Evaluating*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1		3								2
CO2		3								2
CO3		2		3						1
CO4		3		3	1					
CO5			3	3	3	3		3	3	3

*Indicators: 1. Reasonable 2. Significant 3.Strong*

Text Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Basic Cell Culture: A practical approach	J M Davis	Oxford University Press	2002 & Two
2	The Life of Vertebrates.	Young, J. Z.	Oxford university press.	2004 & Third
Reference Books				
S.No.	Title	Author	Publishers	Year of Publications
1	Animal Cell Culture: A Practical Approach	Ian Freshney	John Wiley & Sons Inc.	2006
2	Textbook of animal biotechnology,	Carlos Wyatt,	Syrawood Publishing House	2016

*Pedagogy: Lecture, Assignment*

EI - 59  
2020 - 21

Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)  
COIMBATORE - 641014  
B.Sc. (BIOTECHNOLOGY)

(Under Choice Based Credit System)

EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
SIXTH	20609U1	ELECTIVE II: INDUSTRIAL CHEMISTRY	4	Theory	-	100

**Objective of the Course:** To promote critical thinking, problem-solving skills and creative thinking; and to provide the ability to bring the technology into the development of industrial chemistry work.

**UNIT I: Water**

(Teaching hours: 11)

Treatment of water for municipal purposes, sea water as a source of drinking water, Hard and soft water. Types of hardness, softening of water, lime soda process, permutit or zeolite process, ion exchange process, water for industrial purposes, water for laundry work, water for boiler use, water analysis.

**UNIT II: Fermentation**

(Teaching hours: 12)

Introduction, Historical, condition favourable for fermentation, characteristics of enzymes, short account of some fermentation processes: manufacture of beer, fermentation of wort, manufacture of spirits, manufacture of wines, manufacture of vinegar, ethyl alcohol from molasses - preparation of wash - Distillation - alcohol from waste sulphite liquor.

**UNIT III: Dyes**

(Teaching hours: 12)

Introduction, sensation of colour, colour and constitution, classification of dyes according to their mode of application, classification of dyes based on chemical constitution, method of application, general methods of application of dyes on fiber.

**UNIT IV: Biobleaching and Vitamins**

(Teaching hours: 12)

**Biobleaching:** leaching and extraction, mechanism for biobleaching, Direct and Indirect, application and advantages. **Vitamins:** Fat and water soluble vitamins, detection and estimation, source, isolation, diseases caused by its deficiency, adsorption, storage and excretion.

**UNIT V: Small scale units**

(Teaching hours: 12)

Safety matches, agarbattis, naphthalene balls, wax candles, shoe polish, gum paste, writing/fountain pen ink, chalk crayons, plaster of paris, silicon carbide crucibles. Adhesives: Animal glue, other protein adhesives, starch adhesives, synthetic resin adhesives, rubber based adhesives, cellulose and silicate adhesives.

EI - 60  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)  
COIMBATORE - 641014  
B.Sc. (BIOTECHNOLOGY)  
(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	The students will evaluate the water analysis and removal of water hardness. They will determine the level of water hardness and will remove the hardness with various methods.	K1
CO2	It briefly explains the Fermentation types and manufacture of various products using fermentation	K2 & K3
CO3	It explains the production of inorganic and organic industrial products such as dye and fertilizers.	K3 & K4
CO4	From this course the students will understand about the Types, Applications of Bioleaching and Vitamins	K2, K3 & K5
CO5	Analyse the role of surfactant in various value added applications like detergency, adhesives, surface coatings etc.	K1 & K2

*Note: K1-Remembering; K2-Understanding; K3 -Applying; K4 -Analysing; K5 -Creating & Evaluating*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	2	1	1	1	1	3	3
CO2	3	3	3	3		2	3	3	3	3
CO3		2		2	2	1			1	2
CO4	3	3	3	3	2	2	2	2	2	3
CO5	1	2	1	2	2	2	2	2	2	2

*Indicators: 1. Reasonable 2. Significant 3. Strong*

<b>Text Books</b>				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Biotechnology - A Textbook of Industrial Microbiology	Wulf Crueger and Anneliese Crueger	Panima Publishing Corporation New Delhi	2005 & Second
2	Industrial chemistry	B.K.Sharma	Goel publishing House - India	1990-91 & Fourth
<b>Reference Books</b>				
S.No.	Title	Author	Publishers	Year of Publications
1	The Vitamins	Jr and Gerald F. Combs	Academic Press, USA	2012
2	Synthetic Dyes	Gurdeep R. Chatwal	Himalaya Publishing House	1993

*Pedagogy: Lecture, PPT presentation, Assignment*

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
SIXTH	20609V1	ELECTIVE II: ENZYME TECHNOLOGY	4	Theory	-	100

**Objective of the Course:** This paper presents the basic knowledge on enzyme and enzyme reactions and its characteristics along with the production and purification process.

**UNIT I: Introduction**

**(Teaching hours: 10)**

History and development of enzymology. Enzyme as biocatalysts. Enzyme classification and nomenclature. Mechanisms of enzyme action. Concept of active site. Specificity of enzyme action. General principles of enzyme activity. Units of enzyme activity. Sources of enzymes. Regulatory enzymes. Cofactors. Isoenzymes. Coenzyme.

**UNIT II: Kinetics of Enzyme Action**

**(Teaching hours: 10)**

Enzyme kinetics, Michaelis-Menten equation, Significance of MM equation, Line weaver-Burk plot, Eadie Hofstee and Hanes Woolf equation. Briggs Haldane modification of MM equation.

**UNIT III: Inhibitors and types**

**(Teaching hours: 12)**

Reversible and irreversible. Enzyme substrate complex. Nucleophilic and electrophilic attack. Role of metal ions in enzyme catalyst. Enzyme specificity. Factors affecting enzyme activity like temperature, pH, etc. Comparison of enzymes with chemical catalysts.

**UNIT IV: Enzyme production**

**(Teaching hours: 11)**

Membrane bound enzyme extraction. Comparison of enzyme with fermentations. Intrinsic activity of enzymes. Uses of enzymes. Enzyme manufactures. Biochemical applications. Physical and chemical techniques for enzyme immobilization. Production and purification of crude enzyme extracts from plant, animal and microbial sources

**UNIT V: Applications**

**(Teaching hours: 12)**

In Food Industry. Brewing, Baking and Cheese manufacture, Antioxidants. Uses of enzyme in extraction of natural products. Commercial applications of enzymes. Production of Industrial Enzymes. Modified and Artificial Enzymes. Catalytic Antibodies. Enzymes as food processing aids.

EI-62  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	The course provides the fundamentals of enzyme properties, nomenclatures, characteristics, mechanism of enzymes and enzyme specificity	K1 & K2
CO2	The student will learn kinetics of enzyme catalyzed reactions and they apply biochemical calculation for enzyme kinetics	K2 & K3
CO3	The student will understand the regulatory mechanisms of enzyme activity, enzyme inducers and repressors and mainly about the factors affecting enzyme activity	K2 & K3
CO4	Compare methods for production, purification, characterization and immobilization of enzymes	K2 & K4
CO5	The student will get exposure of wide applications of enzymes and their future potential.	K4 & K5

*Note: K1-Remembering; K2-Understanding; K3-Applying; K4-Analysing; K5-Creating & Evaluating*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	1	2	1	1	1	1	1
CO2	2	2	2	2	1	2		2	3	2
CO3	1		1	3		1	3	2	3	
CO4	2	2		1	1	3	1	2	1	2
CO5	1	2	3	2	3	2	1		2	2

*Indicators: 1. Reasonable 2. Significant 3.Strong*

<b>Text Books</b>				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Handbook of Enzyme Biotechnology	Alan Wisemen	Ellis-Horward limited	1995 & Third
2	Enzyme Technology	Pandey A., Webb C., Socol C. R. and Larroche C	Springer	2006 & First
<b>Reference Books</b>				
S.No.	Title	Author	Publishers	Year of Publications
1	Enzymes: Biochemistry, Biotechnology and Clinical Chemistry	Trevor Palmer	Horwood Publishing Limited	2001

*Pedagogy: Lecture, PPT presentation, Assignment*

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
SIXTH	20609W1	ELECTIVE II: BIOPHARMACEUTICALS	4	Theory	-	100

**Objective of the Course:** To enable the students to know the actual path of metabolism of drugs and drug discovery.

**UNIT I: Biological systems**

**(Teaching hours: 11)**

Solubility- factors, Bio-availablility, Agonist, antagonist, synergism; Routes of drug administration, Passage across biological membrane, absorption and distribution of drugs; Binding of drugs to plasma proteins, Drug – dose relationship (ED50, LD50, therapeutic index)

**UNIT II: Drug Metabolism**

**(Teaching hours: 11)**

Drug metabolism (Phase I and Phase II reaction), Microsomal drug metabolism: hydroxylation, conjugation, deamination, N-oxidation, Azo & nitro reduction; Non-microsomal oxidation – oxidative deamination, purine oxidation, dehalogenation, hydrolysis; Elimination of drugs from the body with reference to renal system.

**UNIT III: Drug Receptor and Drug Discovery**

**(Teaching hours: 11)**

Drug Receptor: binding forces in drug – receptor interactions, types of receptors, consequence of drug – receptor interaction, isolation and characterization of receptors. Need for developing new drugs, procedure followed in drug designing, molecular modification of lead compounds, Active site determination of enzymes, Design of enzyme inhibitors.

**UNIT IV: Pharmaceutical products**

**(Teaching hours: 12)**

Antibiotics: penicillin, streptomycin, tetracycline, Vitamins, Plant Secondary metabolites: Alkaloids, flavanoids, steroids, terpenoids.

**UNIT V: Use of DNA technology in pharma products**

**(Teaching hours: 12)**

Therapeutic proteins- insulin, human growth hormone, clotting factors, interferons, interleukins, tissue plasminogen activators (tPA), Erythropoietin, production, and applications.

FI - 64  
2020 - 21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	This course enables the students to learn about basics of drugs and distribution of drugs in biological systems.	K1 & K3
CO2	This course deals with different types of chemical components of drugs and their metabolism and elimination.	K3 & K4
CO3	The students gain knowledge about components involved in drug discovery and its mechanism so that they can have a strong base in pharmaceutical biotechnology.	K2, K3 & K5
CO4	This course deals about the production and application of pharmaceutical products which is the platform for pharmaceutical industries.	K2, K3 & K5
CO5	This course deals about the production and application of genetically engineered pharmaceuticals which is a blooming field in biotechnology, where there exists ample of scope for a job in bio products based commercial sectors.	K3, K4 & K5

Note: K1-Remembering; K2-Understanding; K3-Applying; K4-Analysing; K5-Creating & Evaluating

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	-	-	-	-	1	-	-	1
CO2	1	-	2	-	2	-	-	-	-	1
CO3	-	1	-	3	1	-	-	-	-	2
CO4	-	-	3	3	3	2	3	3	1	1
CO5	-	1	3	-	-	-	3	3	1	1

Indicators: 1. Reasonable 2. Significant 3.Strong

Text Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Introduction to Drug Design	SN Pandeya	New Age International Publication	2007 & First
2	Pharmacology and Pharmacotherapeutics	Satoskar, R.S., Bhandarkar, S.D., Ainapure, S.S	Popular Prakashan, Mumbai	2002 & Seventeenth
Reference Books				
S.No.	Title	Author	Publishers	Year of Publications
1	Industrial Pharmaceutical Biotechnology	Heinrich Klefenz	Wiley-VCH publication, Germany	2002
2	Pharmaceutical Biotechnology	Daan Crommelin, Robert D Sindelar	Taylor and Francis publications, New York	2002
3	Handbook of Pharmaceutical Biotechnology	Jay P. Rho, Stan G Louie	Pharmaceutical products press, New York	2003
4	Theory and Practice of Industrial Pharmacy	Lachman L Lieberman, HA Kanig. J., Easton, PA	Varghese publishing & Co	2000

Pedagogy: Lecture, Assignment, Seminar

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theory %
SIXTH	20609X1	ELECTIVE II: HUMAN ANATOMY AND PHYSIOLOGY	4	Theory	-	100

**Objective of the Course:** Students get to know about body composition, organs and systems. Syllabus give the insight into the complete body functioning.

**UNIT I: Introduction to Human Body , Human Tissue and Muscular System** (Teaching hours :11)

Overview of Anatomy and Physiology, Structural Organization of Human Body, Homeostasis, Medical Imaging: X-Rays, CT Scan, MRI Scan and Ultra Sonography - Principle, Working and Applications, Anatomical and Medical Terminologies. Tissue: Definition and Origin, Classification and Functions of Epithelial Tissue, Connective Tissue, Muscle Tissue and Nervous Tissue. Structure and function of muscles, Muscle contraction- Voluntary and involuntary actions.

**UNIT II: Bone Tissue and Skeletal System & Integumentary System** (Teaching hours:11)

Bone classification, Structure of Bone, Bones Cells and Tissues, Bone formation and development - Structure, Classification and Function of Axial Skeleton, Appendicular Skeleton and Joints. Layers of Skin, Accessory structures of skin, Functions of Integumentary system.

**UNIT III: Nervous System & Endocrine System** (Teaching hours :12)

Basic structure and function of nervous system: CNS, PNS and ANS, Structure of Brain and Vertebral Column, Neuron: Structure, Types and Function, Synapse; Function of Nervous Tissue. Structure and Function of Pituitary Gland and hypothalamus, Thyroid Gland, Parathyroid Gland, Adrenal Gland and Pineal Gland, Gonadal and Placental Hormone and Endocrine Pancreas.

**UNIT IV: Circulatory, Cardiovascular System & Respiratory System** (Teaching hours :11)

Blood: Hematopoiesis, Classification and Function of Erythrocytes, Leucocytes and Thrombocytes - Structure and Function of Heart and Blood Vessels, Cardiac Muscle and Electrical Conductivity, Principle and working of ECG. Structure and Function of Respiratory system, Structure of Lungs, Process of Breathing, Gas Exchange and Transport.

**UNIT V: Digestive System Urinary System & Reproductive System** (Teaching hours:12)

Digestive System Organs – The Mouth, Pharynx, Esophagus, the Stomach, the Small and Large Intestine , Accessory Organs in Digestion – Liver, Pancreas and Gall Bladder - Structure and Function. Kidney – Structure and Function, Nephrons - Structure and Function, Process of Micturition, Formation of Urine and Characteristics of Urine, Male reproductive System – Anatomy and Function of Male Reproductive organ, Spermatogenesis and Structure of Sperm. Female Reproductive System - Anatomy and Function of Female Reproductive organ, Oogenesis, Menstrual Cycle.

ny

EI-66  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	The students will understand the basic about human anatomy and physiology and compares living and lifeless organisms. This course will give knowledge about Anatomical and Medical Terminologies of human body	K1 & K2
CO2	The students will properly apply structure of skeletal system and lists out the tissues of skeletal system and defines the structure and functions of joints, properties of bone tissue.	K1, K2 & K3
CO3	Understands to learn about the nervous system and sense organs and categorizes endocrine organs and tells how hormones work	K2, K3 & K4
CO4	This course will explain the properties of circulatory, respiratory systems and their structure and functions of heart. Explains how that respiratory system and tells the structure and functions of lungs.	K1 K3 & K4
CO5	The students should learn properties of digestive and excretory systems and the tell the importance. The students will have lifelong learning about organs of reproductive system and the structure of female reproductive organ and male reproductive organ.	K1 & K2

*Note: K1-Remembering; K2 –Understanding; K3 –Applying; K4 –Analysing; K5 –Creating & Evaluating*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1		3	3	1	2	1	1		1
CO2	1	2					2			
CO3			2							
CO4					2			2		
CO5	3	2	3	3		2	1	3	2	1

*Indicators: 1. Reasonable 2. Significant 3.Strong*

<b>Text Books</b>				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Anatomy and Physiology	J. Gordon Betts	Opens tax college	2010 & First
2.	Human Anatomy and Physiology	Elaine N. Marieb and Katja Hoehn	Benjamin-Cummings Pub Co	2003, Second
<b>Reference Books</b>				
S.No.	Title	Author	Publishers	Year of Publications
1	Textbook of Anatomy and Physiology for Nurses and Allied Health Science	Indu Khurana.Arushi	Sathish Kumar jain and Produced by Vinod K.Jain CBS Publishers and Distributors Pvt .Ltd.	2010
2	Human Anatomy and Physiology,	Wilhelm and Patricia Brady	McGraw-Hill, New York.	2009

*Pedagogy: Lecture, PPT presentation, Seminar, E Books*

EI - 67  
2020 - 21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**  
**EFFECTIVE FOR THE STUDENTS ADMITTED DURING THE ACADEMIC YEAR 2020-2021**

Semester	Course Code	Course Title	Credits	Theory/ Practical	Problems %	Theor y %
SIXTH	20609Y1	ELECTIVE II: COMPUTER NETWORKING AND PARTICIPATIVE JOURNALISM	4	Theory	-	100

**Objective of the paper:** To orient the students on the basics of computers, world wide web and its functioning. To create an awareness among the student community about the Emerging trends in Social media platforms.

**UNIT I: Basics of computers**

**(Teaching hours: 11)**

Hardware and Software – Modem, Hard Disk, CD ROM, Control Panel, CPU

**UNIT II: Internet**

**(Teaching hours: 11)**

Internet- History and Structure, Internet Explorer, Email- Search Engines: Yahoo, Netscape and Others- HTML Basics

**UNIT III: Computer Networks**

**(Teaching hours: 11)**

Classification-Interconnectivity-Administration- Network Architecture and Applications. Types of Computer Networks -Ethernet-Types-Virtual LAN. Computer Network Topologies- Network Components: Network cables – Distributors – Routers – Network cards -USB. Network Security: Secret Key and Public Key Encryption-Message Digest. Transmission Media: Magnetic- Twisted Pair – Coaxial – Fiber optics – Wireless Transmission. Switching: Circuit, Message, and Packet Switching.

**UNIT IV: Computer Network Model**

**(Teaching hours: 11)**

Layered Tasks- OSI Model – Physical Link Layer- Data Link Layer- Network Layer – Transport Layer- Session Layer – Presentation Layer – Application Layer. TCP/IP Protocol Suite. Addressing: Physical Address- Logical Address- Port address- specific address.

**UNIT V: Social media platforms**

**(Teaching hours: 11)**

Emerging trends in Social media platforms -Blogging, Twitter, Instagram, Facebook, Online Journalism, Citizen Journalism. Cyber laws in India, Code of Ethics in Web Media.

EI-68  
2020-21

**Dr G R DAMODARAN COLLEGE OF SCIENCE (AUTONOMOUS)**  
**COIMBATORE - 641014**  
**B.Sc. (BIOTECHNOLOGY)**  
**(Under Choice Based Credit System)**

**Course Outcome mapping with Knowledge level**

Course Outcome	CO Statement	Knowledge level
CO1	Course emphasizes on the Basics of computers	K1 & K2
CO2	Students get to know the Basics of world wide web	K1,K2 & K3
CO3	Basics and fundamentals of Computer Networks	K1,K2 & K3
CO4	Chapter details about the Computer Network Model	K1,K2 & K5
CO5	Emerging trends in Social media platforms.	K2,K3 & K4

*Note: K1-Remembering; K2 –Understanding; K3 –Applying; K4 –Analysing; K5 –Creating & Evaluating*

**Course Outcome mapping with Programme outcome**

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1				2	3					3
CO2				2	3					3
CO3				2	3					3
CO4				2	3					3
CO5				2	3					3

*Indicators: 1. Reasonable 2. Significant 3.Strong*

Text Books				
S.No.	Title	Author	Publishers	Publication Year & Edition
1	Data Communication and Networking	Behorouz A Forouzan	McGraw Hill Companies	2007 & Fourth
Reference Books				
S.No.	Title	Author	Publishers	Year of Publications
1	E- Resources	-	-	-