



HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai.)

Uthamapalayam, Theni District. Pin Code: 625 533.

DEPARTMENT OF BIOCHEMISTRY

BACHELOR OF SCIENCE – BIOCHEMISTRY

SYLLABUS

Choice Based Credit System – CBCS

(As per TANSCH/MKU Guidelines)

with

Outcome Based Education (OBE)

(Academic Year 2020 -2021 onwards)

HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

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Uthamapalayam, Theni District. Pin Code: 625 533.

Name of the Programme: B.Sc. Biochemistry

Choice Based Credit System (CBCS)

(As per TANSCH/ MKU Guidelines)

with

Outcome Based Education (OBE)

(with effect from the Academic Year 2020 – 2021)

College Vision and Mission

Vision

Our vision is to provide the best type of higher education to all, especially to students hailing from minority Muslim community, rural agricultural families and other deprived, under privileged sections of the society, inculcating the sense of social responsibility in them. Our college is committed to produce talented, duty-bound citizens to take up the challenges of the changing times.

Mission

Our mission is to impart and inculcate social values, spirit of service and religious tolerance as envisioned by our beloved Founder President Hajee Karutha Rowther.

The Vision beckons the Mission continues forever.

Programme Educational Objectives (PEO)

Our graduates will be progressive, efficient, value based, academically excellent, creative, collaborative, empowered and globally competent literates with the skills required for societal change.

They will demonstrate

PEO1	Comprehensive knowledge and expertise, employability, the acumen of creative and critical thinking, the spirit of enquiry and professional attitude required for a successful career
PEO2	Accountability, linguistic competence and communication skills in the work environment and beyond
PEO3	Perseverance, effective collaboration, team spirit, leadership and problem solving skills
PEO4	Keen sense of civility, professional ethics, receptivity and moral righteousness
PEO5	Commitment to address social and environmental threats and to act as responsible service-minded, duty-bound global citizens

Department Vision and Mission

Vision

The department of biochemistry discerns to provide quality students trained in the contemporary biochemical tools and technology and to achieve academic excellence in biochemistry. Imparting in depth knowledge to the students, facilitating research activities and cater the ever changing industrial demand and societal needs.

Mission

Strive and achieve a quality education that help the students to enhance problem solving skills to be successful in their professional lives and to prepare students a lifelong learner offering solid theoretical and practical foundation in various discipline of the biochemistry. Also educate them about their professional and ethical responsibilities that benefit the society at large.

Programme Outcomes (P0)

On completion (after three years) of B.Sc. Biochemistry programme, the students are able to

P01	Knowledge on the basic concept of Bio organic molecule, structure and functions enable to become excellent in Biochemistry.
P02	Understand fundamental concepts of enzymes and its characteristics, Anabolic and Catabolic functions of the Biomolecules.
P03	Acquiring the knowledge on techniques and biology module in biotechnology, bioinformatics, biostatistics, immunology, lab technology and microbiology.
P04	Use the skill in analyzing the bioorganic compounds qualitatively and quantitatively that includes biochemical, microbiological, immunological and molecular biology techniques.
P05	Enhance entrepreneurial skills to be self-employable.

Programme Specific Outcomes (PSO):

A graduate of B. Sc. Biochemistry Programme after 3 years will

PSO1	Graduates will be able to be successful biochemist in medical & food industries
PSO2	Graduates will be pursuing the higher studies in various fields of biochemistry
PSO3	Graduates able to integrate knowledge in classical laboratory technique & to use modern instrumentation and able to work a team member.
PSO4	Graduates be able to communicate (written & oral) scientific information to biochemist & non- biochemist
PSO5	Graduates will be knowledgeable in ethical practices in science.

Programme Scheme

Eligibility

A pass in +2 examination conducted by the board of higher secondary education, Government of Tamil Nadu with Science as one of the subject or any other examination accepted by the syndicate as equivalent.

For Programme Completion

A Candidate shall complete:

- Part I - Language papers – Tamil/Arabic/Malayalam in semesters I, II, III and IV respectively
- Part II - Language papers - English in semesters I, II, III, IV respectively
- Part III - Core papers in semesters I, II, III, IV, V and VI respectively
- Part III - Allied papers in semesters I, II, III, and IV respectively
- Part III - Elective papers in semesters V and VI respectively
- Part IV - Non- Major Elective papers in semesters I and II respectively
- Part IV - Skill based Subject papers in semesters V and VI respectively
- Part IV - Value Education paper in semester I
- Part IV - Environmental Studies paper in semester II
- Part V - Extension activity in semester IV

Scheme of Examinations under Choice Based Credit System

Term End Examinations (TEE)	- 75 Marks
Continuous Internal Assessment Examinations (CIAE)	- 25 Marks
Total	- 100 Marks

Pattern of Continuous Internal Assessment Examinations (CIAE)

Average of Two Internal Tests (each 20 marks)	- 20 Marks
Assignment	- 05 Marks
Total	- 25 Marks

Pattern of Term End Examinations

(Max. Marks: 75 / Time: 3 Hours)

External Examinations Question Paper Pattern for Part I & III and Part IV (Non- Major Elective & Skill based Subject)

Section – A (10 X 1 = 10 Marks)

Answer ALL questions.

- Questions 1 - 10
- Two questions from each unit
- Multiple choice questions and each question carries Four choices

Section – B (5 X 7 = 35 Marks)

Answer ALL questions choosing either A or B.

- Questions 11 - 15
- Two questions from each unit (either.... or.... type)
- Descriptive Type

Section – C (3 X 10 = 30 Marks)

Answer any THREE out of five questions.

- Questions 16 - 20
- One question from each unit
- Descriptive Type

External Examinations Question Paper Pattern for Part IV (Environmental Studies and Value Education)

Section – A: (5 X 6 = 30 Marks)

Answer ALL questions choosing either A or B.

- Questions 1 - 5
- Two questions from each unit (either.... or.... type)
- Descriptive Type

Section – B (3 X 15 = 45 Marks)

Answer any THREE out of five questions.

- Questions 6 - 10
- One question from each unit
- Descriptive Type

Part V (Extension Activities)

- Internal Evaluation

Passing Marks

Minimum 27 for External Exam

Eligibility for the degree – passing minimum is **40%**

Practical Examination

Internal – 40 marks

External – 60 marks

Total – 100 marks

Passing minimum is **40%**

Weightage

Weightage for Bloom's Taxonomy	Percentage	Marks	
		CIAE	TEE
Knowledge (Remembering) – K1	40	10	30
Understanding – K2	40	10	30
Applying – K3	20	5	15
Gross Total	100	25	75

Assessment

Distribution of questions and marks for Continuous Internal Assessment Examinations

Bloom's Taxonomy	Section A	Section B	Section C	Total
Knowledge(K1)	2 (2)	1 (a or b) (3)	1 (5)	25 marks
Understanding(K2)	2 (2)	1 (a or b) (3)	1 (5)	
Apply(K3)	Assignment (5)			

Distribution of questions and marks for Term End Examinations

Bloom's Taxonomy	Section A	Section B	Section C	Total
Knowledge(K1)	2 (2)	4 (a or b) (28)	-----	Total 75 Marks
Understanding(K2)	3 (3)	1 (a or b) (7)	2 out of 3 (20)	
Apply(K3)	5 (5)	-----	1 out of 2 (10)	

Note: Figures in parenthesis are Marks

Credits Distribution

Part	Course Category	Courses	Credits	Total Marks
I	Tamil/ Arabic/ Malayalam	4	12	400
II	English	4	12	400
III	Core, Elective & Allied	25	98	2500
IV	Non- Major Elective	2	4	200
	Skill based Subject	4	8	400
	Value Education	1	2	100
	Environmental Studies	1	2	100
V	Extension Activities	1	2	100
		42	140	4200

Details of Course Category, Code, Credits & Title

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
Semester - I							
Part - I							
Language - I	20UTAL11/ 20UARL11/ 20UMLL11	Tamil / Arabic / Malayalam	6	25	75	100	3
Part - II							
English - I	20UENL11	English for Enrichment - I	6	25	75	100	3
Part - III (OBE)							
Core – I	20UBCC11	Biomolecules	5	25	75	100	5
Core – III	20UBCC2P	Qualitative Analysis of Biopolymer	3	-	-	-	-
Allied – I	20UCHA11	Organic, Inorganic & Physical Chemistry - I	4	25	75	100	3
Allied – III	20UCHA2P	Volumetric Analysis	2	-	-	-	-
Part - IV							
NME – I	20UBCN11	Human Health and Nutrition	2	25	75	100	2
VED	20UVED11	Value Education	2	25	75	100	2
Total			30			600	18
Semester - II							
Part - I							
Language - II	20UTAL21/ 20UARL21/ 20UMLL21	Tamil / Arabic / Malayalam	6	25	75	100	3
Part - II							
English - II	20UENL21	English for Enrichment - II	6	25	75	100	3
Part - III (OBE)							
Core – II	20UBCC21	Biochemical Techniques	5	25	75	100	5
Core – III	20UBCC2P	Qualitative Analysis of Biopolymer	3	40	60	100	3
Allied – II	20UCHA21	Organic, Inorganic & Physical Chemistry - II	4	25	75	100	3
Allied – III	20UCHA2P	Volumetric Analysis	2	40	60	100	2
Part - IV							
NME – II	20UBCN21	Herbal Medicine	2	25	75	100	2
EVS	20UEVS21	Environmental Studies	2	25	75	100	2
Total			30			800	23

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
Semester - III							
Part - I							
Language- III	20UTAL31/ 20UARL31/ 20UMLL31	Tamil / Arabic / Malayalam	6	25	75	100	3
Part - II							
English - III	20UENL31	English for Enlightenment - I	6	25	75	100	3
Part - III (OBE)							
Core – IV	20UBCC31	Human Physiology	5	25	75	100	4
Core – V	20UBCC32	Enzyme Technology	4	25	75	100	4
Core – VIII	20UBCC4P	Quantitative analysis of Bio organicCompounds	3	-	-	-	-
Allied - IV	20UMBA31	Allied Biology - I	4	25	75	100	3
Allied - VI	20UMBA4P	Allied Biology Practical -I	2	-	-	-	-
Total			30			500	17
Semester – IV							
Part - I							
Language - IV	20UTAL41/ 20UARL41/ 20UMLL41	Tamil / Arabic / Malayalam	6	25	75	100	3
Part - II							
English - IV	20UENL41	English for Enlightenment - II	6	25	75	100	3
Part – III (OBE)							
Core – VI	20UBCC41	Biometabolism	5	25	75	100	5
Core - VII	20UBCC42	Microbiology	4	25	75	100	4
Core - VIII	20UBCC4P	Quantitative analysis of Bio organic Compounds	3	40	60	100	4
Allied - V	20UMBA41	Allied Biology - II	4	25	75	100	3
Allied - VI	20UMBA4P	Allied Biology Practical -I	2	40	60	100	1
Part - V							
EA		Extension Activities**	--	100	--	100	2
Total			30			800	25

Part – V
Extension Activities**

S. No.	Course Code	Course Title	Max. Marks	Credits
1.	20UNCC41	National Cadet Corps (Army)	100	2
2.	20UNCC42	National Cadet Corps (Navy)	100	2
3.	20UNSS41	National Service Scheme	100	2
4.	20UPED41	Physical Education	100	2
5.	20UYRC41	Youth Red Cross	100	2
6.	20URRC41	Red Ribbon Club	100	2
7.	20UHRC41	Human Rights Club	100	2
8.	20UCOC41	Consumer Club	100	2
9.	20UYOC41	Yoga Club	100	2
10.	20UHFC41	Health and Fitness Club	100	2
11.	20UECC41	Eco Club	100	2
12.	20ULIC41	Library & Information Science Club	100	2
13.	20USCC41	Science Communication Club	100	2
14.	20UFAC41	Fine Arts Club	100	2

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
Semester - V							
Part - III (OBE)							
Core - IX	20UBCC51	Cell and Molecular Biology	5	25	75	100	5
Core - X	20UBCC52	Clinical Biochemistry	4	25	75	100	4
Core – XI	20UBCC53	Endocrinology	4	25	75	100	4
Core – XV	20UBCC6P	Clinical Biochemistry Practical	3	-	-	-	-
Core – XVI	20UBCC6Q	Microbiology Practical	3	-	-	-	-
Core – XVII	20UBCC6R	Immuno and Biochemical Techniques Practical	3	-	-	-	-
Elective - I	20UBCE51	Bioinformatics	4	25	75	100	4
	20UBCE52	Medical Lab Technology					
	20UBCE53	Vermicomposting and Mushroom Technology					
Part - IV							
SBS - I	20UBCS51	Nutrition	2	25	75	100	2
SBS - II	20UBCS52	General Studies	2	25	75	100	2
Total			30			600	21
Semester - VI							
Part - III (OBE)							
Core –XII	20UBCC61	Immunology	5	25	75	100	5
Core – XIII	20UBCC62	Plant Biochemistry	4	25	75	100	4
Core - XIV	20UBCC63	Biostatistics	4	25	75	100	4
Core – XV	20UBCC6P	Clinical Biochemistry Practical	3	40	60	100	5
Core - XVI	20UBCC6Q	Microbiology Practical	3	40	60	100	5
Core – XVII	20UBCC6R	Immuno and Biochemical Techniques Practical	3	40	60	100	5
Elective - II	20UBCE61	rDNA Technology	4	25	75	100	4
	20UBCE62	Food Biotechnology					
	20UBCE63	Dairy Biochemistry					
Part - IV							
SBS – III	20UBCS61	Pharmacology	2	25	75	100	2
SBS - IV	20UBCS62	General Aptitude	2	25	75	100	2
Total			30			900	36
Grand Total			180			4200	140

Course Code	Course Title	Category	Total Hours	Credits
20UBCC11	Biomolecules	Core - I	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students, acquire knowledge on occurrence, structure, physical and chemical properties, classification and biological role of biomolecules.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	List the general classification and basic structural organization of biomolecules	K1, K2
C02	Represent the comparison of physical and chemical properties of biomolecules.	K1, K2
C03	Manipulate the importance of various biomolecules in life process of all living organism.	K1, K2, K3
C04	Explain the cause of disease due to vitamin deficiency.	K1, K2, K3
C05	Summaries the monomer to polymer of biomolecules.	K1, K2

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	2	3	3	2
C02	3	3	3	3	3
C03	3	3	3	3	3
C04	2	2	3	2	2
C05	3	2	1	2	1

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	2
CO2	3	3	3	2	2
CO3	3	3	3	3	3
CO4	3	2	3	3	3
CO5	3	2	2	2	2
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

20 Hours

Chemistry of Carbohydrates: Occurrence and general importance of carbohydrates. Monosaccharide: Basic structures of glucose and its isomer and linkages - Disaccharides: Lactose, Maltose and Sucrose. Polysaccharides: Energy storage polysaccharide - Starch, Dextrin and Glycogen, Structural polysaccharide - Cellulose.

UNIT II

14 Hours

Chemistry of Proteins: Classification of amino acids, Physical properties of amino acids - solubility, electrical properties and Fundamental role of proteins in life, composition of proteins, General properties of proteins and Classification on the basis of biological functions.

UNIT III

20 Hours

Chemistry of Lipids: Fatty acids: Classification of some naturally occurring fatty acids - saturated fatty acids, unsaturated fatty acids, branched chain fatty acids, hydroxyl, keto derivatives and cyclic fatty acids. Physical properties of fatty acids - polymorphism, solubility, boiling point, absorption and Petrochemical properties of fatty acids - salt detergents and wetting agents, esters - reactions of unsaturated fatty acids - hydrogenation, halogenations and oxidation. Fats: Chemical composition, Physical and chemical properties of fats - Waxes - Phospholipids - Classification - non phospholipids - steroids.

UNIT IV

11 Hours

Chemistry of Nucleic acids: Fundamental role of nucleic acids in life processes. DNA and RNA: Structure of bases - nucleotides and nucleosides - bonds linking the various bases, primary, secondary and three dimensional structures.

UNIT V

10 Hours

Vitamins: Introduction of Vitamins - Sources, Functions and deficiency states of Vitamin A, D, E, and K and Water soluble vitamins.

Text Books

- L. Veerakumari, **Biochemistry**, MJP Publisher.com, Chennai, 2005, 1st Edition.
Ambika Shanmugam, **Fundamentals of Biochemistry**, Published by the author, Chennai, 2004, 7th Edition
U. Sathyanarayana, **Essentials of Biochemistry**, Books and Allied Pvt. Ltd, Kolkata, first Publication 2002, Reprint 2003.

Reference Books

- Lehninger, **Biochemistry**, Kalyani Publisher, New Delhi, 2016, 2nd Edition.
Mohan P Arora, **Biomolecules**, Himalaya Publishing, Chennai, 2009, 1st Edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Occurrence and importance of carbohydrates	2	Discussion
1.2	Basic structures of glucose	2	E-Resources
1.3	Disaccharides: Lactose	2	Discussion
1.4	Maltose	2	Discussion
1.5	Sucrose	2	Discussion
1.6	Polysaccharides: Energy storage polysaccharide	2	E-Resources
1.7	Starch	2	Discussion
1.8	Dextrin	2	Discussion
1.9	Glycogen	2	E-Resources
1.10	Structural polysaccharide - Cellulose	2	Discussion
UNIT - II			
2.1	Classification of amino acids	3	Discussion
2.2	Physical properties of amino acids	3	E-Resources
2.3	Fundamental role of proteins in life	3	Discussion
2.4	Composition and General properties of proteins	3	Discussion

2.5	Classification on the basis of biological functions	2	Discussion
UNIT - III			
3.1	Classification of naturally occurring fatty acids	3	Discussion
3.2	Physical properties of fatty acids	3	E-Resources
3.3	Petrochemical properties of fatty acids	2	Discussion
3.4	Reactions of unsaturated fatty acids	2	Discussion
3.5	Fats: Chemical composition	2	Discussion
3.6	Physical and chemical properties of fats	2	E-Resources
3.7	Waxes	2	Discussion
3.8	Phospholipids	2	Discussion
3.9	Classification	2	Discussion
UNIT - IV			
4.1	Fundamental role of nucleic acids in life processes	2	Discussion
4.2	DNA and RNA	4	E-Resources
4.3	Structure of bases - nucleotides and nucleosides	3	Discussion
4.4	Primary, secondary and three dimensional structures	2	Discussion
UNIT - V			
5.1	Introduction of Vitamins	2	Discussion
5.2	Sources, Functions and deficiency states	2	E-Resources
5.3	Vitamin A, D, E, and K	4	Discussion
5.4	Water soluble vitamins	2	Discussion
Total		75	

Course Designer

Ms. R. Vanitha

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UCHA11	Organic, Inorganic and Physical Chemistry - I	Allied-IV	60	3

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To recognize the properties of hydrogen, oxides, water, colloids carbohydrates, stereoisomerism, amino acids, proteins and dyes.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	List the preparation and properties of hydrides, oxides, hardness of water and its implications.	K1
C02	Classify the colloidal states of matter and its applications	K1, K2
C03	Demonstrate the reactions of glucose, fructose and sucrose and relate their uses	K1, K2
C04	Explain the concept of enantiomers, diastereoisomers and geometrical isomers	K1, K2
C05	Identify the properties, classification and functions of proteins and dyes	K1, K2, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	2	2	3	2
C02	3	3	2	2	2
C03	3	2	2	3	2
C04	3	2	2	3	2
C05	3	3	2	2	2

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
C01	3	2	2	3	2
C02	3	3	2	2	2
C03	3	2	2	3	2
C04	3	2	2	3	2
C05	3	3	2	2	2
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

12 Hours

Hydrogen: Isotopes of hydrogen – preparation, properties and uses of heavy hydrogen – hydrides – definition – classification – examples - Oxides – Definition – classification – examples. Water: Hardness of water – types of hardness – removal of hardness – industrial implications of hardness in water – estimation by EDTA method (outline only) - Units of hardness of water.

UNIT II

12 Hours

Colloids: Colloidal states of matter – various types – classification - Sols – dialysis – electro osmosis – electrophoresis – stability of colloids – protective action – Hardy Schulze law – gold number - Emulsion: Types of emulsions – emulsifier with examples - Gels: Classification, preparation - Applications of colloids.

UNIT III

12 Hours

Carbohydrates: Definition – classification – monosaccharides – properties and uses of glucose and fructose – Haworth structure (glucose only) – conversion of glucose to fructose and vice versa, mutarotation - Disaccharides: Sucrose – structure – distinction between sucrose, glucose and fructose - Polysaccharides: Starch and cellulose (Structure only) – cellulose derivatives.

UNIT IV

12 Hours

Stereoisomerism – chiral center – optical activity of compounds containing one or two chiral centers (lactic and tartaric acid) – R-S notation – enantiomers – diastereoisomers – racemization – resolution - Geometrical isomerism of maleic and fumaric acids - E-Z notation of geometrical isomers.

UNIT V

12 Hours

Amino acids and proteins: Classification – synthesis – properties of amino acids – action of heat, dipolar ion, iso-electric point, and Ruhemann's purple - polypeptides – proteins – classification and biological functions.

Dyes: Definition – theory of colour and constitution – classification based on structure and applications – preparation of methyl orange – Bismark brown, malachite green – vat dye – indigo.

Reference Book

B. S. Bahl & Arun Bahl, *Advanced Organic Chemistry*, S. Chand & Company, New Delhi, 2009.

B.R. Puri and L.R. Sharma and Madan S. Pathania, *Principles of Physical Chemistry*, Vishal Publishing Co., Jalandhar, 2005.

R.D. Madan, *Modern Inorganic Chemistry*, S. Chand, 2013, revised edition,

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Isotopes of hydrogen – preparation, properties and uses of heavy hydrogen	2	Chalk & Talk
1.2	Hydrides – definition – classification – examples	2	E-Resources
1.3	Oxides – Definition – classification – examples	2	E-Resources
1.4	Hardness of water – types of hardness	2	Chalk & Talk
1.5	Removal of hardness - industrial implications of hardness in water	2	E-Resources
1.6	Estimation by EDTA method - Units of hardness of water.	2	E-Resources

UNIT - II			
2.1	Colloidal states of matter – various types – classification	2	E-Resources
2.2	Sols – dialysis – electro osmosis – electrophoresis	2	Chalk & Talk
2.3	Stability of colloids – protective action – Hardy Schulze law – gold number	2	E-Resources
2.4	Types of emulsions – emulsifier with examples	3	E-Resources
2.5	Classification, preparation - Applications of colloids	3	E-Resources
UNIT - III			
3.1	Carbohydrates: Definition – classification – monosaccharides – properties and uses of glucose and fructose	4	E-Resources
3.2	Haworth structure of glucose mutarotation	2	E-Resources
3.3	Conversion of glucose to fructose and vice versa,	2	Chalk & Talk
3.4	Sucrose – structure – distinction between sucrose, glucose and fructose	2	E-Resources
3.5	Starch and cellulose – cellulose derivatives	2	Chalk & Talk
UNIT - IV			
4.1	Stereoisomerism – chiral center – optical activity of compounds containing one or two chiral centers (lactic and tartaric acid)	4	E-Resources
4.2	R-S notation – enantiomers – diastereoisomers – racemization – resolution	4	Chalk & Talk
4.3	Geometrical isomerism of maleic and fumaric acids	2	Chalk & Talk
4.4	E-Z notation of geometrical isomers	2	E-Resources

UNIT - V			
5.1	Amino acids and proteins: Classification – synthesis	2	E-Resources
5.2	Properties of amino acids – action of heat, dipolar ion, iso-electric point, and Ruhemann's purple	3	Chalk & Talk
5.3	Polypeptides – proteins – classification and biological functions	2	E-Resources
5.4	Dyes: Definition – theory of colour and constitution – classification based on structure and applications	2	E-Resources
5.5	Preparation of methyl orange – Bismark brown, malachite green – vat dye – indigo	3	Chalk & Talk
Total		60	

Course Designer

Dr. S. Sivakumar

Assistant Professor of Chemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC21	Biochemical Techniques	Core - II	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To prepare the students acquire knowledge of different experimental technique used in biochemistry and molecular biology.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Define the general principle, instrumentation, application of biochemical techniques.	K1, K2, K3
C02	Explain the techniques that are used to analyze and separate the unknown sample present.	K1, K2
C03	Find many problems of our life using various solve technique such as PCR, Autoradiography.	K1, K2, K3
C04	Represent the comparison of different wavelength regions of rays to give different coloured band.	K1, K2
C05	Discuss the general information about to determine the concentration of test sample used by colorimetry technique	K1, K2, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	3	3	3	2
C02	3	2	3	2	3
C03	3	2	3	3	2
C04	3	3	3	2	1
C05	3	3	2	2	1

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	3	3	2	2
CO3	3	2	2	3	2
CO4	3	3	3	2	1
CO5	3	2	2	1	1

1-Low

2-Medium

3-Strong

Syllabus

UNIT I

20 Hours

Chromatographic Techniques: Column (Adsorption and Partition), Paper and Thin Layer Chromatography, Ion exchange, Gas chromatography, HPLC, GCMS, Gel Filtration and Dialysis.

UNIT II

15 Hours

Electrophoresis Techniques: Principles, Instrumentation and application of different types of Electrophoresis: Agarose and SDS - PAGE. Principles and application of PCR and Blotting Techniques.

UNIT III

10 Hours

Centrifugation Techniques: Theory, relation between RPM and g - Types of Centrifugation. Measurement of Gases: Manometer.

UNIT IV

15 Hours

Colorimetry & Spectroscopy Techniques: Light spectrum and its wavelength regions, Beer Lambert's law and its application. Spectroscopy (UV, Visible and Raman).

UNIT V

15 Hours

Radio isotopic Technique: Principle and application of Radioactivity, Auto radiography, fluorography, isotopic tracer technique, Isotope dilution method.

Text Books

S. Srivatsava, *Molecular technique in Biochemistry and Biotechnology*, New central Book Agency (P) Ltd, Kolkata, 2010, 1st Edition.

Saroj Dua and Mera Garg, *Biochemical Method of Analysis*, Narosa Publishing House, New Delhi, 2010, 1st Edition.

Reference Books

Davit T Plummer, *Introduction to Practical Biochemistry*, Tata McGraw-Hill Publishing company Limited, New Delhi, 1988, 3rd Edition.

Keith Wilson and John Walker, *Principle and Techniques of Biochemistry and Molecular Biology*, Cambridge University Press, Melbourne, Australia, 2011, 7th Edition.

Pedagogy

Chalk & Talk & E-Resources

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Column (Adsorption and Partition)	3	E-Resources
1.2	Paper Chromatography	2	Discussion
1.3	Thin layer Chromatography	2	Discussion
1.4	Ion exchange chromatography	2	E-Resources
1.5	Gas chromatography	2	Discussion
1.6	HPLC	2	Discussion
1.7	GCMS	3	E-Resources
1.8	Gel Filtration	2	Discussion
1.9	Dialysis	2	Discussion
UNIT - II			
2.1	Agarose Gel Electrophoresis	4	E-Resources
2.2	SDS - PAGE	4	Discussion
2.3	PCR	3	Discussion
2.4	Blotting Techniques	4	E-Resources
UNIT - III			
3.1	Relation between RPM and g	2	E-Resources
3.2	Types of Centrifugation	4	Discussion
3.3	Measurement of Gases: Manometer.	4	Discussion

UNIT - IV			
4.1	Light spectrum and its wavelength regions	5	E-Resources
4.2	Beer Lambert's law and its application.	4	Discussion
4.3	Spectroscopy (UV, Visible and Raman).	6	Discussion
UNIT - V			
5.1	Radioactivity	4	E-Resources
5.2	Auto radiography	4	Discussion
5.3	Fluorography	3	Discussion
5.4	Isotopic tracer technique & Isotope dilution method.	4	E-Resources
Total		75	

Course Designer

Dr. A. Khadira Sereen

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC2P	Qualitative Analysis Of Biomolecules	Core – III	90	3

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students to gather knowledge about the biomolecules, its preparation, use of pH meter and determining the concentration of coloured compounds.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Define the particular compound present in the mixed solution.	K1, K2, K3
C02	Represent the carbohydrate, protein, Amino acids and lipids.	K1, K2, K3
C03	Identify the compound present in the test sample.	K1, K2, K3
C04	Determine the pH in acid or alkaline medium using pH meter.	K1, K2, K3
C05	Experiment the techniques and model of colorimeter.	K1, K2, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	3	3	3	3
C02	2	3	3	3	3
C03	3	3	3	3	2
C04	3	3	3	2	2
C05	2	2	2	3	1

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	2	3
CO4	3	2	3	2	1
CO5	1	2	3	2	1

1-Low

2-Medium

3-Strong

Syllabus

1. Analysis of Carbohydrates
2. Analysis of amino acids
3. Test for proteins
4. Test for lipids (Cholesterol)
5. Qualitative tests for DNA and RNA
6. Biochemical Preparation:
 - a. Starch from potato
 - b. Lactose from milk
 - c. Casein from milk
7. Use of pH meter for the preparation of buffer
8. Verification of Beer - Lambert's law using colorimeter
9. Determining the concentration of any given colored compounds using standard graph.

Text Books

- J. Jayaraman, *Laboratory Manual in Biochemistry*, Wiley Eastern Limited, Lucknow, Pune, 1981, 1st Edition.
- Ranjana Chawla, *Practical Clinical Biochemistry Methods and Interpretation*, Jaypee Brothers, New Delhi, India, 2003, 3rd Edition.
- R.C. Gupta and S. Bhargava, *Practical Biochemistry*, CBS Publishers and Distribution, Delhi, India, 1992, 2nd Edition.

Reference Books

- Keith Wilson and John Walker, *Practical Biochemistry - Principles and Techniques*, Cambridge University Press, Melbourne 3166, Australia, 1995, 4th Edition.

Pedagogy

Chalk & Talk & E-Resources

Teaching aids

Black Board, LCD Projector

Course Designer

Ms. R. Vanitha

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UCHA21	Organic, Inorganic and Physical Chemistry - II	Allied-II	60	3

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To identify the concept of photochemistry, coordination compounds, chromatographic technique, chemotherapy and thermodynamic concepts.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Describe the physical concepts of photochemistry	K1
C02	Explain the basic terms, isomerism and theories involved in coordination compound	K1, K2
C03	Apply the column, thin layer and paper chromatographic techniques to separate and identify the components present in a mixture	K1,K2, K3
C04	classify the chemotherapy drugs such as sulpha, antimalarials, antibiotics and arsenical drugs	K1, K2
C05	Identify the concepts of thermodynamics and its significance	K1, K2, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	2	2	3	2
C02	3	3	2	2	2
C03	3	2	2	3	2
C04	3	2	2	3	2
C05	3	3	2	2	2

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	2
CO2	3	3	2	2	2
CO3	3	2	2	3	2
CO4	3	2	2	3	2
CO5	3	3	2	2	2

1-Low

2-Medium

3-Strong

Syllabus

UNIT I

13 Hours

Photochemistry: Comparison of thermal and photochemical reactions – definition of photochemical reactions – laws of photochemistry – Grotthus-Draper law – Einstein law – quantum efficiency – reasons for low and high quantum yield with examples – consequence of light absorption by atoms and molecules – Jablonski diagram – fluorescence – phosphorescence photosensitization – chemiluminescence – bioluminescence – applications of photochemistry.

UNIT II

10 Hours

Coordination compounds: Definition – nomenclature – definition of various terms involved in coordination chemistry – classification of ligands- Werner's theory, EAN rule – VB theory – Nickel carbonyl – chelates.

UNIT III

10 Hours

Chromatographic technique: Principle – classification -adsorption and partition Chromatography- thin layer chromatography – column chromatography (adsorption) – paper Chromatography – gas-solid and gas-liquid chromatography- applications of each type- ion exchange chromatography.

UNIT IV

15 Hours

Sulphadiazine – Sulphanilamide – Preparation and applications. Antimalarials: chloroquine and plasmoquine. Arsenical drugs: Salvarasan – 606 and neosalvarasan. Antibiotics: Definition – classification – penicillin – amoxicillin – ampicillin – tetracyclin– streptomycin – mode of application – uses only.

UNIT V

12 Hours

Definition of thermodynamic terms-system and surrounding – isolated, closed and open systems -intensive and extensive properties- Thermodynamic processes – reversible and irreversible, isothermal and adiabatic – state and path functions - Second law of thermodynamics - need for second law-Concept of entropy – physical significance of entropy -Gibbs free energy and its significance.

Reference Book

B. S. Bahl & Arun Bahl, *Advanced Organic Chemistry*, S. Chand & Company, New Delhi, 2009.

B.R. Puri and L.R. Sharma and Madan S. Pathania, *Principles of Physical Chemistry*, Vishal Publishing Co., Jalandhar, 2005.

R.D. Madan, *Modern Inorganic Chemistry*, S. Chand, 2013, revised edition,

J. Ghosh, *Fundamental concepts of Applied Chemistry*, S. Chand & Co. Publishing.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Comparison of thermal and photochemical reactions – definition of photochemical reactions	2	Chalk & Talk
1.2	Laws of photochemistry – Grotthus-Draper law – Einstein law	2	E-Resources
1.3	Quantum efficiency – reasons for low and high quantum yield with examples	3	E-Resources
1.4	Consequence of light absorption by atoms and molecules – Jablonski diagram – fluorescence – phosphorescence	3	Chalk & Talk
1.5	Photosensitization – chemiluminescence – bioluminescence – applications of photochemistry	3	E-Resources
UNIT - II			
2.1	Coordination compounds: nomenclature – definition of various terms involved in coordination chemistry	3	E-Resources
2.2	Classification of ligands-Werner's theory, EAN rule	3	Chalk & Talk
2.3	Valence Bond theory – Nickel carbonyl – chelates	4	E-Resources

UNIT - III			
3.1	Chromatographic technique: Principle - classification -adsorption and partition Chromatography	3	E-Resources
3.2	Thin layer chromatography - column chromatography (adsorption) - paper Chromatography	3	E-Resources
3.3	Gas-solid and gas-liquid chromatography-applications of each type- ion exchange chromatography	4	Chalk & Talk
UNIT - IV			
4.1	Sulpha drugs - sulphadiazine - sulphanilamide -preparation and applications	4	E-Resources
4.2	Antimalarials: chloroquine and plasmoquine -preparation and applications	3	Chalk & Talk
4.3	Arsenical drugs: Salvarasan - 606 and neosalvarasan-preparation and applications	3	Chalk & Talk
4.4	Antibiotics: Definition - classification - penicillin - amoxicillin - ampicillin - tetracyclin- streptomycin - mode of application - uses only	5	E-Resources
UNIT - V			
5.1	Definition of thermodynamic terms-system and surrounding - isolated, closed and open systems -intensive and extensive properties	4	E-Resources
5.2	Thermodynamic processes - reversible and irreversible, isothermal and adiabatic - state and path functions	4	Chalk & Talk
5.3	Second law of thermodynamics - need for second law-Concept of entropy - physical significance of entropy -Gibbs free energy and its significance	4	E-Resources
Total		60	

Course Designer

Dr. M. Jannathul Firdhouse

Assistant Professor of Chemistry

Course Code	Course Title	Category	Total Hours	Credits
20UCHA2P	Volumetric Analysis	Allied-III	60	2

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students to acquire the quantitative skills in volumetric analysis and to calibrate burette, pipette and standard flask.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Build basic quantitative skills in volumetric analysis with the use of burette, pipettes and standard flasks	K1,K2, K3
C02	Apply acidimetric and alkalimetric method for the quantitative volumetric estimation of acids and bases	K1,K2, K3
C03	Estimate the amount of inorganic compounds permanganometrically	K1,K2, K3
C04	Demonstrate the quantitative estimation of Potassium dichromate iodometrically	K1, K2
C05	Plan the laboratory hygiene and safety	K1, K2, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	1	3	3	1	2
C02	1	3	3	1	2
C03	1	3	3	2	2
C04	1	3	3	2	2
C05	1	3	3	2	2

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	1
CO2	2	3	3	1	1
CO3	2	2	3	1	1
CO4	2	2	3	1	1
CO5	2	1	1	1	1
1-Low	2-Medium			3-Strong	

Syllabus

A double titration involving making up of the solution to be estimated or single titration involving making up of the solution to be estimated and the preparation of a primary standard.

I. Acidimetry and Alkalimetry

1. Titrations between a strong acid and strong base.
2. Titrations between a strong acid and weak base.
3. Titrations between a weak acid and strong base.

II. Permanganimetry

1. Titrations between potassium permanganate and oxalic acid, ferrous ammonium sulphate (Mohr's salt)

III. Iodometry (Demonstration Only)

1. Titrations of sodium thiosulphate with potassium permanganate and potassium dichromate.

Reference Book

Sundaram, Krishnan, Raghavan, ***Practical Chemistry (Part II)***, S. Viswanathan Co. Pvt. 1996.

B.S. Furniss, A.J. Hannaford, P.W. G. Smith, A.R. Tatchell, ***Vogel's Text Book of Practical Organic Chemistry***. 5th Edition, Pearson Education, 2005.

Course Designer

Dr. M. Kamal Nasar

Associate Professor of Chemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC31	Human Physiology	Core - IV	75	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To empower the knowledge and understanding the function of important physiological systems that includes cardio, respiratory, renal system.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Explain the structure, function, mechanisms of respiratory system and how to exchange gases between lungs to blood and between bloods to cell.	K1, K2
C02	How digest and absorb the food particles in mouth, stomach and intestine.	K1, K2
C03	Demonstrate the working model of human anatomy such as cardiovascular system and excretory system	K1, K2
C04	The list of compounds that are excreted through the Urine.	K1, K2
C05	Represent the muscle and nervous system involved in human body.	K1, K2

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	3	3	3	3
C02	3	3	3	3	2
C03	3	3	3	3	3
C04	3	3	3	3	3
C05	2	1	2	3	1

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2
CO2	3	3	3	3	3
CO3	3	3	3	2	3
CO4	3	3	3	3	3
CO5	3	2	2	1	1
1-Low	2-Medium			3-Strong	

Syllabus

- UNIT I** 15 Hours
Respiratory system: Structure and functions of lung, Mechanism of pulmonary ventilation, Exchange of gases between lung and blood and between blood and cells, Transport of gases in tissues.
- UNIT II** 15 Hours
Digestive System: General structure of digestive system, Digestion and absorption of food in the mouth, stomach and intestines. Structure and function of Pancreas and Liver - Defecation.
- UNIT III** 15 Hours
Circulatory system: Blood: Composition, function and types of blood cells, erythropoiesis, Blood coagulation. Heart: Structure and functions of heart, conductive system of heart, origin and conduction of heart beat; Cardiac cycle, electrocardiogram (ECG).
- UNIT IV** 15 Hours
Excretory system: Structure and functions of kidney and Nephron; Composition and formation of urine; Fluid and electrolyte balance, Acid-base dynamics.
- UNIT V** 15 Hours
Muscle and Nervous System: Muscle Physiology: Ultra-structure and chemical composition of skeletal muscle, sliding filament theory, physico-chemical changes during muscle contraction. Nerve Physiology: Concept of nerve and nerve cells, Transmission of nerve impulse, Action potential, neurotransmitters; Synaptic conduction: neuromuscular synapse, adrenergic and cholinergic neurotransmission.

Text Books

T. S. Ranganathan, ***Human Anatomy***, S. Chand and Company Limited, New Delhi, 1982, 1st Edition, Reprint 2011.

Dr. A.S. Moni, ***Human Anatomy and Physiology***, Jal Publisher, Madurai 1992, 1st Edition, Revised Edition 2002.

N. Murugesh, ***Basic Anatomy and Physiology***, Sathya Publishers, Madurai, 2004, 5th Edition.

Blain N. Mzrieh, ***Essentials of human Anatomy and Physiology***, Tara Act Printer Private Limited, Chennai, 2018, 10th Edition.

Reference Books

Padma B Sanghani, ***Human Anatomy and Physiology***, Tata McGraw-Hill Education Private Limited, New Delhi, 2012, 1st Edition.

Pedagogy

Chalk & Talk & E-Resources

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Structure and functions of lung	3	E-Resources
1.2	Mechanism of pulmonary ventilation	3	Discussion
1.3	Exchange of gases between lung and blood	3	Discussion
1.4	Exchange of gases between blood and cells	3	E-Resources
1.5	Transport of gases in tissues.	3	Discussion
UNIT - II			
2.1	General structure of digestive system	3	E-Resources
2.2	Digestion and absorption of food in the mouth, stomach and intestines.	5	Discussion
2.3	Structure and Functions of Pancreas	4	Discussion
2.4	Structure and Functions of Liver, defecation.	3	E-Resources

UNIT - III			
3.1	Composition, function and types of blood cells, erythropoiesis	2	E-Resources
3.2	Blood coagulation	2	Discussion
3.3	Structure and functions of heart	3	Discussion
3.4	conductive system of heart, origin and conduction of heart beat	2	E-Resources
3.5	origin and conduction of heart beat; Cardiac cycle	3	Discussion
3.6	Electrocardiogram (ECG)	3	Discussion
UNIT - IV			
4.1	Structure and functions of kidney	4	E-Resources
4.2	Structure and functions of Nephron	4	Discussion
4.3	Composition and formation of urine	2	Discussion
4.4	Fluid and electrolyte balance	3	E-Resources
4.5	Acid-base dynamics	2	Discussion
UNIT - V			
5.1	Muscle Physiology	5	E-Resources
5.2	Nerve Physiology	5	Discussion
5.3	Synaptic conduction	5	Discussion
Total		75	

Course Designer

Dr. A. Khadira Sereen

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC32	Enzyme Technology	Core - V	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students acquired knowledge on Enzyme nomenclature, reaction, mechanism, kinetics, technology and co-enzymes, enzyme applications.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Define the enzyme classification, nomenclature, list of enzyme function and characterization of enzymes	K1, K2, K3
C02	Illustrate the different types of enzyme reactions.	K1, K2
C03	How construct MM equation and explanation of Km & Vmax Value.	K1, K2, K3
C04	Explain the coenzymes and its lists, mechanism of action.	K1, K2
C05	State the clinical and industrial application of enzymes and demonstrate Biosensor and immobilization technique.	K1, K2, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	2	3	3	3
C02	3	3	3	3	3
C03	3	3	3	2	3
C04	3	3	3	3	3
C05	2	3	2	1	2

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	2	2	2	1
CO5	2	2	2	2	3
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I 12 Hours

Introduction to Enzyme technology: Nomenclature and classification, functions, Properties of enzyme, Extraction and purification of enzyme.

UNIT II 8 Hours

Enzyme specificity and Reactions: Specificity of enzymes and its types. Different types of Enzyme reactions: oxidation and reduction, isomerisation, phosphorylation, acetylation and methylation, dehydration, decarboxylation, transamination.

UNIT III 16 Hours

Enzyme mechanism and Kinetics: Mechanism of Enzyme action, Michaelis Menten equation, Determination of K_m and V_{max} , Line Weaver Burks plot. Factor influencing enzyme reactions and Enzyme inhibition.

UNIT IV 12 Hours

Coenzymes: Definition, Prosthetic group, Mechanism of coenzyme action. Role of coenzymes in Enzyme Reactions Ex: Coenzyme A, Nicotinamide Adenine Dinucleotide, Flavin Adenine Dinucleotide and Zymogens.

UNIT V 12 Hours

Applications of Enzymes: Applications of Clinical, Industrial, Immobilization and Biosensors.

Text Books

Anusha Bhaskar and V.G. Vidhya, **Enzyme Technology**, MJP Publishers, Chennai, 2009, 1st Edition.

L. Veerakumari, **Biochemistry**, MJP Publishers, Chennai, 2005, 1st Edition.

S.M. Bhatt and S. Chand, **Enzymes and Enzyme Technology**, S. Chand and Company Limited, New Delhi, 2011, 1st Edition.

Reference Books

Trevor Palmer and Philip L. Bonner, *Enzymes*, Affiliated East-west Press Pvt. Ltd., New Delhi, 2008, 2nd Edition.

Donold Voet & Judith G. Voet, *Biochemistry*, John wiley & sons, New York, 1995, 2nd Edition.

Pedagogy

Chalk & Talk, E-Resources & Group Discussion

Teaching aids

Black Board & LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Nomenclature and classification	3	E-Resources
1.2	Functions	2	Discussion
1.3	Properties of Enzymes	2	Discussion
1.4	Extraction and purification of enzyme	5	E-Resources
UNIT - II			
2.1	Specificity of enzymes	4	E-Resources
2.2	Different types of Enzyme reactions	4	Discussion
UNIT - III			
3.1	Mechanism of Enzyme action	3	E-Resources
3.2	Michaelis and Menten kinetics	3	Discussion
3.3	Determination of K_m and V_{max}	2	Discussion
3.4	Line Weaver Burks plot	2	E-Resources
3.5	Factor influencing enzyme reactions	3	Discussion
3.6	Enzyme inhibition	3	Discussion
UNIT - IV			
4.1	Definition, Prosthetic group, Mechanism of coenzyme action	3	E-Resources
4.2	Coenzyme A	3	Discussion
4.3	NAD	2	Discussion
4.4	FAD.	2	E-Resources
4.5	Zymogens	2	Discussion

UNIT - V			
5.1	Clinical application of Enzymes	3	E-Resources
5.2	Industrial application of Enzymes	3	Discussion
5.3	Immobilization of Enzymes	3	Discussion
5.4	Biosensors and their applications	3	E-Resources
Total		60	

Course Designer

Ms. S. Muthupriya

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UMBA31	Allied Biology – I	Allied-IV	60	3

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To introduce about the classification and physiology of plants and understand the physiology of human system.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Discuss about the basic of plant classification.	K1, K2
C02	Discuss about the various fossil genera representing different fossil groups.	K1, K2
C03	Outline of the morphological diversity of bryophytes and pteridophytes.	K1, K2
C04	Indicate the function of important physiological system	K1,K2
C05	Develop the basics of nervous system and explain the muscle movement and sensory perception.	K1, K2, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	2	2	3	3
C02	3	1	2	2	1
C03	2	3	3	1	2
C04	3	2	2	2	1
C05	3	2	3	3	3

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	1
CO2	3	2	1	3	3
CO3	3	1	3	2	3
CO4	2	2	3	3	2
CO5	1	3	2	1	3
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

12 Hours

Basis of classification - units of classification - Species, Genus, Family - Nomenclature - Binomial system. Bentham and hooker system of classification of plants.

UNIT II

12 Hours

Morphology, structure and reproduction of plants. Algae-General characters and classification- sargassum as an example. Fungi- General characters and classification- Yeast as an example. Bryophytes- General characters and classification- Funaria as an example.

UNIT III

12 Hours

Pteridophytes - Selaginella, heterospory and seed habit. Gymnosperm - Pinus - economic uses of gymnosperm. Angiosperm - Monocot plant - Allium sp, Dicot plant - Tribulus terrestris.

UNIT IV

12 Hours

Human physiology - Structure and function of Digestive system - Respiratory system - circulatory system-Blood and their properties - Excretory system.

UNIT V

12 Hours

Muscular system - Nervous system - Endocrine glands - Reproductive system - Hormones - menstrual cycle

Text Books

E. L. Jordan and verma. *Invertebrate Zoology*, S. Chandra & Co, New Delhi, 2009, Revised Edition.

E. L. Jordan and verma. *Chordate Zoology*, S. Chandra & Co, New Delhi, 2013, 14th Edition.

W. T. tailor and R. J. Wehe, *Textbook of General Biology*, East West press Pvt. Ltd. 2005, 3rd Edition.

Reference Books

A. C D Utta, *Botany for Degree students*, Oxford university press, 1997, 6th Edition.

Pedagogy

Chalk & Talk & E-Resources

Teaching aids

Black Board & LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Basis of classification	3	Chalk & Talk
1.2	Units of classification - Species, Genus, Family	3	E-Resources
1.3	Nomenclature - Binomial system	3	Discussion
1.4	Bentham and hooker system of classification of plants	3	E-Resources
UNIT - II			
2.1	Morphology, structure and reproduction of plants	2	E-Resources
2.2	Algae-General characters and classification	2	Discussion
2.3	Sargassum as an example	2	E-Resources
2.4	Fungi - General characters and classification	2	E-Resources
2.5	Yeast as an example	2	E-Resources
2.6	Bryophytes - General characters and classification - Funaria as an example.	2	E-Resources
UNIT - III			
3.1	Pteridophytes-Selaginella, heterospory and seed habit	3	E-Resources
3.2	Gymnosperm - Pinus - economic uses of gymnosperm	3	Chalk & Talk
3.3	Angiosperm - Monocot plant - Allium sp	3	Discussion
3.4	Dicot plant - Tribulus terrestris.	3	E-Resources

UNIT - IV			
4.1	Human physiology	2	Discussion
4.2	Structure and function of Digestive system	2	E-Resources
4.3	Respiratory system	2	E-Resources
4.4	circulatory system	2	E-Resources
4.5	Blood and their properties	2	E-Resources
4.6	Excretory system	2	E-Resources
UNIT - V			
5.1	Muscular system	2	Chalk & Talk
5.2	Nervous system	2	E-Resources
5.3	Endocrine glands	2	E-Resources
5.4	Reproductive system	2	E-Resources
5.5	Hormones	2	Discussion
5.6	menstrual cycle	2	E-Resources
Total		60	

Course Designer

Ms. R. Selvakani

Assistant Professor of Microbiology

Course Code	Course Title	Category	Total Hours	Credits
20UBCC41	Biometabolism	Core - VI	75	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To prepare the students acquire knowledge on Fundamental energetic of biochemical process and different metabolic pathways and its regulations.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Discuss the low and high energy phosphates and ETC.	K1, K2
C02	Elaborate the catabolism of glucose in Energy production.	K1, K2
C03	Represent the metabolism of amino acids.	K1, K2
C04	Summarize the metabolism of lipids.	K1, K2
C05	Define the purine, pyrimidine synthesis.	K1, K2

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	3	3	3	3
C02	3	3	3	2	3
C03	3	3	3	3	3
C04	3	2	3	3	2
C05	2	3	2	1	1

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	2
CO4	3	3	3	2	1
CO5	2	2	2	2	2
1-Low	2-Medium			3-Strong	

Syllabus

- UNIT I** 10 Hours
Bioenergetics: Definition of Phosphorylation - High energy and Low energy phosphates: Electron Transport chain, Oxidative phosphorylation.
- UNIT II** 20 Hours
Metabolism of Carbohydrates: Gluconeogenesis, Glycolysis, TCA cycle, HMP shunt, Glycogenesis, Glycogenolysis (Cori cycle).
- UNIT III** 15 Hours
Metabolism of Amino acids: A brief account of amino acid metabolism of Glycine, Cysteine, Proline, Homoserine, Phenylalanine only.
- UNIT IV** 20 Hours
Metabolism of Lipids: Oxidation of fatty acid: Energetic of oxidation, Ketone body metabolism. Glycerate metabolism; Structure and biosynthesis of TG, Phospholipids, Cholesterol metabolism (Structure not needed)
- UNIT V** 10 Hours
Metabolism of Nucleic acids: Biosynthesis of purine and Pyrimidine bases (De novo synthesis and Salvage pathway).

Text Books

- SC Rastogi, **Biochemistry**, Tata McGraw hill education Private limited, New Delhi, 2010, 3rd Edition.
- U. Sathyanarayana & U. Chakrapani, **Essential of Biochemistry**, Books & Allied (P) Ltd, Kolkata, 2007, 2nd Edition

Reference Books

- Robert K. Murray, Peter A. Meyes, Victor W. Rodwell, **Harper's Illustrated Biochemistry**, Prentice Hall International, Inc. 2003, 26th Edition.
- Albert L. Lehninger, **Principles of Biochemistry**, Kalyani Publication, New Delhi, 2006, 2nd Edition.

Pedagogy

Chalk & Talk, E-Resources & Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Definition of Phosphorylation	1	E-Resources
1.2	High energy and Low energy phosphates	2	Discussion
1.3	Electron Transport chain	4	Discussion
1.4	Oxidative phosphorylation	3	E-Resources
UNIT - II			
2.1	Gluconeogenesis	4	E-Resources
2.2	Glycolysis	4	Discussion
2.3	TCA cycle	3	Discussion
2.4	HMP shunt	3	E-Resources
2.5	Glycogenesis	3	Discussion
2.6	Glycogenolysis	3	Discussion
UNIT - III			
3.1	Glycine	3	E-Resources
3.2	Cysteine	3	Discussion
3.3	Proline	3	Discussion
3.4	Homoserine	3	E-Resources
3.5	Phenylalanine	3	Discussion
UNIT - IV			
4.1	Energetic of oxidation	4	E-Resources
4.2	Ketone body metabolism	3	Discussion
4.3	Glycerate metabolism	3	Discussion
4.4	Biosynthesis of TG	3	E-Resources
4.5	Biosynthesis of Phospholipids	3	Discussion
4.6	Cholesterol metabolism	4	Discussion

UNIT - V			
5.1	Biosynthesis of purine bases	5	E-Resources
5.2	Biosynthesis of Pyrimidine bases	5	Discussion
Total		75	

Course Designer

Ms. R. Vanitha

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC42	Microbiology	Core - VII	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students, acquire knowledge on nature of microorganism and their classification, mode of transformation and mechanism of infection.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Define the general organization and structure of Microorganism	K1, K2
C02	Summarize the bacterial metabolism and reproduction	K1, K2
C03	Describe the part and function of microscopy	K1, K2
C04	Explain the application in food microbiology, develop antibiotics and organic acids.	K1, K2, K3
C05	Represent the pathogenesis and prevention of air and water borne disease	K1, K2

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	3	3	3	1
C02	3	2	3	2	3
C03	3	3	3	3	3
C04	3	3	3	3	3
C05	2	3	3	3	2

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	1
CO3	3	3	2	3	2
CO4	3	2	3	2	3
CO5	2	3	2	1	1
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

15 Hours

Organization and structure of microorganisms: General classification of microorganisms and their characteristics. Prokaryotic organization: Cytoplasmic membrane and their functions, mesosomes, Cell wall - gram positive and gram negative, capsules and slime layers, Flagella and cilia, bacterial chromosomes, Plasmids, ribosome's, reserved food endospore.

UNIT II

10 Hours

Bacterial metabolism and Reproduction: Bacterial Nutrition: autotrophic and heterotrophic nutrition, Bacterial photosynthesis. Bacterial metabolism: Fermentation: homo fermentative and hetero fermentative types. Bacterial Reproduction: Sexual and Asexual - Binary fission, Sporulation, Conjugation, Transformation, Transduction. Bacterial Growth: Kinetics of bacterial growth and normal growth curve.

UNIT III

10 Hours

Microscopy: Parts and their functions, resolving power, numerical aperture of compound microscope, light and dark field microscope, Electron microscope (TEM and SEM), phase contrast microscope.

UNIT IV

15 Hours

Applied microbiology: Food microbiology: Food spoilage, food poisoning, food preservation. Industrial microbiology: Uses of microbes in industries, production of ethanol, organic acid (lactic and citric), antibiotics (Penicillin and Streptomycin). Dairy microbiology: Sources of microorganism in milk, factors affecting milk composition, fermentation of milk, proteolysis, and butyric acid fermentation.

UNIT V

10 Hours

Medical Microbiology: Pathogenesis and prevention of air and water borne diseases: Typhoid, Cholera, Dysentery, Diarrhea, Hepatitis, Amoebiosis, Tuberculosis, Pox diseases, Diphtheria and Poliomyelitis.

Text Books

A. Mani, Dr. A. M. Selvaraj, Dr. N. Arumugam, ***Microbiology***, Saras Publication, Nagarcoil, 1985, 1st Edition.

S. S. Purohit, ***Text Book of Microbiology***, Student Edition, Jodhpur, 2008, 1st Edition.

Kannika Sharma, ***Text Book of Microbiology***, Ane Books Pvt. Ltd., New Delhi, 2011, 1st Edition.

Ananthanarayanan and Paniker, ***Text Book of Microbiology***, University Press Pvt. Ltd., Hyderabad, 2009, 8th Edition.

Reference Books

Michael J. Pelczar, ***Microbiology***, TATA McGraw Hill Education Pvt. Ltd., New Delhi, 1993, 5th Edition.

Power and Dagainawara, ***General Microbiology***, Himalay Publishing House, Chennai, 2012, 2nd Edition.

Prescott, Harley and Klein, ***Microbiology***, Tata McGraw Hill Company, New Delhi, 2006, 6th edition.

Pedagogy

Chalk & Talk, E-Resources & Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	General classification of microorganisms	2	E-Resources
1.2	Cytoplasmic membrane	2	Discussion
1.3	Mesosomes	1	Discussion
1.4	Cellwall - gram positive and negative	2	E-Resources
1.5	Capsules and slime layers	2	Discussion
1.6	Flagella and cilia	1	Discussion
1.7	Bacterial chromosomes	2	E-Resources
1.8	Plasmids	1	Discussion
1.9	Ribosome's	1	Discussion
1.10	Reserved food endospore	1	E-Resources

UNIT - II			
2.1	Bacterial Nutrition	2	E-Resources
2.2	Bacterial metabolism	3	Discussion
2.3	Bacterial Reproduction	3	Discussion
2.4	Bacterial Growth	2	E-Resources
UNIT - III			
3.1	Compound microscope	2	E-Resources
3.2	Light and dark field microscope	2	Discussion
3.3	Electron microscope (TEM and SEM)	4	Discussion
3.4	Phase contrast microscope.	2	E-Resources
UNIT - IV			
4.1	Food spoilage	1	E-Resources
4.2	Food poisoning	2	Discussion
4.3	Food preservation	1	Discussion
4.4	Production of ethanol	2	E-Resources
4.5	Production of organic acid	2	Discussion
4.6	Production of Penicillin	2	Discussion
4.7	Production of Penicillin	1	E-Resources
4.8	Sources of microorganism in milk	1	Discussion
4.9	Factors affecting milk composition	1	Discussion
4.10	Fermentation of milk, proteolysis	1	E-Resources
4.11	Butyric acid fermentation	1	Discussion
UNIT - V			
5.1	Typhoid	1	E-Resources
5.2	Cholera	1	Discussion
5.3	Dysentery	1	Discussion
5.4	Diarrhea	1	E-Resources
5.5	Hepatitis	1	Discussion
5.6	Amoebiasis	1	Discussion
5.7	Tuberculosis	1	E-Resources
5.8	Pox diseases	1	Discussion
5.9	Diphtheria	1	Discussion
5.10	Poliomyelitis	1	E-Resources
Total		60	

Course Designer

Ms. S. Muthupriya

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC4P	Quantitative Analysis of Bioorganic Compounds	Core - VIII	90	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To enable the students to Examine and analyze knowledge about the Colorimetric determination of concentration of bio-organic compounds.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Apply the test for Carbohydrate, Protein, Lipid, Vitamins	K1, K2, K3
C02	Find the amount of particular compound present in the test sample	K1, K2, K3
C03	State the Carbohydrate present in test sample by various methods.	K1, K2, K3
C04	Identify the vitamins and protein determination by 2 different methods	K1, K2
C05	Explain the Estimation of cholesterol	K1, K2

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	3	3	3	3
C02	3	3	3	3	2
C03	3	3	3	2	2
C04	3	3	2	3	1
C05	3	3	2	3	1

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	2
CO4	3	2	2	3	3
CO5	3	3	3	2	3
1-Low	2-Medium			3-Strong	

Syllabus

1. Analysis of Carbohydrates

- Estimation of glucose by
 - Phenol sulphuric acid method
 - Anthrone method.
 - Benedict's method
- Estimation of pentose by Bial's method
- Estimation of fructose by Seliwanoff's method
- Estimation of reducing sugar in a fruit
- Estimation of lactose in milk

2. Analysis of Proteins

- Protein determination - Lowry's method
- Protein determination - Biuret method

3. Analysis of Lipids

- Estimation of total cholesterol.

4. Estimation of Vitamins

- Determination of ascorbic acid (Colorimetry)

Text Books

J. Jayaraman, *Laboratory Manual in Biochemistry*, Wiley Eastern Limited, Lucknow, Pune, 1981, 1st Edition.

Ranjana Chawla, *Practical Clinical Biochemistry Methods and Interpretation*, Jaypee Brothers, New Delhi, India, 2003, 3rd Edition

R.C. Gupta and S. Bhargava, *Practical Biochemistry*, CBS Publishers and Distribution, Delhi, India, 1992, 2nd Edition

Reference Books

Keith Wilson and John Walker, *Practical Biochemistry - Principles and Techniques*, Cambridge University Press, Melbourne 3166, Australia, 1995, 4th Edition.

Pedagogy

Chalk & Talk & E-Resources

Teaching aids

Black Board, LCD Projector

Course Designer

Ms. S. Deepa

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UMBA41	Allied Biology – II	Allied - V	60	3

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To introduce the importance of statistics in life science and understand the basics of Mendel genetics.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Outline the nature of genetic inheritance	K1, K2, K3
C02	Discuss of DNA coding that occupies a given locus on a chromosome.	K1, K2
C03	Express is no lack of data floating around most education and social programs.	K1, K2, K3
C04	Discuss the assessment criteria specify the minimum requirement for the dates.	K1, K2
C05	Learn about statistical analysis	K1, K2, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	3	1	3	1
C02	3	2	1	2	3
C03	3	2	2	2	3
C04	3	2	1	3	2
C05	3	3	1	2	1

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	3	3
CO2	3	3	3	3	1
CO3	3	1	2	2	3
CO4	3	2	3	3	2
CO5	3	3	3	1	3
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I 12 Hours

Mendelian Genetics - Mendel's works, experiments, observations and results - Mendel's laws - Terms - Back cross, Test cross - complete and incomplete dominance - co dominance.

UNIT II 12 Hours

Allelic interaction - Multiple Alleles - blood group inheritance - Rh factor - Multiple gene inheritance - genes and chromosomes - crossing over and linkage, chromosomal aberration.

UNIT III 12 Hours

Biostatistics - Introduction - Data collection - Types of data - Primary and secondary data - sampling and sampling designs - random and non-random sampling.

UNIT IV 12 Hours

Representation of data - Diagrammatic - Simple bar diagram, Pie diagram - graphical representation - Histogram, frequency curve, cumulative frequency curve - Measures of central tendency - Explanation - Types of average - Arithmetic mean - median - Mode - Continuous series - discrete series.

UNIT V 12 Hours

Measures of dispersion - Explanation - Types - range - Mean deviation - Standard deviation - Variance - correlation and regression, ANOVA - one way.

Text Books

N. Gurumani. *An introduction to Biostatistics*, Mjp publishers, 2005, 2nd edition.
Pillai. R.S.N and bhagavathi, *Text book of Statistics*. 2003, Elsevier India, 2nd edition.

Reference Books

Edmund. W Sinnot, Dunn, L.C *Principles of Genetics*, Mc Graw - Hill Inc, US, 1984, 5th edition.

David Frifielder, *Molecular Biology*, Jones and Bartlett Publishers, 1985.

Pedagogy

Chalk & Talk & E-Resources

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Mendelian Genetics	3	Chalk & Talk
1.2	Mendel's works, experiments, observations and results	3	E-Resources
1.3	Mendel's laws	2	Discussion
1.4	Terms - Back cross, Test cross	2	E-Resources
1.5	Complete and incomplete dominance-co dominance	2	E-Resources
UNIT - II			
2.1	Allelic interaction	2	E-Resources
2.2	Multiple Alleles-blood group inheritance-Rh factor	2	Discussion
2.3	Multiple gene inheritance	2	E-Resources
2.4	Genes and chromosomes	2	E-Resources
2.5	Crossing over	2	E-Resources
2.6	Linkage,	1	E-Resources
2.7	Chromosomal aberration	1	E-Resources
UNIT - III			
3.1	Biostatistics - Introduction	3	E-Resources
3.2	Data collection - Types of data - primary and secondary data	3	Chalk & Talk
3.3	sampling and sampling designs	3	Discussion
3.4	Random and non-random sampling	3	E-Resources

UNIT - IV			
4.1	Representation of data	2	Discussion
4.2	Diagrammatic - simple bar diagram, Pie diagram	2	E-Resources
4.3	Graphical representation - Histogram	2	E-Resources
4.4	Frequency curve, cumulative frequency curve	2	E-Resources
4.5	Measures of central tendency - Explanation - Types of average - Arithmetic mean - Median - Mode - Continuous series - Discrete series	4	E-Resources
UNIT - V			
5.1	Measures of dispersion - Explanation - Types - range - Mean deviation - Standard deviation	4	Chalk & Talk
5.2	Variance - Correlation and regression	4	E-Resources
5.3	ANOVA - one way	4	E-Resources
Total		60	

Course Designer

Ms. R. Selvakani

Assistant Professor of Microbiology

Course Code	Course Title	Category	Total Hours	Credits
20UMBA4P	Allied Biology Practical -I	Allied - VI	60	1

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	✓

Preamble

To introduce about the basic structure of cell and to understand the mechanism of various cell regulation.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Illustrate the section cutting of stem - Sargassum, Selaginella and Pinus needle	K1, K2
C02	Demonstrate the external and digestive, reproductive and urogenital system of cockroach and frog	K1, K2
C03	Demonstrate the morphology of the representative for each phylum spotters.	K1, K2
C04	Experiment with mitosis by smear technique of Allium cepa root.	K1, K2,K3
C05	Experiment with blood grouping, Rh factors, blood cells and blood vessels of human.	K1, K2,K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	1	1	1	1	1
C02	2	2	2	2	2
C03	3	3	3	3	3
C04	3	3	3	3	3
C05	3	3	3	3	3

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	1	1
CO2	2	2	2	2	2
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

1-Low

2-Medium

3-Strong

Syllabus

Vegetative structure in sargassum, yeast, funaria, seleginella and pinus (section cutting of Sargassum and Selaginella, pinus stem and needles)

Structure of monocot flower - *Allium cepa*

Study of mitosis by smear technique of *Allium cepa* root.

Cockroach - external and digestive system and reproductive system.

Frog - External, digestive system, urogenital system and brain (spotters only).

Morphology of the representative for each phylum spotters only - Paramecium, Hydra, Tania, Ascaris, earthworm, Prawn, Pila, Starfish, rat.

Determination of blood groups & Rh factors.

Determination of haemoglobin.

Law of probability.

Estimation of dissolved Oxygen in different water samples.

Estimation of Alkalinity in different water samples.

Soil testing for pH, alkalinity, nitrate and phosphates.

Problems in Measures of central tendencies - Mean, median and Mode.

Problems in Measures of dispersion - Standard deviation.

Text Books

George William Hunter, *Elements of Biology; a Practical Text Book Correlating Botany, Zoology, and Human Physiology*, Creative Media Partners, LLC, 2018.

Course Designer

Ms. R. Selvakani

Assistant Professor of Microbiology

Course Code	Course Title	Category	Total Hours	Credits
20UBCC51	Cell and Molecular Biology	Core - IX	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To gives a deep knowledge about molecular process at the sub cellular and molecular level.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Define how the cell is originated and assembled in the modern cell structured and compare with Prokaryotic and Eukaryotic cell.	K1, K2
C02	Explain the basic structure of DNA and its replication.	K1, K2
C03	Explain the process of transcription and its modification.	K1, K2
C04	Construct the process of Translation and Regulation of Gene expression.	K1,K3
C05	Illustrate the core cause of genetic disorder by explaining the damage and repair Mechanism.	K1, K2

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
C01	3	2	2	1	2
C02	3	2	1	2	2
C03	2	2	1	1	3
C04	2	2	3	2	3
C05	2	3	3	1	1

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2
CO2	2	3	3	2	2
CO3	3	3	3	3	1
CO4	3	2	2	2	1
CO5	3	2	1	2	2
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

15 Hours

Origin of Cell: Origin of cells, Self-replicating biomolecule, Significance of cells and organelles in biochemical studies, Chromosomal organization in prokaryotes and eukaryotes, Ribosome, Histones, Chromatin structure and composition.

UNIT II

15 Hours

Genetic material: Fundamentals of DNA Structure - A, B, Z form of DNA, Supercoiled and relaxed DNA. Denaturation and Renaturation of DNA - Melting temperature, Hyperchromic and Hypochromic effect. Genome and its organization, DNA Replication

UNIT III

15 Hours

Gene Expression: Transcription: RNA Polymerases, Promoter, enhancer, silencer, and Transcription factors - Process of Transcription (Initiation, Elongation and Termination) - Post transcriptional modification.

UNIT IV

20 Hours

Translation and Regulation of Gene expression: Process of translation - tRNA, rRNA, mRNA and their roles, amino acid activation, Post translational modification, inhibition of protein synthesis by antibiotics. Regulation of gene expression in prokaryotes - positive Vs negative control, concept of operon, Inducers and repressors - *Lac* and *Trp* operon.

UNIT V

10 Hours

DNA Damage, Repair and Mutation: Cause and types of DNA damage, Mechanism of DNA repair - Molecular basis of mutation, Types of mutation.

Text Books

Aminul, ***Essential of Cell Biology***, Books and Allied Pvt. Ltd, Kolkata, 2008

Ajay Paul, ***Cell and Molecular Biology***, Books and Allied Pvt. Ltd, Kolkata, 2015, 4th Edition

Dr. Dipak Kumar and Dr. Sharma Halder, ***Cell Biology Genetics Molecular Biology***, New Central Book Agency Pvt., Ltd, Kolkata, 2015, 2nd Edition

Reference Books

Michael M. Cox and David L. Nelson, *Principles of Biochemistry*, WH freeman Company, New York, 2008, 5th Edition

David Frifelder, *Molecular Biology*, Narasa Publishing House, New Delhi, 2008, 2nd Edition

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Origin of cells	2	Discussion
1.2	Self-replicating biomolecule	2	E-Resources
1.3	Significance of cells and organelles in biochemical studies	2	Discussion
1.4	Chromosomal organization in prokaryotes and eukaryotes	2	Discussion
1.5	Ribosome	3	Discussion
1.6	Histones	2	E-Resources
1.7	Chromatin structure and composition	2	Discussion
UNIT - II			
2.1	Fundamentals of DNA Structure - A, B, Z form of DNA, Supercoiled and relaxed DNA	4	Discussion
2.2	Denaturation and Renaturation of DNA	4	E-Resources
2.3	Genome and its organization	3	Discussion
2.4	DNA Replication	4	Discussion
UNIT - III			
3.1	RNA Polymerases, Promoter, enhancer, silencer and Transcription factors	5	Discussion
3.2	Process of Transcription	5	E-Resources
3.3	Post transcriptional modification.	5	Discussion

UNIT - IV			
4.1	Process of translation - tRNA, rRNA, mRNA and their roles.	3	Discussion
4.2	Amino acid activation	1	E-Resources
4.3	Post translational modification	3	Discussion
4.4	Inhibition of protein synthesis by antibiotics.	3	Discussion
4.5	Regulation of gene expression in prokaryotes	2	Discussion
4.6	positive Vs negative control	2	E-Resources
4.7	Concept of operon	2	Discussion
4.8	Inducers and repressors	2	Discussion
4.9	Lac and Trp operon	2	Discussion
UNIT - V			
5.1	Cause and types of DNA damage	2	Discussion
5.2	Mechanism of DNA repair	2	E-Resources
5.3	Molecular basis of mutation	3	Discussion
5.4	Types of mutation	3	Discussion
Total		75	

Course Designer

Dr. A. Khadira Sereen

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC52	Clinical Biochemistry	Core - X	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students, acquire knowledge about clinically assessing the laboratory indicators of Physiologic condition and disease.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Explain the Hyper and Hypo level of glucose in blood and its related disorder.	K1, K2
C02	Summarize the levels of lipids in blood and to know its disorder.	K1, K2
C03	Express and infer the amino acid and protein metabolism.	K1, K2
C04	Outline the normal and abnormal function of Liver, Kidney and digestive System and its Clinical testing.	K1,
C05	Identify the concept of clinical enzymology and its application in diagnosis of disorders.	K1 , K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
C01	3	2	3	3	2
C02	3	1	2	2	2
C03	3	1	1	1	2
C04	3	2	3	2	1
C05	2	3	3	2	1

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	2
CO2	3	2	3	2	2
CO3	2	2	2	2	2
CO4	3	3	3	2	2
CO5	3	2	3	2	2
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

12 Hours

Disorders of Carbohydrate metabolism: Sugar level in normal blood Hypo and Hyperglycemia, glycosuria, obesity, Galactsemia, Glucose tolerance test - Diabetes mellitus and Diabetes Insipidus.

UNIT II

12 Hours

Disorders of lipid metabolism: Lipid and Lipoproteins, Hypo and hyper Lipoproteinemias, disorders of Triglycerides, Phospholipids and Cholesterol metabolism - Factors affecting blood cholesterol level - Dyslipoproteinemias, Artherosclerosis, risk factor, fatty liver.

UNIT III

10 Hours

Disorders of amino acid & protein metabolism: Amino acid metabolism in starvation - disorders of Plasma proteins - Urea, Uric acid, Creatinine, ammonia, Uremia, Uremia and Porphyrria.

UNIT IV

14 Hours

Organ function test: Liver Function Test: Metabolism of bilirubin, Jaundice - types, Clinical feature and test based on bile pigment level in blood and urine. Icteric Index, Verdaberg test, Prothrombin Timing. Renal Function Test: Urine glomerular filtration and tubular reabsorption, Clearance test - Urea, Creatinine, PAH test concentration and dilution test. Gastric Function test: Collection of gastric contents, examination of gastric residence, FIM, Stimulative test, tubeless gastric analysis.

UNIT V

12 Hours

Clinical Enzymology: Functional and non-functional plasma enzymes, Isoenzymes with examples, Enzyme patterns in acute pancreatitis, liver damage (oxidant and antioxidant), bone disorder, Myocardia infraction and Muscle wasting. Diagnostic enzymology -LDH, SGOT, SGPT and its significance.

Reference Books

Varley's, ***Practical Clinical Biochemistry***, Alanh Gowen Lock, CBS Publisher and Distributors, New Delhi, 2002, 6th Edition

Harold Varley, ***Practical Clinical Biochemistry***, New Delhi, 2005, 4th Edition

Trevor Palmer and Philip Bonner, ***Enzymes***, Affiliated East - West Press Pvt. Ltd, New Delhi, 2008, 2th Edition

Donald Voet and Jodith G. Voet, ***Biochemistry***, John Wiley and Sons, Canada, 1995, 2nd Edition

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Sugar level in normal blood Hypo and Hyperglycemia	3	Discussion
1.2	Glycosuria	2	E-Resources
1.3	Obesity and Galactsemia	3	Discussion
1.4	Glucose tolerance test	2	Discussion
1.5	Diabetes mellitus and Diabetes Insipidus.	2	Discussion
UNIT - II			
2.1	Lipid and Lipoproteins	1	Discussion
2.2	Hypo & hyper Lipoproteinemias	2	E-Resources
2.3	Disorders of Triglycerides	1	Discussion
2.4	Phospholipid metabolism	2	Discussion
2.5	Cholesterol metabolism	2	Discussion
2.6	Factors affecting blood cholesterol level	1	E-Resources
2.7	Dyslipoproteinemias	2	Discussion
2.8	Artherosclerosis	1	Discussion
UNIT - III			
3.1	Amino acid metabolism in starvation	1	Discussion
3.2	Disorders of Plasma proteins	2	E-Resources
3.3	Urea	1	Discussion
3.4	Uric acid	1	Discussion

3.5	Creatinine	1	Discussion
3.6	Ammonia	1	E-Resources
3.7	Uremia	1	Discussion
3.8	Uremia	1	Discussion
3.9	Porphyria	1	Discussion
UNIT - IV			
4.1	Metabolism of bilirubin, Jaundice - types, Clinical feature and test based on bile pigment level in blood and urine.	3	Discussion
4.2	Icteric Index, Verdaberg test, Prothrombin Timing.	3	Discussion
4.3	Urine glomerular filtration and tubular reabsorption	2	E-Resources
4.4	Clearance test - Urea, Creatinine, PAH test concentration and dilution test.	2	Discussion
4.5	Collection of gastric contents, Examination of gastric residence	2	Discussion
4.6	FIM, Stimulative test, tubeless gastric analysis.	2	Discussion
UNIT - V			
5.1	Functional and non-functional plasma enzymes	2	Discussion
5.2	Isoenzymes with examples	1	E-Resources
5.3	Enzyme patterns in acute pancreatitis	2	Discussion
5.4	Liver damage	1	Discussion
5.5	Bone disorder	1	Discussion
5.6	Myocardia infraction and Muscle	2	E-Resources
5.7	LDH	1	Discussion
5.8	SGOT	1	Discussion
5.9	SGPT	1	Discussion
Total		60	

Course Designer

Dr. A. Khadira Sereen

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC53	Endocrinology	Core - XI	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable students grasp knowledge of anatomical relation, development and histological feature of endocrine gland and their secretions.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Explanation of systematic Endocrine System.	K1 , K2
C02	Identify the Hormone classification and its Mechanism of action.	K1 , K2
C03	Manipulate the thyroid hormones and its disorder.	K2, K3
C04	Demonstrate the physiological function and abnormalities of hormones.	K1 , K3
C05	Associate the Reproductive Hormones.	K1, K2

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
C01	3	2	1	2	1
C02	3	2	2	2	1
C03	3	3	3	2	2
C04	3	2	2	1	1
C05	3	2	2	1	1

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	2	1
CO2	2	2	1	2	1
CO3	3	2	1	2	1
CO4	3	2	1	2	1
CO5	2	2	1	2	1
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

12 Hours

Endocrine System: Organization of Endocrine system - Endocrine glands - Structure and function of endocrine glands, Pituitary, Hypothalamus, Thyroid, Parathyroid, Thymus, Adrenal and Pancreas.

UNIT II

12 Hours

Hormone: Types and Classification of hormones, Biological importance of hormones, Mechanism of action, receptors and secondary messenger.

UNIT III

12 Hours

Thyroid Hormone: Formation and secretion of thyroid hormones, Disorder of Thyroid Hormone, Hyper and Hypothyroidism.

UNIT IV

12 Hours

Physiological Function of Hormones: Chemistry, function and abnormality of Growth hormones, Oxytocin, vasopressin and Insulin.

UNIT V

12 Hours

Role of hormones in Reproduction: Hormones involved in Reproduction: Female Reproduction Hormone - Estrogen and Progesterone, Menstrual Cycle. Male Reproduction Hormone - Androgen and Testosterone. Endocrine Defects.

Reference Books

R. NagaBhusanam et., al, ***Text Book of Animal Physiology***, Oxford of IBH Publishing Co, New Delhi, 1983, 2nd Edition

C. C Chatterjee, ***Human Physiology***, Medical Allied Agency, Calcutta, 1981, Volume II

Mac E. Hardley and John E. Levine, ***Endocrinology***, Pearson India Education Services Pvt. Ltd, 2009, 6th Edition

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Organization of Endocrine system	1	Discussion
1.2	Endocrine glands - Structure and function of endocrine glands	2	E-Resources
1.3	Pituitary	2	Discussion
1.4	Hypothalamus	1	Discussion
1.5	Thyroid	1	Discussion
1.6	Parathyroid	1	E-Resources
1.7	Thymus	1	Discussion
1.8	Adrenal	1	Discussion
1.9	Pancreas	2	Discussion
UNIT - II			
2.1	Types and Classification of hormones	3	Discussion
2.2	Biological importance of hormones	3	E-Resources
2.3	Mechanism of action	3	Discussion
2.4	Receptors and secondary messenger	3	Discussion
UNIT - III			
3.1	Formation and secretion of thyroid hormones	4	Discussion
3.2	Disorder of Thyroid Hormone	4	E-Resources
3.3	Hyper and Hypothyroidism	4	Discussion
UNIT - IV			
4.1	Chemistry, function and abnormality of Growth hormones	3	Discussion
4.2	Oxytocin	3	E-Resources
4.3	Vasopressin	3	Discussion
4.4	Insulin	3	Discussion

UNIT - V			
5.1	Female Reproduction Hormone - Estrogen and Progesterone	3	Discussion
5.2	Menstrual Cycle	3	E-Resources
5.3	Male Reproduction Hormone - Androgen and Testosterone	3	Discussion
5.4	Endocrine Defects	3	Discussion
Total		60	

Course Designer

Dr. A. Khadira Sereen

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCE51	Bioinformatics	Elective-I	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	✓

Preamble

To promote the basics of computer and to understand the applications of computer in life science.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Define the basics of computer, its basic hardware and software devices.	K1, K2, K3
CO2	List about the basic MS office software	K1, K2, K3
CO3	Represent the DNA and Protein databases and its downloading systems.	K1, K2
CO4	Elaborate the idea of DNA sequencing methods and Computational knowledge in functional regions of DNA and proteins	K1, K2
CO5	Outline the basics of sequence alignment and Phylogenetic analysis including its software's used.	K1, K2, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	1	2	2	2	2
CO2	2	2	2	2	2
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
C01	3	3	2	2	1
C02	3	1	1	2	1
C03	3	2	3	1	2
C04	3	2	1	2	2
C05	2	3	2	1	1
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

12 Hours

Internet basics: Components of computers input/output devices, Storage devices, Graphic devices, Operations system - MS DOS & WINDOWS - Networks - HTTP, HTML, Internet.

UNIT II

12 Hours

Use of commercial software: MS word, Windows, Power Point, MS Excel.

UNIT III

12 Hours

Biological databases: DNA databases-NCBI, DDBJ and protein databases - PIR, SWISS PROT. Collection and downloading information from databases - SRS.

UNIT IV

12 Hours

DNA sequencing methods: Maxam Gilbert and Sanger's methods. Pattern, motifs and profiles.

UNIT V

12 Hours

Sequence alignment: Pairwise and multiple sequence alignment, FASTA, BLAST and CLUSTAL. Phylogenetic analysis.

Reference Books

Christopher J Rawlings, *Software Directory for molecular Biologists* Stockton Press, Mac Millan Publishers, 1986.

A directory - DBT, *Data basis in life sciences and Biotechnology*: Govt. of India, March 1995.

R.M. Kamp, T. Choli - Papadaopoulou B. Witman Liebold., *Protein Structure Analysis* - Springer Lab Manual.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Components of computers input/output devices	2	Discussion
1.2	Storage devices and Graphic devices	2	E-Resources
1.3	Operations system - MS DOS & WINDOWS	2	Discussion
1.4	HTTP	2	Discussion
1.5	HTML	2	Discussion
1.6	Internet	2	E-Resources
UNIT - II			
2.1	MS word	3	Discussion
2.2	Windows	3	E-Resources
2.3	Power Point	3	Discussion
2.4	MS Excel	3	Discussion
UNIT - III			
3.1	DNA databases - NCBI, DDBJ	3	Discussion
3.2	Protein databases - PIR, SWISS PROT	3	E-Resources
3.3	Collection and downloading information from databases	3	Discussion
3.4	SRS.	3	Discussion
UNIT - IV			
4.1	Maxam gilbert and Sanger Nicoulsan methods	6	Discussion
4.2	Pattern, motifs and profiles	6	E-Resources
UNIT - V			
5.1	Pairwise and multiple sequence alignment	2	Discussion
5.2	FASTA	2	E-Resources
5.3	BLAST	2	Discussion
5.4	CLUSTAL	3	Discussion
5.5	Phylogenetic analysis	3	E-Resources
Total		60	

Course Designer

Ms. R. Vanitha

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCE52	Medical Lab Technology	Elective-I	60	4

Nature of Course	
Knowledge Oriented	
Skill Oriented	✓
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To prepare the students acquire knowledge different parameters in haematology, immunology, molecular biology and microbiology.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Define the basic Haematology and its Parameters.	K1,K2
CO2	Represent the collection, Preservation and examination of urine.	K1, K2
CO3	Summarize the Collection, Preservation and examination of stool.	K1,K2, K3
CO4	Illustrate the Immunological assay and its Interpretation.	K2, K3
CO5	Elaborate the Techniques in Molecular Biology and its Interpretation.	K1, K2, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	1
CO2	2	2	3	3	2
CO3	3	3	3	3	1
CO4	2	1	3	3	1
CO5	2	1	3	3	2

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	2
CO2	2	2	3	2	2
CO3	2	1	3	2	2
CO4	2	1	3	2	2
CO5	2	1	3	2	2
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

12 Hours

Chemistry of Blood: Collection and preservation of blood, Anticoagulants, Normal haematological values, Blood clotting mechanism. Abnormal haemoglobin - anaemia and polycythaemia. Blood Banking: grouping & "Rh" typing. Blood Banking - Blood collection, screening, storage, cross matching and Blood transfusion.

UNIT II

12 Hours

Urine analysis: Collection and preservation of urine, Macroscopic and microscopic examination of urine culture, chemical examinations of urinary calculi. Normal and abnormal constituent of Urine.

UNIT III

12 Hours

Stool Examination: Specimen collection, Inspection of faeces - odour, pH, Interfering substance. Test for occult blood faecal fat, Microscopic examination of stool specimen.

UNIT IV

12 Hours

Immunological Diagnosis: Collection and preservation of serum for Immunological analysis, Measurement of Antibodies, Agglutinations reaction, Widal test, serological tests for syphilis, VDRL slide flocculation test, ELISA.

UNIT V

12 Hours

Molecular Biology Techniques: Plasmid Analysis, Polymerase chain reaction for detection of diseases, sample processing for DNA extraction, DNA finger printing.

Reference Books

Ramnik Sood, *Medical Laboratory Technology methods and interpretation*, Jaypee Brothers Medical Publisher Pvt. Ltd, , New Delhi, 2009, 6th Edition

Kanai L Mukherjee, Swarajit Ghosh, *Medical Laboratory Technology methods and interpretation*, Tata MC Graw Hill, Pvt. Ltd, , New Delhi, 2010

Franck Firkim et. Al., *Clinical Hematology*, Oxford University, New Delhi, 1989, 5th Edition

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Collection and preservation of blood	2	Discussion
1.2	Anticoagulants	2	E-Resources
1.3	Normal haematological values	2	Discussion
1.4	Blood clotting mechanism	2	Discussion
1.5	Abnormal haemoglobin - anaemia and polycythaemia	2	E-Resources
1.6	Grouping & "Rh" typing	1	Discussion
1.7	Blood Banking	1	Discussion
UNIT - II			
2.1	Collection and preservation of urine	3	Discussion
2.2	Macroscopic examination of urine culture	3	E-Resources
2.3	Microscopic examination of urine culture	2	Discussion
2.4	Chemical examinations of urinary calculi.	2	Discussion
2.5	Normal and abnormal constituent of Urine.	2	E-Resources
UNIT - III			
3.1	Specimen collection	3	Discussion
3.2	Inspection of faeces - odour, pH, Interfering substance	3	E-Resources
3.3	Test for occult blood faecal fat	3	Discussion
3.4	Microscopic examination of stool specimen	3	Discussion
UNIT - IV			
4.1	Collection and preservation of serum for Immunological analysis	1	Discussion
4.2	Measurement of Antibodies	2	E-Resources
4.3	Agglutinations reaction	2	Discussion
4.4	Widal test	2	Discussion
4.5	Serological tests for syphilis	2	E-Resources
4.6	VDRL slide flocculation test	2	Discussion

4.7	ELISA	1	Discussion
UNIT - V			
5.1	Plasmid Analysis	3	Discussion
5.2	Polymerase chain reaction for detection of diseases	3	E-Resources
5.3	Sample processing for DNA extraction	3	Discussion
5.4	DNA finger printing	3	Discussion
Total		60	

Course Designer

Ms. S. Muthupriya

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCE53	Vermicomposting and Mushroom Technology	Elective-I	60	4

Nature of Course	
Knowledge Oriented	
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	✓

Course Relevance	
Local	
Regional	✓
National	
Global	

Preamble

To enable students obtain understanding fertilization, types of earthworm, techniques of vermicomposting and mushroom culture.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Define the history and scope of Vermicomposting	K1, K2
C02	Elaborate the study of classification of earthworm	K1, K2
C03	Demonstrate the technique of vermicomposting and importance of vermicomposting	K2, K3
C04	Statements of the mushroom culture and list of mushrooms	K1, K3
C05	Illustrate of the techniques and problems of mushroom cultivation	K1, K2

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
C01	3	2	1	2	3
C02	3	2	1	1	3
C03	2	1	1	1	3
C04	2	2	2	1	3
C05	3	1	2	2	3

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	1	2	1
CO2	2	2	1	2	2
CO3	1	1	2	1	2
CO4	2	2	3	1	1
CO5	3	1	3	2	1

1-Low

2-Medium

3-Strong

Syllabus

UNIT I

12 Hours

Introduction to Vermicomposting: History and scope of Vermicomposting - Scope of Earth worms in fertilizer preparation.

UNIT II

10 Hours

Types of earthworms: Epigeics, Aneic and Endogeics - Vermicasts - Coccons.

UNIT III

14 Hours

Vermicomposting technique: Requirements for vermicomposting - Vermicake - Economic importance of Vermicompost.

UNIT IV

12 Hours

Mushroom culture: Introduction & Scope of Mushroom culture - Types of Mushrooms.

UNIT V

12 Hours

Cultivation of edible mushroom: Techniques in mushroom cultivation - problems in mushroom cultivation.

Text Books

E Sreenivasan, *Handbook of Vermicomposting Technology*, The Western India Plywoods Ltd., 2020 first edition (E. Book).

Mukda Thognaitham et.al., *Organic mushroom cultivation manual*. Freeland foundation, Thailand, 2012, first edition (E.Book)

Reference Book

Chandra Karthick, *Plant Biotechnology*, MJP Publisher, Chennai, 2009, 2nd Edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	History and scope of Vermicomposting	6	Discussion
1.2	Scope of Earth worms in fertilizer preparation.	6	E-Resources
UNIT - II			
2.1	Epigamic, Anaemic & Endogenic	4	Discussion
2.2	Vermicasts	3	E-Resources
2.3	Cocoons	3	Discussion
UNIT - III			
3.1	Requirements for vermicomposting	4	Discussion
3.2	Vermicake	5	E-Resources
3.3	Economic importance of Vermicomposting	5	Discussion
UNIT - IV			
4.1	Introduction and Scope of Mushroom culture	6	Discussion
4.2	Types of Mushrooms	6	E-Resources
UNIT - V			
5.1	Techniques in mushroom cultivation	6	Discussion
5.2	Problems in mushroom cultivation	6	E-Resources
Total		60	

Course Designer

Ms. S. Deepa

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCS51	Nutrition	SBS - I	30	2

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To enable student nutritional aspects of biomolecules and their deficiency, disease, energy value of foods, future nutritional challenge, diet for different stages of development.

Syllabus

UNIT I

6 Hours

Food & Nutrition: Definition of food and nutrition, Food groups, food fads and fallacies, changing food habits, Balanced diet, Formulation and Assessment of nutritional status.

UNIT II

6 Hours

Protein nutrition & Nitrogen balance: Complete and incomplete proteins Quality of food proteins and requirements, Protein nutrition abnormalities, protein deficiency disorder PEM.

UNIT III

6 Hours

Energy Metabolism: Energy yield, Unit of energy, Basal metabolism, measurement of BMR, factors affecting BMR, regulation of body temperature, energy needs, total energy requirement and calorific value of protein, carbohydrates and fat.

UNIT IV

6 Hours

Nutrition at various stages of growth and development: Diets for infants, children, adolescents, pregnant women, lactating mothers and older persons. Malnutrition and its types - Kwashiorkor and Marasmus. Over nutrition - obesity.

UNIT V

6 Hours

Nutritional challenges of the future: Food production and food storages, future foods new protein foods. Food Processing, Preservation and Fortification.

Text Book

B. Sri Lakshmi, ***Nutrition Science***, New Age International Pvt., Ltd Publisher, New Delhi, 2015, 4th Edition.

Reference Books

S. Paul, ***A Text Book of Bionutrition Curing Diseases Through Diet***, CBS Publisher and Distributors Pvt., Ltd, Delhi, 2014, 1st Edition

Dr. S. Ramakrishnan and Venkat Rao, ***Nutritional Biochemistry***, TR Publication, New Delhi, 1995, 1st Edition

Eva D. Wilson et., al, ***Principles of Nutrition***, Wiley Eastern Pvt., Ltd, New Delhi, 1965, 2nd Edition

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Definition of food and nutrition	1	Discussion
1.2	Food groups, food fads and fallacies	2	E-Resources
1.3	changing food habits, Balanced diet	2	Discussion
1.4	Formulation and Assessment of nutritional status.	1	Discussion
UNIT - II			
2.1	Complete and incomplete proteins Quality of food proteins and requirements	2	Discussion
2.2	Protein nutrition abnormalities	2	E-Resources
2.3	Protein deficiency disorder PEM.	2	Discussion
UNIT - III			
3.1	Energy yield, Unit of energy, Basal metabolism, measurement of BMR, factors affecting BMR	2	Discussion
3.2	Regulation of body temperature, energy needs, total energy requirement	2	E-Resources

3.3	Calorific value of protein, carbohydrates and fat.	2	Discussion
UNIT - IV			
4.1	Diets for infants, children, adolescents, pregnant women, lactating mothers and older persons	2	Discussion
4.2	Malnutrition's and its types - Kwashiorkor and Marasmus.	2	E-Resources
4.3	Over nutrition - obesity	2	Discussion
UNIT - V			
5.1	Food production and food storages, future foods new protein foods.	3	Discussion
5.2	Food Processing, Preservation and Fortification.	3	E-Resources
Total		30	

Course Designer

Ms. S. Muthupriya

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCS52	General Studies	SBS - II	30	2

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable students, acquire knowledge on general concepts of cell and organelles, biochemical techniques, food and nutrition, physiology, pharmacology, clinical biochemistry, hormones and neurochemistry.

Syllabus

UNIT I

8 Hours

Cell: Structural organization and importance of animal and plant cell. Difference between prokaryotes and eukaryotes. Chemistry of bio molecules: Carbohydrates - Mono, Di, Polysaccharide. Proteins: Types and Function. Amino acids: Essential and Non-essential, Role of amino acid. Lipids: Cholesterol, Fat, Fatty acid, Wax, Steroid, Phospholipids, and its function. Nucleic acid: DNA & RNA. Enzymes: Nomenclature. Vitamins: Fat and Water soluble, and its function. Metabolism pathways: Glycolysis, TCA Cycle, Glycogenolysis, Gluconeogenesis, Cholesterol Metabolism, Amino Acid Metabolism, Purine and Pyrimidine Metabolism. Dairy chemistry: Composition of milk, Physical properties of milk, Milk clotting enzymes, Frozen Dairy Products.

UNIT II

6 Hours

Food & Nutrition: Food groups, Food production and food storage, Basal metabolism, Measurement of BMR, Diets for infants, pregnant women. Human health and nutrition: Importance of good health, nutrition & exercise - Causes of diseases (environment, age, living conditions & life style), Obesity, Ulcer, Appendicitis and Anaemia. Immunodeficiency disease - AIDS, Air borne & Waterborne diseases - Cholera, dysentery, diarrhoea & Amoebiasis. Viral diseases - TB, Leprosy, Dengue and Bird Flu. Clinical biochemistry: Tissue function test of Liver, Pancreas & Kidney and their significance. GTT, glycosuria, Hypercholesterolemia, Gout, Phorphyria. Diagnostic enzymology - SGOT, SGPT, LDH & CK.

UNIT III

8 Hours

Physiology: Digestive System-Respiratory System-Blood-Body Fluids-Nervous system. Myosin and Actins and regulatory proteins. Nephron-Renal Regulation-Spermatogenesis-Menstrual Cycle-Pregnancy and lactation. Hormones and neurochemistry: Oxytocin, Vasopressin, Growth Hormone, Thyroid Hormone, Pancreatic Hormone. Steroid Hormones: Androgen, Estragen, Progesterone. Neurotransmitter, Axon, Denton, Synapse, Acetylcholine Receptor. Pharmacology: Pharmacology Drug classes, herbal drugs and allopath drugs. Drug metabolism – Drug absorption, transformation and elimination. Immunochemistry: Immunity, Antibody, Antigens Agglutination, precipitation, Transplantation. Blood Transfusion. Hypersensitivity.

UNIT IV

5 Hours

Microbiology: Microscopy, gram positive and gram negative microorganism, mode of reproduction, kinetics and growth curve, microbial productions. Environmental biology: Ecology, Food Web, Pollution, Biodiversity, Biogeochemical Cycle, Disaster Management. Plant biochemistry: Plant Anatomy, Embryology, Genetics, photosynthesis, nitrogen fixation, plant hormones, plant tissue culture

UNIT V

3 Hours

Biochemical and molecular techniques: Centrifugation, Electrophoresis, Chromatography, Dialysis, PCR, Colorimeter, Spectroscopy, Autoradiography, Fluorography, ELISA, Blotting Technique, Gene library, DNA sequencing. Biotechnology: Vector, Genetic engineering, Application of stem cell research. Gene therapy.

Text Books

Aminul, ***Essential of Cell Biology***, Books and Allied Pvt. Ltd, Kolkata, 2008

B. Sri Lakshmi, ***Nutrition Science***, New Age International Pvt., Ltd Publisher, New Delhi, 2015, 4th Edition

Ajay Paul, ***Immunology***, Books and Allied Pvt. Ltd., Kolkata, 2018, 2nd Edition

N.P Wong, R. Jenness and M. Kenney, E. H. Marth, ***Fundamental of Dairy Chemistry***, 3rd Edition

Reference Books

David Frifelder, *Molecular Biology*, Narasa Publishing House, New Delhi, 2008, 2nd Edition

Donald Voet and Jodith G. Voet, *Biochemistry*, John Wiley and Sons, Canada, 1995, 2nd Edition

Mac E. Hardley and John E. Levine, *Endocrinology*, Pearson India Education Services Pvt. Ltd, 2009, 6th Edition.

Kanai L Mukherjee, Swarajit Ghosh, *Medical Laboratory Technology methods and interpretation*, Tata MC Graw Hill, Pvt. Ltd, , New Delhi, 2010.

B. D. Singh, *Biotechnology*, Kalyani Publisher, Hyderabad, 2015, 4th Edition

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Cell	2	Discussion
1.2	Chemistry of Biomolecule	2	E-Resources
1.3	Bio metabolism	2	Discussion
1.4	Dairy Chemistry	2	Discussion
UNIT - II			
2.1	Food and Nutrition	2	Discussion
2.2	Human health and nutrition	2	E-Resources
2.3	Clinical biochemistry	2	Discussion
UNIT - III			
3.1	Physiology	2	Discussion
3.2	Hormones and neurochemistry	2	E-Resources
3.3	Pharmacology	2	Discussion
3.4	Immunochemistry	2	Discussion
UNIT - IV			
4.1	Microbiology	2	Discussion
4.2	Environmental biology	1	E-Resources
4.3	Plant biochemistry	2	Discussion

UNIT - V			
5.1	Biochemical and molecular techniques	2	Discussion
5.2	Biotechnology	1	E-Resources
Total		30	

Course Designer

Ms. R. Vanitha

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC61	Immunology	Core - XII	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable student to bring up the knowledge on development of the immune system, immunological structure, Antigen-Antibody reaction and immune disease.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Define immunity and its types	K1, K2
C02	Summarize about immune organs and cells	K1, K2
C03	Label list of antigen and immunoglobulins	K1,K2
C04	Represent the interaction between antigen and antibody and its application.	K2, K3
C05	Explain on hypersensitivity transplantation and autoimmune disease.	K1, K2

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
C01	3	2	3	1	2
C02	2	3	2	2	1
C03	3	1	2	3	2
C04	1	1	2	3	3
C05	2	2	3	2	1

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	1	3
CO2	3	2	1	3	2
CO3	2	1	1	3	2
CO4	3	2	3	2	1
CO5	2	3	2	2	1
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

15 Hours

Introduction: General Principle of Immunology - host parasitic Relationship - Source of Infection - Transmission of Infection, host resistance. Immunity - Innate Immunity and Accured immunity.

UNIT II

15 Hours

Cells and organs of Immune System: Immune organs - bone marrow, thymus Lymph node, Spleen. Structure, Function and properties of Immune cells: T-cell, B-cell, NK cells, Macrophage, Neutrophil, eosinophil, basophil, Mast cell and dendritic cell.

UNIT III

10 Hours

Antigen and Antibody: Antigen - Types, Properties, Hapten Adjuvants - T dependent and independent antigens. Immunoglobulins: Types and properties - IgM, IgG, IgA, IgD and IgE Structure of IgG.

UNIT IV

20 Hours

Ag-Ab Interaction and its application: Interacting Antigen and Antibody, Features of antigen and antibody Interaction. Defection - Agglutination, Precipitation, immunodiffusion, Immunofluorescence, complement fixation, enzyme linked immune sorbent assay (ELISA). Production of antisera, Production of monoclonal antibodies - Vaccination.

UNIT V

15 Hours

Hypersensitivity: Hypersensitivity reaction and its types - Transplantation - graft Vs Host rejection and host Vs graft rejection. Auto immune disease - Graves' disease and pernicious anemia.

Text Books

Dulsy Fatima and N. Arumugam, **Immunology**, SARAS Ppublication, Nagercoil, 2009, 1st Edition 1994, Revised Edition 2009.

Ajay Paul, **Immunology**, Books and Allied Pvt. Ltd., Kolkata, 2018, 2nd Edition

Kannan, **Immunology**, MJP Publisher, Chennai, 2015, 1st Edition.

M. Rajasekara Pandiyan and SZenthil Kumar, **Immunology and Immnotechnology**, Pandian Publishing Corporation, New Delhi, 2007, 1st Edition.

Reference Books

Ian. R. Tizard, *Immunology*, Saunders College Publishing, San Diego, New York, 1995, 4th Edition

C. Vauraus Rao, *Immunology*, Narosa Publishing House, New Delhi, 2017, 3rd Edition

Ajith Kumar Banerjee, *Immunology and Microbiology*, New Central Book Agency Pvt. Ltd, London, 2012, 1st Edition

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	General Principle of Immunology - host parasitic Relationship - Source of Infection	5	Discussion
1.2	Transmission of Infection, host resistance.	5	E-Resources
1.3	Immunity - Innate Immunity and Accured immunity.	5	Discussion
UNIT - II			
2.1	Immune organs - bone marrow, thymus Lymph node, Spleen.	5	Discussion
2.2	Structure, Function and properties of Immune cells: T-cell, B-cell, NK cells, Macrophage	5	E-Resources
2.3	Neutrophil, eosinophil, basophil, Mast cell and dentritic cell.	5	Discussion
UNIT - III			
3.1	Antigen - Types, Properties, Hapten Adjuvants - T dependent and independent antigens.	5	Discussion
3.2	Immunoglobulins - Types and properties - IgM, IgG, IgA, IgD and IgE Structure IgG.	5	E-Resources

UNIT - IV			
4.1	Interacting Antigen and Antibody. Features of antigen and antibody Interaction.	5	Discussion
4.2	Defection - Agglutination, Precipitation, immunodiffusion, Immunofluorescence,	5	E-Resources
4.3	Complement fixation, enzyme linked immune sorbent assay (ELISA).	5	Discussion
4.4	Production of antisera, Production of monoclonal antibodies - Vaccination	5	Chalk & Talk
UNIT - V			
5.1	Hypersensitivity reaction and its types	5	Discussion
5.2	Transplantation - graft Vs Host rejection and host Vs graft rejection.	5	E-Resources
5.3	Auto immune disease - Graves' disease and pernicious anaemia.	5	Discussion
Total		75	

Course Designer

Ms. R. Vanitha

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC62	Plant Biochemistry	Core - XIII	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable student to gain knowledge of plant biology, plant cell, pigments, photosynthesis, importance of plant growth regulator and plant tissue culture.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	How direct with path of transition and mechanism of translation	K1, K2
C02	Explain about photosynthesis apparatus, pigment, photosynthesis reaction, factor affecting photosynthesis	K1, K2
C03	List out mineral nutrient in plant	K1, K2
C04	Explain plant hormones	K1, K2
C05	Summarize the plant tissue culture, seed germination and dormancy	K1, K2

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
C01	3	3	2	1	2
C02	3	3	2	2	1
C03	3	2	3	1	2
C04	2	3	1	3	1
C05	1	1	3	1	3

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	3	1
CO2	3	2	2	2	1
CO3	2	3	2	1	3
CO4	3	2	3	3	2
CO5	2	2	1	2	1
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

12 Hours

Translocation of plant: Significance, Direction and path of translocation, Mechanism of translocation. Ascent of sap: Path and Mechanism.

UNIT II

12 Hours

Photosynthesis: Photosynthetic apparatus and photosynthetic pigments, Light and dark reaction of photosynthesis, C₃, C₄ and CAM plants, factors affecting photosynthesis, Photorespiration.

UNIT III

12 Hours

Plant Nutrition: Essential mineral nutrients, function, effects of toxicity and deficiency, N₂ cycle, N₂ fixation - symbiotic and asymbiotic. Nitrogen Fixation - Nitrogenase, nitrate assimilation, sulphur as a mineral nutrient, sulphate assimilation.

UNIT IV

12 Hours

Plant growth regulators: Natural growth hormones - Auxins, GA, Cytokines, Ethylene and ABA.

UNIT V

12 Hours

Plant tissue culture: Importance of plant tissue culture, Basic requirements formulation of medium, culture of plant tissues, Applications. Seed germination and dormancy. Photoperiodism.

Text Books

C. B. Nirmala, G. Rajalakshmi and Chandra Karthick, ***Plant Biochemistry***, MJP Publishers, Chennai, 2010, 1st Edition

Dr. Rajkumar and Jayakumar, ***Plant Biochemistry***, Saras Publication, Nagarcovil, 2001, 1st Edition

V. Verma, ***Plant Biochemistry***, Ane Book's Pvt. Ltd, New Delhi, India, 2009, 1st Edition

Reference Books

Robert M. Delvin, ***Plant Physiology***, MED TECH Publishers, Kolkata, Bangalore, 2017, 1st Edition.

S. S. Purohit, ***Plant Physiology***, Mrs. Sarawati Purohit for Student Edition, Jodhpur, India, 2007, 3rd Edition.

V. K. Jain, Fundamentals of ***Plant Physiology***, S. Chand and Company Ltd, New Delhi, India, 2002, 1st Edition - 1974, Reprinted 2002.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Significance, Direction and path of translocation	4	Discussion
1.2	Mechanism of translocation.	4	E-Resources
1.3	Ascent of sap: Path and Mechanism	4	Discussion
UNIT - II			
2.1	Photosynthetic apparatus and photosynthetic pigments	3	Discussion
2.2	Light and dark reaction of photosynthesis	3	E-Resources
2.3	C3, C4 and CAM plants - factors affecting photosynthesis.	4	Discussion
2.4	Photorespiration	2	Discussion
UNIT - III			
3.1	Essential mineral nutrients, function, effects of toxicity and deficiency	4	Discussion
3.2	N ₂ cycle, N ₂ fixation - symbiotic and asymbiotic.	4	E-Resources
3.3	Nitrogen Fixation - Nitrogenase, nitrate assimilation, sulphur as a mineral nutrient, sulphate assimilation.	4	Discussion

UNIT - IV			
4.1	Auxins	3	Discussion
4.2	GA	3	E-Resources
4.3	Cytokinins	3	Discussion
4.4	Ethylene, ABA	3	Discussion
UNIT - V			
5.1	Importance of plant tissue culture, Basic requirements formulation of medium, culture of plant tissues, Applications.	4	Discussion
5.2	Seed germination and dormancy.	4	E-Resources
5.3	Photoperiodism	4	Discussion
Total		60	

Course Designer

Ms. S. Deepa

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC63	Biostatistics	Core - XIV	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable student, provide knowledge biological statistics.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Describe of data and to compare with two different sampling.	K1, K2
C02	Define some definitions and diagrammatic representation of data.	K1, K2
C03	State the symmetry and using some concepts and problems.	K1, K2, K3
C04	Explain the probability and apply in biological samples	K1, K2, K3
C05	Elaborate the correlation and regression, ANOVA	K1, K2

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	3	1	2	2
C02	3	3	3	2	1
C03	3	2	2	1	3
C04	2	3	2	1	2
C05	1	2	2	3	1

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
C01	3	2	3	1	2
C02	2	3	1	2	1
C03	2	1	2	2	3
C04	1	2	1	3	2
C05	2	1	3	1	1
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

12 Hours

Collection of Data: Types of Data - Method of Collecting primary and Secondary Data. Sampling: Definitions, Types - Random and Non random sampling. Classification of Data: Definition, Objectives and classification of Data. Frequency Distribution: Univariate, continuous, discrete and Cumulative frequency distribution.

UNIT II

12 Hours

Tabulation: Meaning and definition, parts of table and advantages. Representation of the Data: Diagrammatic Representation: Types of Diagrams (Line, bar, rectangles, pictogram, and pie diagram). Graphic Representation: Frequency distribution - Frequency Polygon, O give curve and Histogram. Measures of Central Tendency: Explanation, Types of average: Arithmetic mean, Median, Mode Explanation.

UNIT III

12 Hours

Measures of Symmetry: Dispersion- Definition and objectives, Kurtosis - Definition and objectives, Skewness - Definition, objectives and Measures of Skewness and Types of Kurtosis (Problems necessary)

UNIT IV

12 Hours

Probability: Probability Scale - Definition and Explanation of some term - Types of probability, Theorem of probability - Addition theorem and multiplication theorem, Types of theoretical distribution, Application of probability, Venn diagram.

UNIT V

12 Hours

Correlation and Regression: Analysis of variance (ANOVA) Principle - Basic concepts. Correlation: Definition and Types of Correlation - A method of studying correlation using Karl Pearson's co - efficient of correlation (simple problems related to correlation). Regression analysis: Definition, Regression line - Regression equation: regression equation of X on Y, regression equation of Y on X, Difference between correlation and regression.

Text Books

- N. Arumugam, *Basic Concepts of Biostatistics*, Saras Publication, Nagacoil, 2007, 1st Edition.
- N. Gurumani, *An Introduction to Biostatistics*, MJP Publications, Chennai, 2016, 2nd Revised Edition.
- S. Palanichamy and M. Manokaran, *Statistical Methods for Biologists*, Palani Paramount Publications, Palani, 2008, 3rd Revised Edition.
- E. Padmini, *Biochemical Calculations and Biostatistics*, Books and Allied Pvt, Ltd, Kolkata, 2015, 1st Edition.

Reference Books

- Jerrold H. Zar, *Bio statistical analysis*, Dorling Kindersley Pvt. Ltd, New Delhi, India, 2008, 4th Edition
- Khan and Khanum, *Fundamentals of Biostatistics*, UKAAZ Publication, Hyderabad, 2004, 2nd Revised Edition
- P. K. Jasra and Gurudeep Raj, *Biostatistics*, Krishna Prakasham Media Pvt. Ltd, Meerut, 1997, 1st Edition
- Wayne W. Daniel, *Biostatistics*, Sanut Printers, Haryana, 2006, 7th Edition

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Types of Data	3	Discussion
1.2	Sampling	3	E-Resources
1.3	Classification of Data	3	Discussion
1.4	Frequency Distribution	3	Discussion
UNIT - II			
2.1	Tabulation	3	Discussion
2.2	Representation of the Data	3	E-Resources
2.3	Measures of Central Tendency	3	Discussion
2.4	Measures of Dispersion	3	Discussion

UNIT - III			
3.1	Dispersion	4	Discussion
3.2	Skewness	4	E-Resources
3.3	Kurtosis	4	Discussion
UNIT - IV			
4.1	Probability Scale - Definition and Explanation of some term, Types of probability.	3	Discussion
4.2	Theorem of probability - Addition theorem and multiplication theorem.	3	E-Resources
4.3	Types of theoretical distribution, Application of probability	4	Discussion
4.4	Venn Diagram.	2	E-Resources
UNIT - V			
5.1	ANOVA Analysis	4	Discussion
5.2	Correlation	4	E-Resources
5.3	Regression analysis	4	Discussion
Total		60	

Course Designer

Ms. R. Vanitha

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC6P	Clinical Biochemistry Practical	Core-XV	90	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable students, gain proficiency of practical skill in diagnostic performance of the laboratory test by collection of blood and urine specimens.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Define the urine and blood specimen	K1, K3
C02	Illustrate the test for biochemical substance present in our blood sample	K2, K3
C03	List How much amount of haemoglobin present in sample	K2, K3
C04	Identify normal and abnormal analysis of urine sample	K1, K3
C05	Represent the enzymes present in test sample	K1, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	2	1	3	1
C02	2	3	2	3	2
C03	3	3	2	1	1
C04	2	1	3	2	2
C05	1	2	3	3	3

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	2	1	2
CO2	2	2	3	1	1
CO3	3	3	2	2	2
CO4	2	2	1	3	3
CO5	1	3	1	2	1
1-Low	2-Medium			3-Strong	

Syllabus

Introductory, collection of blood and urine specimen.

I. Blood Analysis:

1. Analysis of Blood sugar - Copper reduction method
2. Analysis of Blood cholesterol - Ferric chloride method
3. Analysis of Blood urea - Urease method
4. Analysis of Blood uric acid - Molybdate method
5. Analysis of Blood Creatinine - Picric acid method
6. Serum phosphorus - Fiske Subbarow's Method
7. Estimation of haemoglobin - Sahli method

II. Urine analysis

1. Normal & Abnormal Analysis of Urine
2. Collection & Preservation of urine Sample

III. Estimation of any two enzymes

1. LDH - Serum
2. Acid phosphates - Serum
3. Alkaline phosphates - Serum
4. SGOT - Serum
5. SGPT- Serum
6. Amylase - Saliva
7. Urease - Urine

Text Books

J. Jayaraman, *Laboratory Manual in Biochemistry*, Wiley Eastern Limited, Lucknow, Pune, 1981, 1st Edition.

Ranjana Chawla, *Practical Clinical Biochemistry Methods and Interpretation*, Jaypee Brothers, New Delhi, India, 2003, 3rd Edition

R.C. Gupta and S. Bhargava, *Practical Biochemistry*, CBS Publishers and Distribution, Delhi, India, 1992, 2nd Edition

Reference Book

Keith Wilson and John Walker, ***Practical Biochemistry - Principles and Techniques***, Cambridge University Press, Melbourne 3166, Australia, 1995, 4th Edition

Course Designer

Dr. A. Khadira Sereen

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC6Q	Microbiology Practical	Core-XVI	90	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To give the student practical skill in basis microorganisms handling techniques, staining procedure, preparation of culture media and their application.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Define cleaning of glassware	K1, K2
C02	Summarize the ideas using to prepare different medias, used to make different plating methods	K1, K2, K3
C03	How Isolate <i>E. coli</i> present in ice cream	K1, K3
C04	Identify ESR by western grin's method	K1, K2
C05	Find on water quality analysis	K1, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	3	3	3	1
C02	3	2	2	2	2
C03	3	2	3	1	3
C04	2	1	2	1	3
C05	2	1	1	3	3

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
C01	3	3	2	1	1
C02	3	2	3	2	1
C03	3	1	2	3	1
C04	3	3	3	2	2
C05	1	2	1	3	1
1-Low	2-Medium			3-Strong	

Syllabus

1. Cleaning of glass wares
2. Sterilization techniques
3. General Preparation of Media
 - a. Solid Media Preparation
 - b. Liquid Media Preparation
4. Isolation of microbes - Serial dilution method
5. Pour plate method
6. Spread plate method
7. Streak plate method
8. Enumeration of *E. coli* in milk and ice cream
9. Gram's staining
10. Motility - Hanging drop method
11. ESR - Erythrocyte Sedimentation rate
12. Water Quality analysis

Reference Books

James G. Cappuccino, ***Microbiology - A laboratory Manual***, Chad Welsh Pearson Education Ltd., 2017, Global Edition

Daryl Fox et., al, ***Microbiology - A Laboratory Manual***, ADDITION Wesley Logman INC., 1999, 5th Edition.

Course Designer

Ms. S. Muthu Priya

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCC6R	Immuno and Biochemical Techniques	Core-XVII	90	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To enable students acquires intelligence on learning of techniques involved in understanding the immunological aspects of physiology and biological sample

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Identify the RBC,WBC counting	K1, K3
C02	Summarize the paper, thin layer chromatography technique using amino acid	K1, K2
C03	Illustrate the particular substance present in test sample by Chromatography technique	K1, K2
C04	Explain the Isolation of genomic DNA from Animal Tissue	K1, K3
C05	Explain the Isolation of genomic DNA from Plant Tissue	K1, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	P01	P02	P03	P04	P05
C01	3	3	1	2	3
C02	3	1	2	2	3
C03	3	2	3	3	2
C04	2	1	2	2	3
C05	2	3	1	3	1

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	2	2
CO2	3	3	2	2	1
CO3	2	3	3	3	3
CO4	3	2	2	1	2
CO5	2	1	2	1	3
1-Low	2-Medium			3-Strong	

Syllabus

1. RBC Count
2. WBC count
3. Paper chromatography
4. TLC
5. Isolation of genomic DNA

Demonstration

1. SDS PAGE
2. Agarose gel electrophoresis

Text Books

J. Jayaraman, *Laboratory Manual in Biochemistry*, Wiley Eastern Limited, Lucknow, Pune, 1981, 1st Edition.

Ranjana Chawla, *Practical Clinical Biochemistry Methods and Interpretation*, Jaypee Brothers, New Delhi, India, 2003, 3rd Edition

R.C. Gupta and S. Bhargava, *Practical Biochemistry*, CBS Publishers and Distribution, Delhi, India, 1992, 2nd Edition

Reference Book

Keith Wilson and John Walker, *Practical Biochemistry - Principles and Techniques*, Cambridge University Press, Melbourne 3166, Australia, 1995, 4th Edition

Course Designer

Ms. R. Vanitha

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCE61	rDNA Technology	Elective-II	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	✓

Preamble

To understand about the basics of gene cloning and to promote the applications of gene cloning in various fields.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	Describe basics on general Strategies of cloning.	K1, K2
C02	Identify the various vectors involved in rDNA technique	K1, K2
C03	Explain the Methods in gene transfer and blotting techniques.	K1, K2
C04	Define the idea of Transgenic animals and Plants	K2
C05	Explain the basics of patent and its rights.	K2

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
C01	2	2	2	2	2
C02	2	2	2	2	2
C03	3	3	3	3	3
C04	3	3	3	3	3
C05	2	2	2	2	2

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
C01	3	2	1	2	1
C02	3	3	2	1	2
C03	2	3	2	1	1
C04	3	3	1	2	2
C05	2	1	3	3	3
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

12 Hours

General Strategies of cloning - Gene cloning enzymes Restriction enzymes and its types, DNA Ligase, *Taq*-polymerase, Klenow, Terminal nucleotide transferase, Alkaline phosphatase, linkers and adopters.

UNIT II

12 Hours

Vectors - Plasmids- constructed plasmids, pBR322, pUC18 - Lambda phage derived vectors, cosmids and their applications. BAC and YAC as vectors.

UNIT III

12 Hours

Methods of gene transfer - Transformation, Transduction, Transfection, micro-projectile bombardment, Southern, Northern and Western blotting techniques.

UNIT IV

14 Hours

Transgenic animals - transgenic mice and sheep. Agrobacterium mediated gene transfer mechanism - Markers and Reporter genes and their applications - Transgenic plants - insecticide resistance, herbicide and drought tolerance. Production of Insulin- Growth hormone (STH) - Interferons, etc.

UNIT V

10 Hours

Intellectual property rights, patent, forms of patents, process of patenting, Indian and international agencies involved in patenting, patenting biological materials.

Reference Books

Brown, T.A., ***Genetics - A Molecular Approach***, Chapman Hall, London, 2004.

Darnell, J. Lodish, H., and Baltimore, D., ***Molecular Cell Biology***, Scientific American Books Inc., Iowa. 2006

Glick, B.R. and Pasternak, J.J., ***Molecular Biotechnology- Principles and Applications of Recombinant DNA technology***, ASM press, Washington, 2006.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	General Strategies of cloning -Gene cloning enzymes	4	Discussion
1.2	Restriction enzymes and types - DNA Ligase, Taq polymerase, Klenow	4	E-Resources
1.3	Terminal nucleotide transferase, Alkaline phosphatase, linkers and adapters.	4	Discussion
UNIT - II			
2.1	Vectors- Plasmids- constructed plasmids, pBR322, pUC18	4	Discussion
2.2	Lambda phage derived vectors, cosmids and their applications.	4	E-Resources
2.3	BAC and YAC as vectors.	4	Discussion
UNIT - III			
3.1	Methods of gene transfer - Transformation, Transduction,	4	Discussion
3.2	Transfection, micro projectile bombardment	4	E-Resources
3.3	Southern, Northern and Western blotting techniques.	4	Discussion
UNIT - IV			
4.1	Transgenic animals, transgenic mice and sheep.	3	Discussion
4.2	Agrobacterium mediated gene transfer mechanism	3	E-Resources
4.3	Markers and Reporter genes and their applications	2	Discussion
4.4	Transgenic plants - insecticide resistance, herbicide and drought tolerance.	3	Chalk & Talk

4.5	Production of Insulin-Growth hormone (STH) - Interferon	3	Discussion
UNIT - V			
5.1	Intellectual property rights, patent, forms of patents, process of patenting	5	Discussion
5.2	Indian and international agencies involved in patenting, patenting biological materials.	5	E-Resources
Total		60	

Course Designer

Ms. R. Vanitha

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCE62	Food Technology	Elective-II	60	4

Nature of Course	
Knowledge Oriented	
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable student obtain understanding the properties of food components, important pathogen and spoilage microorganism in food.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	State the basic concept of food and type related to health	K1, K2
C02	Illustrate the characteristics of natural bioorganic compound related to food and fortification	K1, K2, K3
C03	How develop genetically engineered plant with desire characteristic.	K1, K2
C04	Manipulate the role of microbes in food technology	K1, K2
C05	List Out of food analysis and packaging.	K1, K3

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
C01	3	1	2	3	2
C02	2	3	3	1	3
C03	1	3	3	2	1
C04	3	2	1	2	2
C05	3	2	2	2	3

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	1	1
CO2	3	2	3	2	1
CO3	3	1	3	2	3
CO4	1	2	1	1	2
CO5	2	3	2	1	3
1-Low		2-Medium		3-Strong	

Syllabus

UNIT I

12 Hours

Introduction to Food: Basic Concepts of Food - Origin of Food - Food types - Nutrition and Health - Food Adulteration - Health issues.

UNIT II

12 Hours

Food Biochemistry: Natural colours, Sources, Functions, Stability and Derivatives of Chlorophyll, Carotenoids, Flavonoids, β -alanine's, Curcuminoids and Antioxidants. Fortification.

UNIT III

12 Hours

Food Microbiology: Introduction and scope of food microbiology - Growth of Microorganisms - Food Contamination - Beneficial effects of Microorganisms.

UNIT IV

12 Hours

GMO (Genetically Modified Food): Genetic engineering of Plants - Insect Resistance, Virus Resistance, Herbicide Resistance, Bacterial Resistance and Stress (Biotic & Abiotic) Resistance. Delayed Fruit Ripening, Edible Vaccines & Plant antibodies, Terminator seed Concepts.

UNIT V

12 Hours

Food analysis: Food law - Quality assurance - Processing of food - Packaging of fresh and processed food.

Text Books

Chandra Karthick, ***Plant Biotechnology***, MJP Publisher, Chennai, 2009, 2nd Edition.

R. Mundami M Rao, ***Food Science***, Wiley Eastern Ltd, New Delhi, 1991

Reference Books

William C. Frazier, ***Food Microbiology***, MC Graw Hill Education Pvt., Ltd, New Delhi, 2014, 4th Edition

B. D. Singh, ***Biotechnology***, Kalyani Publisher, Hyderabad, 2015, 4th Edition

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Basic Concepts of Food - Origin of Food	2	Discussion
1.2	Food types	2	E-Resources
1.3	Nutrition and Health	3	Discussion
1.4	Food Adulteration	3	Discussion
1.5	Health issues	2	Discussion
UNIT - II			
2.1	Chlorophyll	2	Discussion
2.2	Carotenoids	2	E-Resources
2.3	Flavonoids	2	Discussion
2.4	Betaalanines	2	Discussion
2.5	Curcuminoids	2	Discussion
2.6	Antioxidants	1	E-Resources
2.7	Fortification	1	Discussion
UNIT - III			
3.1	Introduction and scope of food microbiology	4	Discussion
3.2	Growth of Microorganisms - Food Contamination	4	E-Resources
3.3	Beneficial effects of Microorganisms.	4	Discussion
UNIT - IV			
4.1	Insect Resistance	2	Discussion
4.2	Virus Resistance	2	E-Resources
4.3	Herbicide Resistance	2	Discussion
4.4	Bacterial Resistance and Stress (Biotic & Abiotic) Resistance.	2	Discussion
4.5	Delayed Fruit Ripening	1	Discussion
4.6	Edible Vaccines	1	E-Resources
4.7	Plant antibodies	1	Discussion
4.8	Terminator seed Concepts.	1	Discussion

UNIT - V			
5.1	Food law - Quality assurance	4	Discussion
5.2	Processing of food	4	E-Resources
5.3	Packaging of fresh and processed food.	4	Discussion
Total		60	

Course Designer

Dr. A. Khadira Sereen

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCE63	Dairy Biochemistry	Elective-II	60	4

Nature of Course	
Knowledge Oriented	
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To enable student to learn with understanding of bio organic milk constituents chemical, physical, biological changes that occur during processing.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
C01	List the composition properties, nutritive value of milk and milk products	K1, K2
C02	Explain the different processing of milk and its products	K1, K2, K3
C03	State the manufacture of butter, cream ,butter oil, ice cream, cheese	K1, K2
C04	Classify milk products	K1, K2
C05	summarize dairy products like kheer, khoa, kulfi, ghee, paneer, lassi	K1, K2

K1-Knowledge

K2-Understand

K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
C01	3	3	2	3	1
C02	3	2	1	2	1
C03	2	3	1	2	1
C04	1	3	2	1	2
C05	3	1	3	1	3

1-Low

2-Medium

3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
C01	3	3	2	1	2
C02	3	2	1	1	3
C03	2	1	2	3	2
C04	3	3	2	3	1
C05	2	1	3	2	2
1-Low	2-Medium			3-Strong	

Syllabus

UNIT I

10 Hours

Introduction to Dairy Chemistry: Composition of milk - factors affecting composition of milk - physico chemical Properties of Milk.

UNIT II

12 Hours

Processed milk: Sterilized milk - Homogenized Milk - Flavoured Milk - Standardized milk - reconstituted or Rehydrated Milk - Recombined Milk - Toned Milk.

UNIT III

12 Hours

Production of Dairy Products: Manufacture of Butter, Cream, Butter, Butter oil, Ice cream, Cheese.

UNIT IV

14 Hours

Dried Milk and Milk Products: Method of manufacture of whole milk powder and skim milk powder - Preparation of Butter milk powder, Whey powder, Cream powder, Butter powder, Icecream mix powder, Cheese powder and Malted milk powder.

UNIT V

12 Hours

Dairy products: Manufacture of dairy products from whole milk - Kheer, Khoa, Curd, Kulfi, Ghee, Rabri, Paneer, Lassi.

Reference Books

N.P Wong, R. Jenness and M. Kenney, E. H. Marth, ***Fundamental of Dairy Chemistry***, 3rd Edition

Web Johnson and Alford, ***Fundamentals of Dairy Chemistry***, 2nd Edition

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Composition of milk	2	Discussion
1.2	Properties of Milk	3	E-Resources
1.3	Factors affecting composition of milk	2	Discussion
1.4	Physico chemical Properties of Milk	3	Discussion
UNIT - II			
2.1	Sterilized milk	2	Discussion
2.2	Homogenized Milk	2	E-Resources
2.3	Standardized milk	2	Discussion
2.4	Flavoured Milk	2	Discussion
2.5	Reconstituted or Rehydrated Milk	2	Discussion
2.6	Recombinant Milk	1	E-Resources
2.7	Tonned Milk	1	Discussion
UNIT - III			
3.1	Manufacture of Cream	3	Discussion
3.2	Manufacture of Butter	3	E-Resources
3.3	Manufacture of Butter oil	2	Discussion
3.4	Manufacture of Ice cream	2	Discussion
3.5	Manufacture of Cheese	2	Discussion
UNIT - IV			
4.1	Method of manufacture of whole milk powder	2	Discussion
4.2	Skim milk powder	2	E-Resources
4.3	Preparation of Butter milk powder	2	Discussion
4.4	Whey powder	1	Discussion
4.5	Cream powder	1	Discussion
4.6	Butter powder	2	E-Resources
4.7	Ice cream mix powder	2	Discussion
4.8	Cheese powder	1	Discussion
4.9	Malted milk powder.	1	Discussion
UNIT - V			
5.1	Kheer	1	Discussion
5.2	Khoa	1	E-Resources
5.3	Curd	2	Discussion
5.4	Kulfi	1	Discussion
5.5	Ghee	2	Discussion

5.6	Rabri	1	E-Resources
5.7	Paneer	2	Discussion
5.8	Lassi	2	Discussion
Total		60	

Course Designer

Ms. S. Muthupriya

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCS61	Pharmacology	SBS - III	30	2

Nature of Course	
Knowledge Oriented	
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To enable student, provide knowledge on pharmacological indication, action, Pharmacokinetic feature, efficiency, adverse effect, drug interaction.

Syllabus

UNIT I

4 Hours

Basic Concept of pharmacy: Introduction to pharmaceutical chemistry - Classification and Nomenclature of Drugs - theory of Drug Action and factors affecting of Drug Action, Assay of Drug and Metabolism of Drugs.

UNIT II

6 Hours

Mechanism of Drug Metabolism: Drug receptor interaction, Binding forces in drug receptor interaction, Drug action not mediated by Receptor, Acute and chronic effect of animals. Phase I metabolism: (cytochrome p450, hydroxylation, dealkylation, dehalogenation). Phase II metabolism: Conjugation (amino acids, glutathione, hyaluronic acid, sulphate), acetylation.

UNIT III

8 Hours

Natural products and Drug Developments: Introduction - Historical Background of Drugs and Update of drug discovered from natural resources - Lovastatin, Acetaminophen, Ciprofloxacin, Caffeine, theophylline, Nicotine, Tamoxifen.

UNIT IV

6 Hours

Adverse and side effect of drug: Allergy, Drug intolerance, Drug addiction, Drug abuse and their biology effect.

UNIT V

6 Hours

Importance of pharmacy: Metabolites and Antimetabolites, Drug Administration: Route of administration, absorption and distribution of drugs, factor influencing drug administration.

Text Book

G. R. Chatwal, ***Medicinal Chemistry***, Himalaya Publishing House, Bangalore, 1998, 1st Edition.

Reference Books

R.S. Satoskar, S.D. BantharkarAinopure, ***Text book of pharmacology and pharmaco therapeutics***

Shargel. L. et al., 2015, ***Applied pharmaceutics and pharmaco kinetics***, McGraw hill medical 7th edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Introduction to pharmaceutical chemistry	1	Discussion
1.2	Classification and Nomenclature of Drugs	1	E-Resources
1.3	Theory of Drug Action and factors affecting of Drug Action	1	Discussion
1.4	Assay of Drug and Metabolism of Drugs.	1	Discussion
UNIT - II			
2.1	Drug receptor interaction, Binding forces in drug receptor interaction, Drug action not mediated by Receptor.	2	Discussion
2.2	Acute and chronic effect of animals.	2	E-Resources
2.3	Phase I metabolism and Phase II metabolism	2	Discussion
UNIT - III			
3.1	Introduction - Historical Background of Drugs and Update of drug discovered from natural resources	1	Discussion
3.2	Lovastain	1	E-Resources
3.3	Acetaminophen	1	Discussion
3.4	Ciprofloxain	1	Discussion

3.5	Caffeine	1	Discussion
3.6	Theophylline	1	E-Resources
3.7	Nicotine	1	Discussion
3.8	Tamoxitein	1	Discussion
UNIT - IV			
4.1	Allergy	1	Discussion
4.2	Drug intolerance	1	E-Resources
4.3	Drug addiction	2	Discussion
4.4	Drug abuse and their biology effect	2	Discussion
UNIT - V			
5.1	Metabolites and Antimetabolites	2	Discussion
5.2	Drug Administration: route of administration, absorption and distribution of drugs	2	E-Resources
5.3	Factor influencing drug administration.	2	Discussion
Total		30	

Course Designer

Ms. R. Vanitha

Assistant Professor of Biochemistry

Course Code	Course Title	Category	Total Hours	Credits
20UBCS62	General Aptitude	SBS - IV	30	2

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	✓
Regional	
National	
Global	

Preamble

To enable student, provide knowledge on English language comprehension skill, general mental ability and interpersonal skill and basic numeracy and logical reasoning.

Syllabus

UNIT I

6 Hours

English language skill: Structure of English components - Reading, Listening, Speaking and Writing. Narration, Idioms and Phrases, Sentence Correction, Sentence Arrangement, Sentence Completion, Synonyms and Antonyms.

UNIT II

6 Hours

General mental ability & interpersonal skill: Analogy, Alphabet Test, Series Completion, Blood Relation Test, Direction Sense Test, Arithmetical Reasoning, Venn diagram. Analogy, common errors, paragraph jumbles, foreign words and phrases.

UNIT III

6 Hours

General Aptitude: Average, Simplification, Percentage, Profit and Loss, Time and Work, Time and Distance, Simple Interest, Area, Clock and Calendar, Probability, LCM, HCM.

UNIT IV

6 Hours

History and Culture of India and Tamil Nadu: Indus Valley civilization - Guptas, Delhi sultan, Mughals and Marathas age of Vijayanagaram and bahmanis, South Indian history culture and heritage of Tamil Nadu people.

UNIT V

6 Hours

Logical reasoning and analytical ability: Syllogism, Statement and Arguments, Statement and Assumption, Statement and Conclusion, Punch Lines, Situation Reaction Test, Cause and Effect, Analytical Reasoning, Abbreviation current Affairs.

Text Books

T. Venkadesan, *Tamil Nadu history*, varthamanan publication, Chennai, 2017, 2nd edition.

T. Venkadesan, *Indian constitution*, varthamanan publication, Chennai, 2015, 8nd edition.

S. Paramasivam, *History of literature*, madras, 2010, 11th edition

Reference Book

Manorama *Year Book 2021*, first edition

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Structure of English components - Reading, Listening, Speaking and Writing	2	Discussion
1.2	Narration, Idioms and Phrases	1	Discussion
1.3	Sentence Correction, Arrangement and Completion	1	E- Content
1.4	Synonyms and Antonyms	2	Discussion
UNIT - II			
2.1	Analogy, Alphabet Test, Series Completion	1	E- Content
2.2	Blood Relation Test, Direction Sense Test	1	Discussion
2.3	Arithmetical Reasoning, Venn diagram	1	E- Content
2.4	Analogy, common errors, paragraph jumbles	2	Discussion
2.5	Foreign words and phrases	1	E- Content
UNIT - III			
3.1	Average, Simplification, Percentage, Profit and Loss	2	Discussion
3.2	Time and Work, Time and Distance, Simple Interest	2	Discussion

3.3	Area, Clock and Calendar, Probability, LCM, HCM.	2	Chalk & Talk
UNIT - IV			
4.1	Indus Valley civilization - Guptas, Delhi sultan, Mughals and Marathas age of Vijayanagaram and bahmanis	3	Discussion
4.2	South Indian history culture and heritage of Tamil Nadu people.	3	E- Content
UNIT - V			
5.1	Syllogism, Statement and Arguments, Statement and Assumption	2	Discussion
5.2	Statement and Conclusion, Punch Lines, Situation Reaction Test	2	E- Content
5.3	Cause and Effect, Analytical Reasoning, Abbreviation current Affairs	2	Discussion
Total		30	

Course Designer

Ms. M. Mariyam Beevi

Assistant Professor of Biochemistry