D.K.M. COLLEGE FOR WOMEN (AUTONOMOUS) VELLORE-1

DEPARTMENT OF BIOCHEMISTRY

SYLLABUS FOR BACHELOR DEGREE COURSE IN BIOCHEMISTRY

WITH EFFECT FROM 2021-2022

SEMESTER V									
32	III	Core	Paper V	5	5	Enzymes & Enzyme Techniques	25	75	100
33	III	Core	Paper VI	4	4	Human Physiology	25	75	100
34	III	Core	Paper VII	4	4	Genetics & Molecular Biology	25	75	100
35	III	Core	Practical III	5	0	Colorimetric Estimations & Enzyme kinetics	0	0	0
36	III	Core	Practical IV	4	0	Hematology and Urine analysis	0	0	0
37	III	Elective I	Paper I	3	3	Biostatistics	25	75	100
38	III	Elective II	Paper II	3	3	Hormonal Biochemistry	25	75	100
39	IV	Skill Based III	Subject III	2	2	Applications of Computer in Biology	0	50	50
				30	**21**		**125**	**425**	**550**
SEMESTER VI									
40	III	Core	Paper VIII	5	5	Nutrition and Plant Biochemistry	25	75	100
41	III	Core	Paper IX	4	4	Intermediary Metabolism	25	75	100
42	III	Core	Paper X	4	4	Biotechnology	25	75	100
43	III	Core	Practical III	5	3	Colorimetric Estimations & Enzyme	40	60	100
44	III	Core	Practical IV	4	3	Hematology and Urine analysis	40	60	100
45	III	Elective III	Paper III	3	3	Immunology	25	75	100
46	III	Elective IV	Paper IV	3	3	Clinical Biochemistry	25	75	100

47	IV	Skill Based IV	Subject IV	2	2	Bioinformatics	0	50	50
48	V				3	Extension Activity	100	0	100
				30	**30**		**305**	**545**	**850**
*** Mini project in the VI-Semester (optional) – Extra Credits 1-3**									

PROGRAM OBJECTIVE

PEO1: To introduce students a solid foundation in biology and chemistry, develop analytical and critical-thinking skills.

PEO2: To use modern laboratory skills and apparatus to implement experimental protocols that allows independent exploration of biological phenomena through the scientific method.

PROGRAME OUTCOME

PO1. Students gain knowledge about the structural-functional relationships of proteins, lipids, nucleic acids, and carbohydrates and their role in metabolic pathways.

PO2. Course prepares the students to participate in independent research.

PO3. The tools used in analytical biochemistry will help the students to improve their potential applications in medical science.

PO4. Students will be able to analyze, plan current biochemical and molecular techniques to generate and test hypotheses, using statistical methods from experimental data.

PO5. Students in the Biochemistry major will be able to apply and effectively communicate scientific reasoning and data analysis in both written and oral forums.

PO6. Students in the Biochemistry major will understand and practice the ethics surrounding scientific research.

ENZYMES AND ENZYME TECHNIQUES

Sem	Sub. Code	Category	Lecture		Theory		Practical		Credit
			Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	
V	21CBC5A	Core	5	75	5	75	-	-	5

COURSE OBJECTIVE:

To understand the classification of enzymes and Isolation and purification of enzymes. Also, understanding of kinetics of enzyme catalyzed reactions and inhibition of enzyme activity.

- To advance the knowledge on mechanism of enzyme action as well as regulation of enzyme action with relevant examples.
- To study about the techniques of immobilization and application of enzymes in food and pharmaceutical industries.

COURSE OUTCOMES:

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

CO Number	CO Statement	Knowledge Level ($K_1 – K_4$)
CO1	Course material will help in understanding of nomenclature and classification of enzymes, and also about the isolation and purification of enzymes.	**K1**
CO2	Students will thoroughly understand the Kinetics of enzyme catalyzed reaction and various types of enzyme inhibition.	**K2**
CO3	Course will advance the knowledge of students on mechanism of action of various enzymes and structure and function of various coenzymes.	**K2**
CO4	Understanding of enzyme regulation with relevant examples.	**K3**
CO5	Students will gain knowledge in various immobilization techniques and industrial and therapeutic application of enzymes	**K4**

(*CO – Course OutcomesKnowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze).

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	M	S	M
CO2	S	S	M	M	S	S
CO3	M	M	M	S	M	S
CO4	S	M	S	S	M	M
CO5	M	S	S	M	S	S

(S- Strong; M-Medium; L – Low)

Total Hours:75

UNIT I

Enzymes **15 Hours**

Introduction to Enzymes - Nomenclature and classification of enzymes, enzyme units, Enzyme Specificity and active site, Intracellular localization of Enzymes, Isolation and Purification of enzymes. Theories of enzyme action. Antioxidant enzymes, Isoenzymes, Multienzyme complex, ribozymes and abzymes.

UNIT II

Enzymes Kinetics and enzyme inhibition **15 Hours**

Enzyme Kinetics - MM Equation, significance of Km and Vmax. Modification of Mm equation - LB Plot, EadieHofstee Plot, Briggs - Hanes Plot. Factors affecting enzyme activity, Metalloenzymes and Metal - activated Enzymes. Enzyme Inhibition - Reversible and irreversible enzyme inhibition.

UNIT III

Mechanism of Enzyme activity and Co-enzymes **15 Hours**

Mechanism of Enzyme Action – Acid-base catalysis, covalent catalysis. Structure and mechanism of action of chymotrypsin and lysozyme. Vitamin and non-vitamin co-enzymes – structure and biochemical functions of NAD, FAD, TPP, PLP, Biotin and CoA.

UNIT IV

Enzyme Regulation and Cooperativity **15 Hours**

Enzyme Regulation–General mechanisms of enzyme regulation, product inhibition. Reversible and irreversible covalent modifications of enzymes. Feedback inhibition and feed forward stimulation. Allosteric enzymes, qualitative description of “concerted” & “sequential” models for allosteric enzymes. Half site reactivity, Flipflop mechanism, positive and negative co-operativity. Regulation of enzyme activity by proteolytic cleavage.

UNIT V

Applications of enzymes **15 Hours**

Application of enzymes in food, pharmaceutical, pulp, textile and other industries; diagnostic & therapeutic applications. Immobilized enzymes - Techniques of enzyme immobilization; application of immobilized enzymes.Enzymes as Biosensors - Calorimetric, Amperometric, Optical and Immuno biosensors. Enzyme Engineering: Artificial enzymes. Future prospects of Enzyme engineering.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- Black Board
- Power Point Presentations
- Assignments
- Models
- Demonstrations

TEXT BOOKS:

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	S.M. Bhatt	Enzymes and Enzyme Technology	Chand Publishing	2004
2	T. Devasena	Enzymology	Oxford University Press	2003

REFERENCE BOOKS:

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	Trevor Palmer	Enzymes	West Press Pvt. Ltd	2004
2	Dixon , E.C Webb, CJR Thorne and K.F. Tipton, Longmans	Enzymes	Academic Press	2002
3	Nicholas C.Price, Lewis Stevans.	Fundamentals of Enzymology	Oxford University Press	1998

4	Trevor Palmer	Understanding Enzymes	Ellis Horwood Limited.	1991
5	Boyer	The Enzymes	Academic Press	1982

WEB SOURCES:

- www.biology.arizona.edu/cell_bio/cell_bio.html
- https://ecok.libguides.com/biology/web_sources
- www.nicholls.edu/biol-ds/biol155/Lectures/Cell%20Biology.pdf
- www.bio-nica.info/Biblioteca/Bolsover2004CellBiology.pdf

SYLLABUS DESIGNER:

- Dr.V. Prabha, Head & Assistant Professor of Bio-Chemistry
- Ms.T. Nalini, Assistant Professor of Bio-Chemistry

HUMAN PHYSIOLOGY

Sem	Sub. Code	Category	Lecture		Theory		Practical		Credit
			Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	
V	21CBC5B	Core	4	60	4	60	-	-	4

COURSE OBJECTIVE:

- The paper covers the working of internal organ and system.
- The students will be exposed to anatomy of different organs
- Paper helps the students to understand the physiological functions of the biological systems

COURSE OUTCOME:

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

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To have the basic knowledge of the structure and functions of heart transport of oxygen and nutrients, composition and function of Blood cells.	**K1**
CO2	To understand the structure, function and chemical digestion of digestive system	**K2**
CO3	To learn the sum total of the chemical and electrical activity in the brain and nervous system. To study the structure and function of Reproductive system	**K3**
CO4	To describe the structure and function of the organs in the urinary system	**K3**
CO5	To know structural organization of respiratory system and its function An overview of types and essential function of muscle and its abilities in during response	**K4**

(*CO-Course Outcome

Knowledge Level: K1-Remember; K2-Understand; K3-Apply; K4-Analyze)

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	S	S	M	M	M
CO2	S	M	M	S	S	M
CO3	S	S	M	S	M	S
CO4	M	M	S	S	M	S
CO5	S	S	S	M	S	S

(S- Strong; M-Medium; L-Low)

Total Hours:60

UNIT-I

Circulatory System **10 Hours**

Blood composition and their functions. Types of blood cells, morphology and function of Blood cells. Blood groups, ABO system, and rhesus system. Blood coagulation- Blood clotting factors, intrinsic and extrinsic pathways for blood clotting, Composition and function of lymph and lymphatic system, Structure of heart, cardiac cycle, ECG and Blood pressure.

UNIT-II

Digestion and Absorption **10 Hours**

Structure and function of different components of digestive system. Digestion and absorption of Carbohydrate, Lipid, and Protein.Role of bile salt in digestion and absorption.Mechanism of HCl formation in Stomach.

UNIT-III

Nervous system and Reproductive system **15 Hours**

Brief outline of Nervous system. Brain (parts of Ventricle) spinal cord.Nerve fibres, synapses - chemical and electrical synapses.Nerve Impulse, action potential and Neuro transmitter.Structure and function of reproductive organs, composition of semen, physiology of parturition and lactation.Menstrual cycle.

UNIT-IV

Excretory system **10 Hours**

Overall design of Urinary system. Kidney structure and organization.Mechanism of Urine formation. Glomerularfiltration rate (GFR), Selective re-absorption, Active and Passive transport of various substance and tubular secretion.

UNIT-V **15 Hours**

Respiration and Muscular system

Outline of various components of respiratory system. Transport of blood gases – O_2 and CO_2. Muscles – Types of muscles and their functions, myofilamentation, contraction and relaxation of skeletal muscles.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- Black Board
- Power Point Presentations
- Assignments
- Models
- Demonstrations

TEXT BOOKS:

S.No.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	Ross and Wilson	Human Physiology	Elsevier	11th edition (2010)
2	K. Sembulingam	Essentials of Medical Human Physiology	Juta, Limited	4th edition (2008)

REFERENCE BOOKS:

S. NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	William. F.Ganong	Review of Medical physiology	MCGraw- Hill Medical	22 edition (2005)

2	Guyton and Hall	Human Physiology and Mechanisms of Disease	Saunders Publications	6th edition (1996)
3	C.C Chatterjee	Human Physiology	Medical Allied Agency	11th edition(1985)
4	Davidson and Passmore	Human Nutrition and Dietics	Churchcill Livingstone	8th edition (1986)

WEB SOURCES:

- www.coursea.org.
- www.guides.lib.uw.edu.
- www.futurelearn.com
- www.usq.edu.au
- www.visiblebody.com

SYLLABUS DESIGNER:

- Dr.B. Hebsibah Elsie, Assistant Professor of Bio-Chemistry
- Dr. K. Shoba, Assistant Professor of Bio-Chemistry

GENETICS AND MOLECULAR BIOLOGY

Sem	Sub. Code	Category	Lecture		Theory		Practical		Credit
			Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	
V	21CBC5C	Core	4	60	4	60	-	-	4

COURSE OBJECTIVE:

To impart fundamental knowledge of basic genetics and molecular biology in understanding the molecular mechanism of gene function and mutational aspects.

COURSE OUTCOMES:

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

CO Number	CO Statement	Knowledge Level ($K_1 – K_4$)
CO1	Students will learn about the concepts of Mendelian genetics.	**K2**
CO2	Students will acquire knowledge on the role and the mechanism of DNA replication.	**K2**
CO3	Provides a clear knowledge on the RNA synthesis and its mechanism	**K4**
CO4	Provide an understanding of characteristic features of genetic code and protein synthesis Mechanism.	**K4**
CO5	Understand the major functional role of mutation, mechanism and its types	**K1**

(*CO – course Outcomes Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze).

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	S	S	M	S	M
CO2	S	M	M	S	S	M
CO3	M	S	M	M	M	S
CO4	M	M	S	S	S	M
CO5	S	S	S	M	S	M

(S- Strong; M-Medium; L-Low)

Total Hours: 60

UNIT-I

Mendelian Genetics **10 Hours**

Introduction – Birth of Genetics, Mendelian principles – Mendel's experimental organism.Mono hybrid cross–Principles of dominance and segregation.Di hybrid cross – Principles of Independent assortment.Chromosome Structure.

UNIT – II

DNA Replication **15 Hours**

Evidences for DNA as genetic material: - Experimental proof for DNA replication in prokaryotes; Formation of DNA from nucleotides; Semi conservative mechanism and experimental proof; RNA priming; Bidirectional replication; theta mode, rolling circle model. Enzymology of DNA replication; Initiation, elongation and termination; Differences in eukaryotic replication; Inhibitors of replication [names only].

UNIT –III

Transcription **10 Hours**

Prokaryotic transcription: - Central dogma; RNA polymerases; Initiation, elongation and termination of transcription. Role of eukaryotic RNA polymerases.RNA splicing and processing of mRNA, tRNA and rRNA. Reverse transcription.

UNIT – IV

Translation **15 Hours**

Genetic code: - Experimental evidences; Features of genetic code. Composition of Prokaryotic ribosomes, tRNA - structure; activation of amino acids, coding and non - coding strands of DNA. Translation: - Initiation, elongation and termination of protein synthesis; inhibitors of protein synthesis. Post - Translational modifications of proteins.

UNIT – V

Mutation **10 Hours**

Genome Mutations – change in structure of Chromosome, Changes in the number of Chromosomes, Gene Mutations – Spontaneous Mutation, induced Mutation, Point Mutation, Missense Mutation, Temperature Sensitive Mutation, Hot Spot.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- Black Board
- Power Point Presentations
- Assignments
- Models
- Demonstrations

TEXT BOOKS:

S.NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
2.	Weaver, F., Robert, Hedrick, W. Philip,	Genetics	W.C. Brown Publishers	1997, 3rd ed.
3.	Lodish, Berk, Zipursky	Molecular Cell Biology	Baltimore, Freeman.	2007
4.	David Freifelder	Molecular Biology	Jones and Bartlett publishers	1993 2nd edition
5.	Gardner, Simmons	Principles of Genetics	Narosa Publishing House	8th edition, 1994.
6.	Karp, G.	Cell and Molecular Biology	John Wiley & Sons. Inc.	2010

REFERENCE BOOKS:

S. NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
6.	James.D.Watson	Molecular Biology of the Gene	Benjamin Cummings	2013
7.	Bruce Alberts and Dennis Bray	Essential Cell Biology	Garland Science	2013
8.	De Robertis, E.D.P. and De Robertis, E.M.F.	Cell and Molecular Biology	Lippincott Williams and Wilkins	2010

WEB SOURCES:

- www.slideshare.net/samiurrehmankhan/genetics-ppt-8948503
- www.slideshare.net/purakichha/dna-as-genetic-material
- www.slideshare.net/namarta28/dna-replication-11967263
- www.slideshare.net/joyjulie/transcription-14274749
- www.slideshare.net/joyjulie/transcription-14274749
- www.tavernarakislab.gr/publications/Chapter%2020.final.pdf
- www.boyertownasd.org/cms/lib07/PA01916192/Centricity/Domain/743/D.%20Chapter%207%20Lesson%204-Mutations.pdf

SYLLABUS DESIGNER:

- Dr.K. Shoba, Assistant Professor of Bio-Chemistry
- Dr.B. Hebsibah Elsie, Assistant Professor of Bio-Chemistry

BIOSTATISTICS

Sem	Sub Code	Category	Lecture		Theory		Practical		Credit
			Per week	Per sem.	Per week	Per sem.	Per week	Per sem.	
V	21CBC5D	Elective	3	45	3	45	-	-	3

COURSE OBJECTIVE:

To enable the students to acquire skills in data collection and data management and apply appropriate statistical methods for analyzing variables and Interpret statistical results effectively in context.

COURSE OUTCOMES:

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

CO. Number	CO statement	Knowledge level (K1-K4)
CO1	Describe the basic principles, the role biostatistics serves in biomedical research and assess data sources and data quality for the purpose of selecting appropriate data.	**K3**
CO2	Identify, differentiate, determine the value and the relationship between the mean, the median, and the mode of data.	**K3**
CO3	Understand hypothesis testing, verify the conditions and explain the meaning of significance level in context.	**K2**
CO4	Describe basic principles and the practical importance of key concepts from probability	**K1**
CO5	Students will have developed problem solving abilities in biostatistics, characterised by flexibility of approach.	**K3**

*CO – course Outcomes Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze.

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	S	S	S
CO2	S	M	S	S	M	M
CO3	M	M	M	L	S	M
CO4	M	S	L	M	S	L
CO5	L	L	M	M	M	L

(S- Strong; M-Medium; L-Low)

Total Hours: 45

UNIT I:

Nature and Scope of Statistics **8 Hours**

Nature and scope of statistical methods and their limitation. Data –definition, primary and secondary data, Collection of data - choice of methods, Questionnaire method- framing a questionnaire, classification of data, Tabulation of Statistical data.Diagrammatic and graphical representation of data.

UNIT II:

Measures of Central Tendency **10 Hours**

Measures of central Tendency – Definition, Types of Averages – Mean, Median, Mode, Arithmetic mean, Geometric mean.Measures of dispersion.Need and definition, Range, Mean deviation, Quartile Deviation, Decile range, Standard deviation.

UNIT III:

Sampling Design **10 Hours**

Introduction – Hypothesis , Null Hypothesis. Sampling – Necessity of sampling , Law of Statistical Regularity, Law of Inertia of Large numbers. Merit and demerits of sampling.Methods of sampling (Random, Deliberate sampling).

UNIT IV:

Probability **10 hours**

Probability – Concepts, Events, Type and distribution patterns, Binominal and Normal distribution, Test of Significance of Larger Sample, Sampler Sample (t-Test) and Chisquare test for independent attributes.

UNIT V:

Correlation and Regression **7 Hours**

Bivariate frequency table and its uses – Correlation Analysis, Scatter Diagram – Karl Pearson's Correlation Coefficent – Spearman's Rank correlation – Regression Analysis, Regression lines – Fitting of straight line using method of least squares.

DISTRIBUTION OF MARKS: Theory - 75% and Problems – 25%

TEACHING METHODOLOGY

- Lectures and demonstration by audio visual ads
- Classical chalk and board
- Learning through group discussions
- Tutorials
- Assignments
- Students seminars
- Interactive learning
- Self-study

TEXT BOOKS:

S. NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	P.R.Vital	Business Mathematics and Statistics	Margham Publications	2013

REFERENCE BOOKS:

S. NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	S.C.Gupta and V.K.Kapoor	Fundamental of Mathematical Statistics	Sultan Chand & Sons	2000
2.	Snedecor G.W. and Cochran W.G.	Statistical methods	Oxford and IBH Publishing Co.,	1967

3.	Rohatgi, V.K.andSaleh, A.K.	An Introduction to Probability and Statistics	John Wiley & Sons.	2001
4.	S.P.Gupta	Practical Statistics	Sultan Chand & sons	1979
5.	Gurumani N	An Introduction to Biostatistics	MJP Publishers.	2005

WEB SOURCES:

- www.scribd.com/doc/234328874/Business-Mathematics-and-Statistics-pdf
- www.scimagojr.com/journalrank.php?category=2613
- www.math.louisville.edu/~pksaho01/teaching/Math662TB-09S.pdf

SYLLABUS DESIGNER:

- Ms.T. Nalini, Assistant Professor of Bio-Chemistry
- Mrs.G. Nithya, Assistant Professor of Bio-Chemistry

HORMONAL BIOCHEMISTRY

Sem	Sub Code	Category	Lecture		Theory		Practical		Credit
			Per week	Per sem.	Per week	Per sem.	Per week	Per sem.	
V	21CBC5E	Elective	3	45	3	45	-	-	3

COURSE OBJECTIVES

The course is designed such that the biochemists get an accurate information about the process of cellular communication including signal reception, transduction, amplification and response. It also imparts different endocrine factors, functions, mechanism of action.

COURSE OUTCOMES

After the completion of this course, the student will be able to

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	Understand the basic terminologies of hormones, classification of hormones, mechanism of action of hormones based on receptors, different types of secondary messengers and regulation of hormones action by feedback mechanism.	**K1**
CO2	Understand the synthesis, mechanism and disorders of thyroid and parathyroid hormones	**K2**
CO3	Learn various functions of pancreatic hormones.	**K2**
CO4	Demonstrate the various mechanism of action of steroid hormones.	**K2**
CO5	Understand the role of sex hormones.	**K2**

(*CO-Course Outcomes

Knowledge Level: K1-Remember; K2-Understand; K3-Apply; K4-Analyze).

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	S	L	M	S	S
CO2	S	S	L	S	S	S
CO3	S	S	L	S	S	S
CO4	S	S	L	S	S	S
CO5	S	S	L	S	S	S

(S- Strong; M-Medium; L-Low)

Total Hours :45

UNIT - I

Introduction to Hormones **10 Hours**

Definition of a hormone, classification of hormones, chemical signalling – endocrine, paracrine, autocrine and neuroendocrine mechanisms.Mechanism of action of peptide and signal steroid hormones. G protein coupled receptors, signal transduction, role of secondary messengers in hormonal action – cAMP, cGMP, IP3 and calcium.Feedback mechanism of hormone.

Unit II

Hormones of Hypothalamus and Pituitary gland **10 Hours**

Relation between Hypothalamus and Pituitary, hormones released by hypothalamus, Pituitary hormones-Oxytocin, Vasopressin, Growth hormone.

Hormones of Thyroid and Parathyroid gland

Biosynthesis and biological action of thyroid hormones.Hypo and hyper thyroidism-cretinism, myxoedema, Grave's diseases and Goiter.Biosynthesis and biological action of parathyroid hormones (PTH).Disorders of parathyroid hormones- rickets and osteomalacia.

Unit III

Hormones of Pancreatic Gland **7 Hours**

Biosynthesis and biological actions of pancreatic hormones- Insulin and Glucagon.Disorders of pancreas – Diabetes mellitus.GI hormones (secretin, gastrin, somatostatin and CCK) and its role.

Unit IV

Hormones of Adrenal Gland **10 Hours**

Biosynthesis and biological role of adrenal medullary hormones– Catecholamine's(Epinephrine and Nor epinephrine). Biosynthesis and biological role of adrenal cortical hormones–Mineralocorticoids (aldosterone) and Glucocorticoids (cortisol).Disordersof adrenal medulla and cortex -Addison's disease, Cushing's syndrome, Conn's syndrome and Phaeochromocytoma.

Unit V

Gonadal Hormones **8 Hours**

Gonadal Hormones- Biosynthesis and biological role of male sex hormones - androgens (Testosterone), female sex hormone - oestrogens and progesterone. Menstrual Cycle – phases.

DISTRIBUTION OF MARKS: Theory – 100% and Problems - Nil

TEACHING METHODOLOGY

- Lectures and demonstration by audio visual ads
- Classical chalk and board
- Learning through group discussions
- Tutorials
- Assignments
- Students seminars
- Interactive learning
- Self-study

TEXT BOOKS

S.No	Author Name	Title of the Book	Publisher	Year
1.	Prakash. S. Lohar	Endocrinology	MJP Publishers	2005
2.	R.Radheshyam	Textbook of Endocrinology	Neha Publishers	2012
3.	Hadely, M. amnd Levine .J.E	Endocrinology	6th Edition, Benjamin Cummings	2006
4.	Smith, E. et al.,	Principles of Biochemistry	7th Edition. McGraw Hill International Book Co	1983

REFERENCE BOOKS

S.No	Author Name	Title of the Book	Publisher	Year
1.	Guyton, A.C. and Hall., J.E.	Text Book of Medical Physiology	12th Edition, Saunders Publishers	2010
2.	ShlomoMelmed Kenneth Polonsky P. Reed Larson Henry Kronenberg,	William's Endocrinology	13thEdn Elsevier publishers	2015
3.	Hadley, M.C. and Levine, J.E	Endocrinology	6th ed., Pearson Education (New Delhi),	2007
4.	Larson *et al*.,:	Williams Textbook of Endocrinology,	10th ed., Elseiver.	2003
5.	R.Radheshyam	Behavior endocrinology	Neha Publishers	2013
6.	Melmed*et al*.,	Williams Text Book of Endocrinology	13th Edition, Saun	2015

WEB SOURCES:

- www.pathwaymedicine.org/hormone-biochemistry
- www2.centralcatholichs.com/APbiologysite/Hormone/more%20hormone%20notes.PDF.

SYLLABUS DESIGNER:

- Dr.S. Asha, Assistant professor in Biochemistry.
- Dr.K. Shoba, Assistant professor in Biochemistry.

SKILL BASED III

APPLICATION OF COMPUTER IN BIOLOGY

Sem	Sub. Code	Category	Lecture		Theory		Practical		Credit
			Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	
V	21SBC5A	Skill Based	2	30	2	30	-	-	2

COURSE OBJECTIVES:

The objective of this course is to have a firm foundation of the fundamentals and applications of computer and their application in modern field, to know the importance of computers.

COURSE OUTCOMES

After the completion of this course, the student will be able to

CO Number	CO Statement	Knowledge Level (K1 – K4)
CO1	To learn about Fundamentals of Computers	**K1**
CO2	To understand the process involved Basics of internet and emailing	**K3**
CO3	To gain information on Ms word	**K2**
CO4	To understand the Histograms and graph	**K4**
CO5	Know to handle the different style of presentation	**K4**

(*CO-Course Outcomes

Knowledge Level: K1-Remember; K2-Understand; K3-Apply; K4-Analyze).

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	S	S	M
CO2	M	S	M	S	M	S
CO3	M	M	S	M	M	M
CO4	S	S	M	S	S	S
CO5	S	S	M	M	S	M

(S-Strong; M-Medium; L-Low)

Total Hours:30

UNIT-I

Fundamentals of Computers **5 Hours**

Classification, Computer organization, Input devices, Processing unit, Output devices, external storage devices, System Software, Language, flowcharting examples.

UNIT-II

Internet and Mailing **5 Hours**

Internet introduction, applications, scope and objectives, the World Wide Web, Browsing, working and downloading, search engines.

UNIT-III

Ms Word **7 Hours**

MS Word introduction, The Screen and its Elements, Creating a new document – starting on a new blank document, starting a new document from a template, Writing and simple formatting, page layout, pictures and graphics, tables, Quitting Microsoft word.

UNIT-IV

MS-Excel **6 Hours**

MS-Excel-Introduction, Features-Opening of Spreadsheet, Components of an Excel work book, Entering data and saving a new work book, Mathematical calculations, Moving and copying data, Deleting and adding rows and columns, Aligning data, Creating a graph, Closing the work book, Quitting Microsoft Excel.

UNIT-V

MS-Powerpoint **7 Hours**

MS PowerPoint introduction, The Screen and its Elements - the office buttons, Quick access, ribbons and tabs, thumbnails, note field, status bar, view buttons, normal view, slide sorter, slide show, zoom. Basic tasks in Power Point, Initial tasks, Putting content in the presentation.

TEXT BOOKS:

S.NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	E.Balagurusamy	Programming in BASIC	Tata McGraw Hill,	1991

REFERENCE BOOKS:

S. NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Bartee	Digital Computer Fundamentals	Tata McGraw Hil	1990
2.	Horowitz, Shahni, Rajasekaran	Fundamentals of Computer algorithms	Gottfried	2001
3.	Gottfried	Programming with Basic	Tata McGraw Hill	2004

WEB SOURCES:

- https://library.ku.ac.ke/wp-content/downloads/2011/08/Bookboon/Office-programs/microsoft-office-word.pdf
- www.mta.ca/uploadedFiles/Community/Administrative_departments/Human_Resources/Training_and_professional_development/Classroom/Excel%20Training%20-%20Level%201.pdf
- https://library.ku.ac.ke/wp-content/downloads/2011/08/Bookboon/Office-programs/microsoft-office-powerpoint.pdf

SYLLABUS DESIGNER

- Dr.K. Shoba, Assistant Professor of Bio-Chemistry

NUTRITION AND PLANT BIOCHEMISTRY

Sem	Subject Code	Category	Lecture		Theory		Practical		Credit
			Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	
VI	21CBC6A	Core	5	75	5	75	-	-	5

COURSE OBJECTIVE:

- To discuss the established functions of micronutrients and to examine the clinical and biochemical effects of depletion.
- To understand plant cell structure, organization, and the role of different biosynthetic pathways in plant growth and development.
- Understanding of Plant defence mechanism against pathogens.

COURSE OUTCOMES:

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

CO Number	CO Statement	Knowledge Level ($K_1 – K_4$)
CO1	Gain the basic knowledge about Nutrition, BMR and energy expenditure.	**K1**
CO2	Obtain the knowledge about vitamins and their functions.	**K2**
CO3	Obtain the knowledge about minerals and their functions.	**K2**
CO4	Acquire basic knowledge about plant physiology and plant hormones.	**K3**
CO5	Gain the knowledge about role of plant in its defencemechanism and to understand the process of production of biotechnological products.	**K4**

(*CO – Course Outcomes

Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze).

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	S	S	M	M	M
CO2	S	S	M	S	S	M
CO3	S	M	M	S	M	S
CO4	M	M	S	S	S	S
CO5	S	S	S	M	M	S

(S- Strong; M-Medium; L-Low)

Total Hours: 75

UNIT I

Energy Measurement **15 Hours**

Definition for utrition, Nutrients, Body weight, Body composition. Respiratory Quotient and Specific Dynamic action. Measurement of energy expenditure - Basal Metabolic Rate- Measurement, factors affectingBMR and its significance.

UNIT II

Vitamins **15 Hours**

Definition, classification. Structure, function, dietary sources, nutritional requirements deficiency states of fat soluble vitamins (A,D,E,K) and water soluble vitamins (B complex vitamins and C).

UNIT III

Minerals **15 Hours**

Definition and classification of Minerals.Nutritional requirements, dietary sources, function and deficiency states of minerals [Ca, P, K, Na, Zn, Fe, I, Mg, Mn]. Nutritious diet sheet-childhood, adolescence and adults, Pregnancy and lactation.

UNIT IV

Plant Physiology and Plant Hormones. **15 Hours**

Structure and functions of Plant cell. Mechanism of water absorption – Aquaporins, Symplast and Apoblast concept. Transpiration and role of stomata.Photosynthesis and its regulation.Photorespiration.Plant hormones - Auxin, Giberillins, Cytokinins, Abscisic acid, Ethylene.

UNIT V

Plant defence mechanism and Microbial production. **15 Hours**

Defence mechanism in plants against pathogens – Structural and Biochemical defence. Production of biotechnological products – SCP (Algae, Yeast, Mushroom). Biofertilizers, Biopesticides.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- Black Board
- Power Point Presentations
- Assignments
- Models
- Demonstrations

TEXT BOOKS:

S.NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	U.Satyanarayana, U.Chakrapani	Biochemistry	Books and Allied (P) Ltd	2010
2	B. Srilakshmi	Nutrition Science	New Age International Pvt Ltd	2009
3	R C Dubey	A Text Book of biotechnology	S Chand	4th Edition 2006

REFERENCE BOOKS:

S.NO	AUTHOR	TITLE	PUBLISHER	YEAR OF PUBLICATION
1	Christopher K. Mathews and K. E. Van Holde	Biochemistry	Benjamin/Cummings	2nd edition 1996
2	NayakShivananda B,	Handbook of Biochemistry and Nutrition	Jay pee brothers Medical publishers	3rd edition 2014
3	Phyllis A. Balch	Prescription for Nutritional Healing, Fifth Edition	Avery	Revised edition 2010

4	Brian J. Deverall	Defence mechanism of plants	Cambridge University Press	1977
5	William G. Hopkins and Norman P. A. Huner	Introduction to Plant Physiology	John Wiley & Sons	4th Edition 2008
6	Alan Crozier	Plant Secondary Metabolites	Blackwell Publishing Ltd	2006
7	Kirti Rani	Microbial Production Technology	Lap lambert Academic Publishing	2012
8	Richard H. Baltz	Manual of Industrial Microbiology and Biotechnology	American Society for Microbiology	3rd Edition 2010

WEB SOURCES

- www.healthline.com/health/what-is-basal-metabolic-rate
- www.healthline.com/nutrition/fat-soluble-vitamins
- www.healthline.com/nutrition/water-soluble-vitamins
- www.sciencedirect.com/journal/plant-physiology-and-biochemistry
- https://courses.lumenlearning.com/boundless-biology/chapter/plant-defense-mechanisms/
- https://byjus.com/biology/single-cell-protein/

SYLLABUS DESIGNER:

- Dr.V.Prabha, Head & Assistant Professor of Bio-Chemistry
- Mrs. G. Nithya, Assistant Professor of Bio-Chemistry

INTERMEDIARY METABOLISM

Sem	Sub Code	Category	Lecture		Theory		Practical		Credit
			Per week	Per sem.	Per week	Per sem.	Per week	Per sem.	
VI	21CBC6B	Core	4	60	4	60	-	-	4

COURSE OBJECTIVE:

To enable the students to learn and comprehend the pathways of intermediary metabolism of biomolecules, and discuss their bioenergetics, correlate the metabolic activity of tissues and organs with their function.

COURSE OUTCOMES:

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

CO Number	CO statement	Knowledge level (K1-K4)
CO1	Understand and relate the function of specific anabolic and catabolic pathways	**K2**
CO2	Students will analyze the importance of carbohydrate metabolism to energy production.	**K4**
CO3	Provides a clear knowledge on the substrates and the products of committed steps in fatty acid biosynthesis.	**K2**
CO4	Provide an understanding on the significance of proteins to the processing of amino acids in the creation of metabolic intermediates	**K4**
CO5	Understand how nucleotides regulate their de novo and salvage synthesis and their interconversions in the cell	**K1**

*CO – course Outcomes

Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze.

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	S	S	S
CO2	S	M	S	S	M	M
CO3	M	M	M	L	S	M
CO4	M	L	L	M	L	L
CO5	L	L	M	M	M	L

(S- Strong; M-Medium; L-Low)

Total Hours: 75

UNIT I

Introduction to Intermediary Metabolism and Biological Oxidation **10 Hours**

Basic metabolic pathways -catabolism, anabolism and amphibolism. Biological transport chain, components of electron transport chain, structure of ATPase complex, Inhibitors of ETC, Oxidative phosphorylation - Chemiosmotic hypotheses, P/o ratio, uncouplers of oxidative phosphorylation.

UNIT II

Carbohydrate Metabolism **10 Hours**

Glycolysis - energetics and its regulation, TCA cycle, anaplerotic and amphibolicnature of TCA cycle, Glycogenesis and Glycogenolysis, Gluconeogenesis, Cori cycle.

UNIT III

Lipid Metabolism **15 Hours**

Biosynthesis of Fatty acid, Fatty acid synthase complex, mitochondrial synthesis of unsaturated fatty acids, Biosynthesis of cholesterol and its regulation. Biosynthesis of triglycerides and phospholipids - (Cephalin, Lecithin, Sphingomylein).Degradation of fatty acids by beta – Oxidation, Formation of ketone bodies.

UNIT IV

Protein Metabolism and Detoxification **10 Hours**

Degradation of Proteins – Transamination, Oxidative deamination, Non – oxidative deamination and decarboxylation of amino acids, Biogenic amines – biosynthesis and function. Urea cycle. Detoxification mechanism in liver – phases of detoxification.

UNIT V:

Nucleic acid Metabolism **15 Hours**

Biosynthesis of Purine nucleotides - De novo synthesis, Salvage pathway, Catabolism of purine nucleotides. Biosynthesis of Pyrimidine nucleotides- De novo and salvage pathways, Catabolism of Pyrimidine nucleotides, Regulation of purine and pyrimidine metabolism.Urieotelic and Uricotelic systems.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- Black Board
- Power Point Presentations
- Assignments
- Models
- Demonstrations

TEXT BOOKS:

S. NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	U. Satyanarayana, U.Chakrapani	Biochemistry	Books and Allied (P) Ltd	2010

REFERENCE BOOKS:

S.No	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	J L Jain	Fundamentals of Biochemistry	S Chand	2016
2	Donald Voet, Judith G.Voet , Charlotte W Pratt	Fundamentals of Biochemistry	John Wiley& Sons.	1999

3	David L. NelsonMichael Cox	Lehninger Principles of Biochemistry	Cox-CBS Publishers	2017
4	Murray R K	Harper's illustrated Biochemistry	P.A. Mayes and U.W.Rodwell - Lange Medical publications	2006
5	Chatterjee	Textbook of Medical Biochemistry	Jaypee brothers medical Publishers (p) Ltd	2012

WEB SOURCES:

- http://themedicalbiochemistrypage.org/carbohydrates.html
- https://en.wikibooks.org/wiki/Category:Book:Structural_Biochemistry
- www.oreilly.com/library/view/biochemistry-for-nurses/9788131768563/xhtml/chapter008.xhtml

SYLLABUS DESIGNER:

- Dr.V. Prabha, Head& Assistant Professor of Bio-Chemistry
- Ms.T. Nalini, Assistant Professor of Bio-Chemistry

BIOTECHNOLOGY

Sem	Subject Code	Category	Lecture		Theory		Practical		Credit
			Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	
VI	21CBC6C	Core	4	60	4	60	-	-	4

COURSE OBJECTIVES

- The content of the syllabus provides an understanding of how biochemical processes find application and improves our life.
- The course introduces the basic biotechnology concept and its application such as plant tissue culture, transgenic technology in plants, genetic engineering tools, and the products developed by biotechnologists found useful in research, industry and clinic.

COURSE OUTCOMES

After the completion of this course, the student will be able to

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	Students will understand the methods forproduction of enzymes using recombinant DNA technology and their application in industrial systems.	**K3**
CO2	Describes the steps involved in plant tissue culture and its applications. It design and deliver the useful production of transgenic plants to the society.	**K4**
CO3	Understand the role of vectors, plasmids in gene technology.	**K2**
CO4	Students will acquire basic knowledge of recombinant DNA technology, engineering of DNA molecules using restriction and modification enzymes. Creation of genomic and cDNA libraries and their applications.	**K2**
CO5	Application of recombinant technology in the production of Biopharmaceutical processes and bio-products.	**K3**

(*CO-Course Outcomes
Knowledge Level: K1-Remember; K2-Understand; K3-Apply; K4-Analyze).

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	L	S	S	L	L	S
CO2	L	S	S	L	L	S
CO3	L	M	L	M	L	L
CO4	S	M	S	L	L	S
CO5	L	S	S	M	L	S

(S- Strong; M-Medium; L-Low)

Total Hours:60

UNIT - I

Scope and applications of Biotechnology **10 Hours**

Biotechnology: Definition and scope, types and branches of biotechnology. Enzyme biotechnology – enzyme production from microbes and its application. Enzyme immobilization - definition, methods involved in immobilization of enzyme, industrial and medical applications of immobilized enzymes.

UNIT – II

Plant biotechnology **10 Hours**

Plant tissue culture – concept, methods involved in plant tissue culture and its applications. Genetic engineering of plants for pest resistance, herbicide tolerance, stress tolerance and delayed fruit ripening.

UNIT – III

Cloning vectors and techniques **10 Hours**

Cloning vectors: Plasmids – definition, classification of plasmids isolation and characteristics of plasmids, cosmids, bacteriophages, PBR 322, plant vectors- Ti plasmid.PCR-principle, types, applications and RT- PCR.

UNIT – IV

Recombinant DNA technology **15 Hours**

Recombinant DNA technology-Basic techniques-cutting and joining of DNA molecules – DNA ligases and its uses, Restriction endonucleases-types, target sites, nomenclature and classification, Reverse transcriptase, DNA polymerase, Taq polymerases - uses and application. Definition of gene structure.Cloning techniques- genomic library and cDNA.

UNIT – V

Genetic engineering **15 Hours**

Production of medically important biomolecules – Insulin, Growth hormone, interferons, Cytokines.Monoclonal antibodies, mycelium cell fusion, selection of hybrids, hybridomas, protoplast fusion and HAT-medium, screening assays, purification and application of monoclonal antibodies.

DISTRIBUTION OF MARKS: Theory – 100% and Problems - Nil

TEACHING METHODOLOGY

- The students will be given home assignments
- Classical black board teaching, power point presentation.
- Learning through discussion and encouraging peer learning and vertical learning.

TEXT BOOKS

S.NO	AUTHOR NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
1.	Sathyanarayana	Biotechnology	Books and allied publishers, 3rd edition	2006
2.	RC Dubey	Textbook of Biotechnology	S.Chand& Co	2009

REFERENCE BOOKS

S.NO	AUTHOR NAME	TITLE OF THE BOOK	PUBLISHER	YEAR
1.	Brown TA	" Gene cloning: An introduction"	Nelson Thornes, 3rd edition	1995
2.	William. J. Thieman , Michael A. Pallidino	Introduction to biotechnology	Pearson Publication,2nd edition	2013
3.	SS Purohit	Biotechnology fundamentals and Applications	Agrobios Publications,4thdition	2007
4.	SB Primose& R Twyman	Principles of gene manipulation and genomics	Blackwell publishing,7th edition	2006
5.	PK Gupta	Biotechnology and genomics	Rastogi Publication,2nd reprint	2006
6.	T.Strachan and A.P.Read	Human Molecular Genetics	BIOS Scientific Publications,2nd Edition	2003

WEB SOURCES:

- www.easybiologyclass.com/enzyme-cell-immobilization-techniques/
- www.slideshare.net/TapeshwarYadav1/recombinant-dna-technology-49722102

SYLLABUS DESIGNER:

- Dr.S. Asha, Assistant professor in Biochemistry.
- Mrs.G. Nithya, Assistant professor in Biochemistry

IMMUNOLOGY

Sem	Sub. Code	Category	Lecture		Theory		Practical		Credit
			Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	
VI	21CBC6D	Elective	3	45	3	45	-	-	3

COURSE OBJECTIVE:

- An understanding of role of immune system in maintaining health and contributing to disease.
- An understanding of cellular and molecular basis of immune responsiveness.
- An understanding of the characteristics of antigens and antibodies and application of antigen-antibody reactions

COURSE OUTCOMES:

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

CO Number	CO Statement	Knowledge Level ($K_1 – K_4$)
CO1	To know about the Cells and Organs of the Immune system and the role of complement system.	**K1**
CO2	To understand the types of immunity, Immunological response and interaction between the immune cells	**K2**
CO3	To gain the knowledge about Immunization methods and also about the principle, application of various Immune Techniques	**K2**
CO4	To understand the concept of theories of Antibody formation and mechanisms contributing to Antibody diversity and MHC complex	**K3**
CO5	To gain knowledge about the cause, symptoms and treatment of Hypersensitivity, Immunodeficiency diseases and auto immune diseases.	**K4**

(*CO – Course Outcomes

Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze).

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO5	PO6
CO1	S	M	S	S	S
CO2	M	M	S	S	M
CO3	S	S	M	M	S
CO4	S	S	M	S	M
CO5	S	M	M	S	S

(S- Strong; M-Medium; L – Low)

Total Hours: 45

UNIT I

Cells and Organs of the Immune system **10 Hours**

Types of immunity - Innate and Acquired immunity. Structure and function of Immune cells- Lymphocytes, macrophages, monocytes, granulocytes and dendritic cells- Mechanism of phagocytosis.Lymphoid organs - Bone marrow, Thymus, Bursa of fabricus, Lymph node and Spleen.

UNIT II

Types of Immunity **5 Hours**

Antigens - definition, antigenicity, antigenic determinant, Haptens, adjuvants and epitopes. Antibodies - structure, classification and function. Complements– nomenclature and function, Complement pathways – classical and alternative pathway.

Immune Response - Primary and Secondary Immune response. Humoral and Cell mediated immunity.

UNIT III

Vaccines and Immunotechniques **10 Hours**

Immunization practices- Active and Passive immunization. Vaccines - killed and attenuated organisms, Toxoids, Recombinant vaccines, DNA vaccines, Multivalent subunit vaccines. Commonly used vaccines for corona infection.

Immune techniques - Immunoelectrophoresis, Immunoprecipitation, RIA, ELISA, Immunoblotting and Immunoflourescence, Complement fixation test.

UNIT IV

Antibody biosynthesis and MHC complex. **10 Hours**

Antibody biosynthesis - Theories of antibody formation- side chain and clonal selection theory. Monoclonal antibodies – Hybridoma Technology and its application.

MHC complex - Gene organization, HLA genes, class I and II antigens, Structure and function.

UNIT V

Immune disorders **10 Hours**

Immunotolerance, Immuno deficiency disorders – Primary and Secondary Immunodeficiency diseases. Hypersensitivity types, Autoimmunity - the spectrum of autoimmune diseases, diagnostic aspects and treatment. Tumor immunology - Tumor antigens and Immune response to tumor.

SARS-CoV-2 : Life cycle, pathophysiology and rationalized treatments.

AIDS: Pathogenesis, HIV life cycle, diagnostic aspects and treatment.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- Black Board
- Power Point Presentations
- Assignments
- Models
- Demonstrations

TEXT BOOKS:

S.NO	AUTHOR	TITLE	PUBLISHER	YEAR OF PUBLICATION
1	N. Arumugam, Dulsy Fatima,	Immunology	Saras Publication	2014
2	NandhiniShetty	Immunology	New age international (p) limited.	2nd edition 2005
3	https://www.abebooks.com/servlet/SearchResults?an=joshi%20osama&cm_sp=det-_-bdp-_-authorJoshi Kr/Osama	Immunology	Agrobios (India)	5th edition 2012

REFERENCE BOOKS:

S.NO	AUTHOR	TITLE	PUBLISHER	YEAR OF PUBLICATION
1	Kuby	Immunology	W.H.Freeman and company	4th edition 2000
2	Ivan M. Roitt	Essential Immunology	Wiley-Blackwell	9th edition 1997
3	D. M. Weir and John Stewart	Immunology	Churchill Livingston	8th edition 1997
4	Janeway's and Kenneth Murphy	Immunobiology	Garland Science	9th edition 2016
5	William E. Paul	Fundamental Immunology	Lippincott Williams and Wilkins	7th edition 2012
6	Jeffrey K. Actor	Introductory Immunology	Academic Press	1 edition 2014
7	David Male	Immunology	Saunders	8 edition 2012
8	Helen Chapel	Essentials of Clinical Immunology	Wiley-Blackwell	5th Revised edition 2006

WEB SOURCES:

- www.immunology.org
- https://en.wikibooks.org/wiki/Immunology/Organs of the Immune System
- https://teachmephysiology.com/immune-system/adaptive-immune-system/antigen-processing-presentation/
- www.immunopaedia.org.za
- www.microbiologybook.org/mobile/m.immuno-18.htm
- www.tusculum.edu/faculty/home/ivanlare/html/genetics/antibodies-master.html

SYLLABUS DESIGNER:

- Dr.V. Prabha, Head & Assistant Professor of Bio-Chemistry

- Mrs. G. Nithya, Assistant Professor of Bio-Chemistry

CLINICAL BIOCHEMISTRY

Sem	Sub. Code	Category	Lecture		Theory		Practical		Credit
			Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	
VI	21CBC6E	Elective	3	45	3	45	-	-	3

COURSE OBJECTIVE:

- To enable the fundamental biochemistry knowledge related to health, the clinical significance of the laboratory tests.
- To evaluate the abnormalities which commonly occur in the clinical field,
- To create awareness of different lifestyle diseases increasingly found in present day.

COURSE OUTCOME:

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

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	List specimen requirements and reference ranges for blood analyses	**K1**
CO2	To explain the basis of carbohydrates metabolism	**K2**
CO3	To explain the basis of amino acid and Nucleic acid metabolism	**K3**
CO4	To explain the basis of Lipid metabolism Explains about the importance of Diagnostic enzymes	**K3**
CO5	From this unit we can obtain the knowledge about the Organ function test	**K4**

(*CO-Course Outcome
Knowledge Level: K1-Remember;K2-Understand;K3-Apply;K4-Analyze)

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	M	S	S	M	M	M
CO2	S	M	M	S	S	M
CO3	S	S	M	S	M	S
CO4	M	M	S	S	M	S

CO5	S	S	S	M	S	S

(S- Strong; M-Medium; L-Low)

Total Hours:45

UNIT-I

Basic concept in clinical Biochemistry **5 Hours**

Setting up of clinical laboratory, Collection, specimen and processing (Blood, Urine, Faeces) Uses of anticoagulants and preservatives for blood and urine. Transport of specimen.

UNIT-II

Disorders of Carbohydrate Metabolism **10 Hours**

Regulation of Blood glucose, Hypo and Hyperglycemia.Diabetes mellitus – metabolic complications and clinical features, cause and treatment of –Glycosuria, galactosemia, Fructosuria, Glycogen storage Disease, Ketonuria and Ketosis.

UNIT-III

Disorders of Protein and Nucleic acid Metabolism **10 Hours**

Clinical Manifestation of phenylketonuria, cystinuria, alkaptonuria, Tyrosinemia, fanconi's Syndrome, Albinism, haemophilia, Hypo and Hyperurecemia, and Gout.

UNIT-IV

Disorders of Lipid Metabolism **10 Hours**

Clinical features of atherosclerosis, hypo and hyper cholesterolemia and fatty liver. Factors affecting blood cholesterol level.

Clinical Enzymology

Isoenzymes with example. Enzymes pattern in acute pancreatitis, liver damage, Bone disorder, myocardial infarction and muscle wasting

UNIT-V

Organ function Test **10 Hours**

Liver function test- Bilirubin metabolism, Jaundice type and its clinical manifestation, Ictric index, Vanderberg test, Plasma protein changes, Prothrombin time.

Renal function test- clearance test-Urea, Creatinine, Inulin, PHA Test, Concentration and Dilution test

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- Black Board
- Power Point Presentations
- Assignments
- Models
- Demonstrations

TEXT BOOKS:

S.NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	M.N.Chaterjee	Text book of medical Biochemistry	Jaypee Brothers Medical Publishers (P) Ltd	8th 2012

REFERENCE BOOKS:

S. NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Hoffmann.W.S	Clinical Biochemistry	Year Book Medical Publishers	4th edition(1970)
2.	A.C.Deb	Fundamentals of Biochemistry	New Central Book Agency	7th edition(2006)
3.	K.Wilson and I.Walker	Practical Biochemistry	Cambridge University press	5th edition(2000)
4.	S.K.Sawhney	Introductory Practical Biochemistry	Alpha Science International, Ltd	2nd edition(2005)
5.	Tietz	Fundamentals of Clinical chemistry	C.A.Burtis, E.R.Ash wood(eds),Saunders WB Co	5th edition

WEB SOURCES:

- www.journals.elsevier.com.
- www.acb.org.uk.
- www.sciencedirect.com.
- www.medicalbiochemistrypage.org.
- www.springer.com
- www.degruyter.com.
- openclinicalbiochemistryjournal.com
- academic.oup.com.

SYLLABUS DESIGNER:

- Dr.B. Hebsibah Elsie, Assistant Professor of Bio-Chemistry
- Dr. K. Shoba, Assistant Professor of Bio-Chemistry

SKILL BASED IV

BIOINFORMATICS

Sem	Sub. Code	Category	Lecture		Theory		Practical		Credit
			Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	Hrs/ week	Hrs/ sem.	
VI	21SBC6A	Skill Based	2	30	2	30	-	-	2

COURSE OBJECTIVE:

To introduce classic bioinformatics theory to students by focusing on how computer techniques can be used for the storage, analysis, prediction and simulation of biological sequences (DNA, RNA and Proteins).

COURSE OUTCOMES:

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

CO Number	CO Statement	Knowledge Level ($K_1 – K_4$)
CO1	To understand the fundamentals of concepts of bioinformatics	**K1**
CO2	Provide a clear knowledge on the sequence analysis and its software tools.	**K2**
CO3	Students will analyze structural functional relationship of sequence.	**K4**
CO4	Students will have a clear knowledge on the different level of protein structure and their prediction tools.	**K4**
CO5	Provide deeper insights into protein structure. prediction and homology modeling process.	**K1**

(*CO – course Outcomes Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze).

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	M	M	M
CO2	S	S	S	S	M	M

CO3	M	M	M	S	M	S
CO4	M	S	M	S	M	M
CO5	S	S	M	M	S	S

(S- Strong; M-Medium; L-Low)

Total Hours:30

UNIT I

Introduction to Bioinformatics **5 Hours**

Introduction, definition, Aim and objectives. Branches of Bioinformatics, Scope and Research area of Bioinformatics. Sequence and Molecular file format.

UNIT II

Biological Databases **5 Hours**

Introduction, Biological Databases – Sequence, Structure and Classification of Databases.National Centre for Biotechnology (NCBI) – Introduction, General tools and Databases.

UNIT III

Sequence Analysis **7 Hours**

Introduction to Sequences, alignments and Dynamic Programming; Pair wise alignment (BLAST and FASTA Algorithm) and multiple sequence alignment (Clustal W algorithm), Online tools for Sequence analysis.

UNIT – IV

Similarity Search, Gene Identification and Prediction **6 Hours**

Similarity Search Introduction, Working with FASTA, Working with BLAST.Basis of gene prediction, Pattern recognition, Gene prediction methods, commonly available tools.

UNIT – V

Protein Classification and Structure Visualisation **7 Hours**

Overview of the Protein Structure, Protein Structure Visualization and prediction: Pymol, Rasmol, and Structure - based Protein Classification, Protein Structure databases, Protein Structure Visualization Databases and tools. Comparative modelling.

DISTRIBUTION OF MARKS: Theory - 100% and Problems – Nil

TEACHING METHODOLOGY:

- Black Board
- Power Point Presentations
- Assignments
- Models
- Demonstrations

TEXT BOOKS:

S.NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	Attwood.T.K. Parry D.J. and Smith	Introduction to Bioinformatics	A joint Publications	1999
2.	Baldi, P. and Brunak, S.	Bioinformatics: The Machine Learning Approach	ress,	2001
3	A.D. Baxevanis and B.F.F. Ouellette.	Bioinformatics: A practical guide to the analysis of genes and proteins	John Wiley and Sons	2002
4	Gentleman, R.	"Bioinformatics and Computational Biology Solutions using R and Bioconductor	Springer Science and Business media Inc	2005

REFERENCE BOOKS:

S.NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	D.W. Mount	Bioinformatics	Cold spring Press	2001
2	Lesk, A. K	Introduction to Bioinformatics, 4th Edition	University Press	2013
3	Rastogi, S.C	Bioinformatics Concepts, Skills & Applications, 2nd Edition	ublishers	2009

WEB SOURCES

- www.slideshare.net/biinoida/bioinformatics
- www.slideshare.net/PrashantTripathi59/sequence-analysis-71940516

- www.creative-proteomics.com/services/protein-structure-analysis-service.htm

SYLLABUS DESIGNER:

- Dr.K. Shoba, Assistant Professor of Bio-Chemistry

CORE PRACTICAL III

COLORIMETRIC ESTIMATIONS AND ENZYME KINETICS

Sem	Subject Code	Category	Lecture		Theory		Practical		Credit
			Per week	Per sem.	Per week	Per sem.	Per week	Per sem.	
VI	21CBC61	Core Practical	-	-	-	-	5	75	3

I. COLORIMETRIC ESTIMATIONS

1. Estimation of Glucose by O-T method.
2. Estimation of Cholesterol by Zak's method.
3. Estimation of Bilirubin by Venden berg method.
4. Estimation of Protein by Lowry's method.
5. Estimation of Pyruvate.

II. EXPERIMENTS ON ENZYMES BY COLORIMETRY

1. Effect of pH, Temperature, Substrate concentration, Specific activity of salivary amylase.
2. Effect of pH, Temperature, Substrate concentration, Specific activity of Acid Phosphatase.
3. Effect of pH, Temperature, Substrate concentration, Specific activity of Urease

REFERENCE BOOKS:

S.NO	AUTHOR	TITLE	PUBLISHER	YEAR
1.	S.K.Sawhney	Introduction to Practical Biochemistry	Alpha science international Ltd	2nd edition (2005)
2.	A. Sadasivam and A.Manickam	Biochemical techniques	New age international publisher	2003
3.	J. Jayaraman	Laboratory manual in Biochemsitry	Wiley Eastern	1981
4.	H. Varley	Practical Clinical Biochemistry	Wiley Eastern	1981

SYLLABUS DESIGNER:

- Dr.V. Prabha, Head & Assistant Professor of Bio-Chemistry.
- Ms.T. Nalini, Assistant Professor of Bio-Chemistry.

CORE PRATICAL IV

HAEMATOLOGY AND URINE ANALYSIS

Sem	Sub. Code	Category	Lecture		Theory		Practical		Credit
			Hrs/ week	Hrs/ sem.	Hrs/week	Hrs/ sem.	Hrs/ Week	Hrs/ sem.	
VI	21CBC62	Core Practical	-	-	-	-	4	60	3

I. HAEMATOLOGY

1. Blood grouping and Rh typing
2. Bleeding Time
3. Clotting Time
4. Prothrombin Time
5. Total RBC Count
6. Total WBC Count
7. Total Platelet Count

II. URINE ANALYSIS

1. Estimation of Creatinine in urine by Jaffe's method
2. Estimation of Urea in urine by Diacetylmonoxime method
3. Estimation of Uric acid in urine by Caraway's method
4. Qualitative analysis of normal constituent of urine
5. Qualitative analysis of abnormal constituent of urine.
6. Qualitative analysis of urinary calculi.
7. Microscopic analysis of urine.

TEXT BOOKS

S. NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	RanjnaChawla	Practical Clinical Biochemistry Methods and Interpretations	Jaypee Brothers Medical Publishers	2014
2.	Harold Varley	Practical Clinical Biochemistry	CBS	2005
3.	DamodaranGeetha K	Practical biochemistry	Jaypee Brothers Medical Publishers	2016
4.	J.Jayaraman	Laboratory Manual in Biochemistry	New age International publishers	2011
5.	RamnikSood	Medical laboratory Technology	Jaypee	2006

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- Dr.K. Shoba, Assistant Professor of Bio-Chemistry