SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)
(Affiliated to Bharathidasan University)
(Acccredited by NAAC; An ISO 9001:2015 Certified Institution)
SUNDARAKKOTTAI, MANNARGUDI –614016.
TAMILNADU, INDIA.

M.Sc., BIOCHEMISTRY COURSE STRUCTURE UNDER CBCS
(For the candidates admitted in the academic year 2020 – 2021)

Eligibility : Candidates who have passed Bachelor level Examination in Botany/ Zoology/ Biochemistry/ Biotechnology/ Microbiology/ Genetics/ Medicine/ Agriculture/ Life Sciences/ Chemistry/ Pharmacy from any recognized university in India or Abroad.

Sem.	Nature of the Course	Course Code	Title of the Course	Inst. Hrs/ Week	Credit	Exam Hrs	Marks		
							CIA	ESE	Total
I	Core Course (CC) – I	20PBC101	Chemistry of Biomolecules	5	5	3	25	75	100
	Core Course (CC) – II	20PBC102	Bio-Analytical Techniques	5	5	3	25	75	100
	Core Course (CC) – III	20PBC103	Enzymology	5	5	3	25	75	100
	Core Course (CC) – IV	20PBC104	Hormonal Regulation and Signal Transduction	5	5	3	25	75	100
	Core Practical (CP) – I	20PBC105P	Bio-Analytical Techniques and Enzymology Practical	6	5	3	40	60	100
	Elective Course (EC)–I	20PBCE1A/ 20PBCE1B	Ecology and Environmental Sciences/ Basics of Patent and Bioethics	4	3	3	25	75	100
			TOTAL	**30**	**28**	**-**	**-**	**-**	**600**
II	Core Course (CC) – V	20PBC206	Intermediary Metabolism	4	4	3	25	75	100
	Core Course (CC) – VI	20PBC207	Cell Biology and Physiology	4	4	3	25	75	100
	Core Course (CC) – VII	20PBC208	Molecular Biology	5	4	3	25	75	100
	Core Course (CC) – VIII	20PBC209	Plant and Microbes	4	4	3	25	75	100
	Core Practical (CP) – II	20PBC210P	Phytochemistry and Microbial Techniques Practical	6	5	3	40	60	100
	Elective Course (EC) – II	20PBCE2A/ 20PBCE2B	Developmental Biology/ Nanotechnology	4	3	3	25	75	100
	Extra Disciplinary Course (EDC) – I	-	-	3	2	3	25	75	100
			TOTAL	**30**	**26**	**-**	**-**	**-**	**700**
III	Core Course (CC) – IX	21PBC311	Clinical Biochemistry	6	4	3	25	75	100
	Core Course (CC) – X	21PBC312	Research Methodology and Biostatistics	6	4	3	25	75	100
	Core Practical (CP) – III	21PBC313P	Clinical Biochemistry Practical and Internship	8	5	3	40	60	100
	Elective Course (EC)– III	21PBCE3A/ 21PBCE3B	Bioinformatics and Medical Coding/ Industrial Biotechnology	6	3	3	25	75	100
	Extra Disciplinary Course (EDC) – II	-	-	4	2	3	25	75	100
			TOTAL	**30**	**18**	**-**	**-**	**-**	**500**
IV	Core Course (CC) – XI	21PBC414	Immunology	6	4	3	25	75	100
	Core Course (CC) – XII	21PBC415	Genetic Engineering	6	4	3	25	75	100
	Project Work	21PBCPW	Dissertation (2 reviews-20+20=40 marks Report Valuation=35 marks) Viva = 25 Marks	18	10	-	25	75	100
			TOTAL	**30**	**18**	**-**	**-**	**-**	**300**
			G.TOTAL	**120**	**90**	**-**	**-**	**-**	**2100**

CURRICULAM DESIGN

Courses	No. of Courses	Total Credits
Core Course	12	52
Core Practical	03	15
Elective Course	03	09
Extra Disciplinary Course	02	04
Project	01	10
Total	**21**	**90**

Note:

	CIA	ESE
1. Theory	25	75
2. Practical	40	60
3. Project	25	75

Separate passing minimum is prescribed for Internal and External

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]
The passing minimum for ESE shall be 40% out of 75 marks [i.e.30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]
The passing minimum for ESE shall be 40% out of 60 marks [i.e. 24 marks]

The passing minimum not less than 50% in the aggregate.

ELECTIVE COURSES (EC) OFFERED BY THE DEPARTMENT

Semester	Nature of the Course	Course Code	Title of the Course (Any one from the list)
I	Elective Course (EC) – I	20PBCE1A	Ecology and Environmental Sciences
I	Elective Course (EC) – I	20PBCE1B	Basics of Patent and Bioethics
II	Elective Course (EC) – II	20PBCE2A	Developmental Biology
II	Elective Course (EC) – II	20PBCE2B	Nanotechnology
III	Elective Course (EC) – III	21PBCE3A	Bioinformatics and Medical Coding
III	Elective Course (EC) – III	21PBCE3B	Industrial Biotechnology

EXTRA DISCIPLINARY COURSES (EDC) OFFERED BY THE DEPARTMENT

Semester	Nature of the Course	Course Code	Title of the Course (Any one from the list)
II	Extra Disciplinary Course (EDC) – I	20PBCED1A	Herbal Drug Technology
II	Extra Disciplinary Course (EDC) – I	20PBCED1B	Nutritional Biochemistry
III	Extra Disciplinary Course (EDC) – II	21PBCED2A	Applied Pharmacognosy
III	Extra Disciplinary Course (EDC) – II	21PBCED2B	Diagnostic Biochemistry

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TAMILNADU, INDIA.

DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

(For the candidates admitted in the academic year 2020 – 2021)

Question Paper Pattern (Theory)

Max time: 3 Hours **Max Marks: 75**

Section – A (10 x 2 = 20)
Answer all the questions
Answer in One or Two sentences each

1.	**Unit I**
2.	
3.	**Unit II**
4.	
5.	**Unit III**
6.	
7.	**Unit IV**
8.	
9.	**Unit V**
10.	

Section – B (5 x 5 = 25)
Answer all the questions
Each answer should not exceed 500 words

11. a (or)	**Unit I**
b	
12. a (or)	**Unit II**
b	
13. a (or)	**Unit III**
b	
14. a (or)	**Unit IV**
b	
15. a (or)	**Unit V**
b	

Section – C (3 x10 = 30)
Answer any <u>Three questions</u> in 1200 words

16.	-----	**Unit I**
17.	-----	**Unit II**
18.	-----	**Unit III**
19.	-----	**Unit IV**
20.	-----	**Unit V**

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SEMESTER I

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE (AUTONOMOUS), SUNDARAKKOTTAI, MANNARGUDI - 614016.

PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: I-CC- I: CHEMISTRY OF BIOMOLECULES

Ins. Hrs. /Week : 5 **Course Credit: 5** **Course Code :**

OBJECTIVES:

- To appreciate the salient features of Biomolecules in the organization of life
- To characterize the significance and methodology of major Biomolecules
- To understand the classification, functions and application aspects of Biomolecules

UNIT I

Carbohydrates- Definition, classification, structure, properties and functions of monosaccharide, disaccharides, homo polysaccharides and hetero polysaccharides. Sugar derivatives-glycosaminoglycans and proteoglycans. Glycoprotein – Blood group and bacterial cell wall polysaccharides, O- linked and N-linked oligosaccharides, Lectins.

UNIT II

Aminoacids and Proteins - Definition, amino acids as ampholytes. Structure and classification of amino acids based on chemical nature, chemical reaction of amino acids due to carbonyl and amino groups. Essential amino acids. Proteins– classification and general properties. Orders of protein structure: Primary- Ramachandran plot, Secondary structure– the α-helix, β- pleated sheet. Super secondary structure– helix– loop helix, the hairpin β -motif and the β-α-β-motif. Tertiary and quaternary structure-Forces stabilizing tertiary and quaternary structure.

UNIT III

Chemical synthesis of peptides by Merrifield method. Methods of isolation- sonication, repeated freezing and thawing; characterization - Ion exchange chromatography and Affinity chromatography and purification of proteins- Western blot and Gel electrophoresis. Protein sequencing methods- Protein sequencer; *N*-terminal and C-terminal amino acid analysis.

UNIT IV

Fatty acids- Definition, nomenclature, classification, properties and biological significance. Lipids-Definition and classification, biological significance of lipids. Types of Structure and biological functions of phospholipids, sphingolipids, glycolipids. Steroids – structure and functions of cholesterol, bile acids, sex hormones, ergosterol. Structure and biological role of prostaglandins, thromboxanes and leukotrienes.

UNIT V

Nucleic acid- Structure of purines, pyrimidines, nucleosides and nucleotides. DNA - Double helical structure, A, B and Z forms, triple and quadruple structures, super coiling, linking number and properties of DNA, the cot curve. DNA sequencing - chemical and enzymatic methods. Chemical synthesis of DNA. RNA– types, structure - secondary, tertiary structures and biological role.

COURSE OUTCOME:

The students will be able to,

1. Explain the structure and properties of carbohydrates.
2. Identify the structure of amino acids and combine the structure of proteins.
3. Discuss isolation and identification of proteins.
4. Combine the structure and functions of lipids.
5. Describe the structure and functions of nucleic acids.

TEXT BOOK(S):

1. Sujata V. Bhat, Bhimsen A. Nagasampagi, Meenakshi Sivakumar 2005.Chemistry of natural Products, First edition
2. McGraw Hill, 2012, Harper's Biochemistry, 29th edition**.**

REFERENCE BOOK(S):

1. Zubay, 1998, Biochemistry, William C. Brown Publication, 4th edition.
2. Stryer, 2002, Biochemistry.W.H Freeman, 5th edition.
3. Lehninger Nelson Cox Macmillan, 2013, Principles of Biochemistry. Worth Publishers, 7th edition.
4. Davidson and Sittmann, Lippincott William's and Wilkins, 1999, Biochemistry, 4th edition.
5. Voet and Voet, 2011, Biochemistry, J O H N WI VP & Publisher Kaye Pace Associate Publisher
6. Berg, Jeremy M.and Tymoczko, John L. 2011, Stryer, Lubert Biochemistry Student Companion, Berg, W. H. Freeman Publishers, 7th Edition.

E-RESOURCES:

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PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: I-CC- II: BIO-ANALYTICAL TECHNIQUES

Ins. Hrs. /Week : 5 **Course Credit: 5** **Course Code :**

OBJECTIVES:

- To gain the knowledge regarding different analytical techniques for biological sample analysis
- To develop an understanding of the range and uses of analytical methods
- To provide an understanding of analytical methods employed for elemental and compound analysis

UNIT I

Electrochemical techniques – Principles, Electrochemical cells and reaction- pH and buffers. Measurement of pH – glass electrode and titration curves. Ion selective and gas sensing electrodes, oxygen electrode, and their applications. Methods for studying cells and organelles. General scheme for purification of bio- components.

UNIT II

Chromatographic methods: Introduction & classification of chromatography. Theory, instrumentation & applications of the following chromatographic techniques: paper, column, thin layer**,** gel permeation, ion-exchange chromatography, exclusion chromatography, GLC, HPLC and HPTLC, GCMS and LCMS.

UNIT III

Centrifugation: Principles, differential and analytical centrifugation, density gradient centrifugation; Analysis of sub cellular fractions, ultracentrifuge and its application.

UNIT IV

Electrophoresis and Blotting techniques: Principles, electrophoretic mobility, factors influencing electrophoretic mobility – paper, disc, slab gel electrophoresis. Isoelectric focusing, SDS PAGE and 2D PAGE, capillary electrophoresis and blotting techniques.

UNIT V

Spectroscopy: Introduction, Theory of UV Visible Spectroscopy & colorimetry, Beer Lambert law, Deviation from Beer Lambert law. Infrared Spectroscopy: Introduction, Infrared radiation & its interaction with organic molecules, instrumentation & applications, interpretation of IR spectra. Atomic spectroscopy – principle and applications of atomic flame and flameless spectrophotometry ESR, NMR, IR and spectrofluorimetry. Basic principles of turbidimetry and nephelometry. Principle, instrumentation and applications of luminometry,Use of lasers for spectroscopy.

COURSE OUTCOME:

The Students will be able to,

1. Obtain basic knowledge about the principles and applications of electrochemical techniques.
2. Explain the theoretical principles and applications of chromatography techniques.
3. Students will gain the knowledge about the principles of centrifugation techniques and appreciate the scope of their applications.

4. Explain the theoretical principles of electrophoretic and some electro analytical techniques and some of their applications.
5. Students will learn about the principle and applications of Spectroscopy.

TEXT BOOK(S):

1. Robert. D. Braun, Introduction to instrumental analysis.
2. A.I. Vogel, Text book of Quantitative Chemical Analysis.
3. West, E.S. and Todd, W.R, Mac Millan, Germany, 1985, Textbook of Biochemistry.

REFERENCE BOOK(S):

1. Keith Wilson & John Walker, 2005, Principles and Techniques of Practical Biochemistry, Cambridge University Press, India.
2. Avinash Upadhyay, Kakoli Upadhyay and Nirmalendu Nath, 2014, Biophysical Chemistry (Principles and Techniques) Himalaya Publishing House, India, 4th Edition,.
3. Abhilasha Shourie and Shilpa S Chapadgaonkar, 2015, Bioanalytical Techniques, the Energy and Resources Institute, TERI, India.
4. C.R. Kothari, Research Methodology, Methods and Techniques, 2004, New Age International Publishers. India, 2nd ed,.
5. Braun, R.P., Tata McGraw Hill, 1987, Introduction to Instrumental Analysis, India.
6. Ghosal Sabari and Srivastava A. K., 2009, Fundamentals of Bio Analytical Techniques and Instrumentation, PHI Learning Pvt. Ltd. India.
7. Introduction to Spectroscopy. 3rdEdition. Pavia, Brooks/Cole Pub Co., New Delhi, India, 2000.
8. K. K. Machve, 2010, Basic Instrumentation, Neha Publishers & Distributors, India.

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PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: I-CC- III: ENZYMOLOGY

Ins. Hrs. /Week : 5 **Course Credit: 5** **Course Code :**

OBJECTIVES:

- To learn about concepts and classes of enzymes
- To understand the structure and function of enzymes, principles of enzyme catalysis.
- To study about enzyme kinetics and applications of enzymes

UNIT I

Enzymes - Definition, Scope, Properties, Structure and Functions. Historical aspects of enzymology. Nomenclature and classification of enzymes, according to IUB-EC-1964. Intracellular localization of enzymes, homogenization techniques, isolation and fractionation of enzymes - classical methods of purification and crystallization - separation based on molecular size, electric charge, solubility difference and selective adsorption, criteria of purity, units of enzyme activity. Turn over number, specific activity.

UNIT II

Active site definition, organization and determination of active site residues. Catalytic power and specificity of enzymes (concept of active site). Fischer's lock and key hypothesis, Koshland's induced fit hypothesis. Coenzymes - structure and function, Mechanism of enzymes action: mechanism of action of lysozyme, chymotrypsin and carboxypeptidase. Multienzymes system - Mechanism of action and regulations of pyruvate dehydrogenase, and fatty acid synthase complex.

UNIT III

Kinetics of catalyzed reaction: Single substrate reactions, bisubstrate reactions, Factors influencing enzyme activity, Concept and derivation of Michaelis – Menten equation, Lineweaver burk plot, Briggs Haldane relationship. Determination and significance of kinetic constants, Limitations of Michaelis-Menten Kinetics. Inhibition kinetics - competitive, non-competitive and uncompetitive. Allosteric inhibition, cooperative, cumulative, feedback inhibition.

UNIT IV

Criteria of chemical reactions - Collision & transition state theories, Factors affecting the rate of chemical reactions. Mechanism of catalysis: Proximity and orientation effects, general acid-base catalysis, covalent and electrostatic catalysis - nucleophilic and electrophilic attacks, catalysis by distortion, metal ion catalysis. Theories on mechanism of catalysis. Cofactor and prosthetic group, apoenzyme, holoenzyme. Isoenzymes.

UNIT V

Applications of enzymes in Industry. Immobilization and Immobilized enzymes. Various methods of immobilization - ionic bonding, adsorption, covalent bonding (based on R groups of amino acids), microencapsulation and gel entrapment. Applications of immobilized enzymes. Role of Biosensors in Enzymology. Enzymes of clinical importance - diagnostic significance and therapeutic effects. Non protein enzymes - Abzymes and Ribozymes. Enzyme Engineering.

COURSE OUTCOME:

The student will be able to,

1. Obtain basic knowledge about the relationship between properties, structure and functions of the enzymes.
2. Explain how enzymes are able to increase their mechanisms of action and kinetics of enzymatic reactions.
3. Characterize the enzymes in each enzymatic class, examples of such enzymes and their application in practice.
4. Understand the regulatory mechanisms of enzyme activity.
5. Acquire them have knowledge in the field of Biosensors and immobilized enzymes and analyze the options for applying enzymes in medicine and various industries.

TEXT BOOK(S):

1. Alan J. Barrett, J. Fred Woessner, Neil D. Rawlings, Handbook of Proteolytic Enzymes, 2012.
2. Nicholas C, 1989, Fundamentals of Enzymology, Oxford Science Publications, 2nd Edition.
3. Palmer T, 2007, Enzymes: Biochemistry, Biotechnology, Clinical Chemistry Kindle Edition..

REFERENCE BOOK(S):

1. Bohinski, R.C, 1987, Modern concepts in Biochemistry, Alllyn and Bascon Inc. Boston.
2. Caret, 1993, Inorganic, Organic and Biological Chemistry, W.M.C. Brown Publ. USA.
3. Dixon, M. and Webb, J.F, 1979, Enzymes, Longman Publicatios, London.
4. Lehninger, A.H, 1993, Principles of Biochemistry, Worth Publ. Inc. USA.
5. Montgomery, R, 1990, Biochemistry: A case Orientede Approach, The C.V. Mosby Co., St. Louis.
6. Rawn, J.D, 1989, Biochemistry, Neil Patterson Publicatios, North Carolina.
7. Stryer, I, 1988, Biochemistry, W.H. Freeman & Co., Publicatios, New York, 2nd edition.
8. Voet, D. and Voet, J.G, 1990, Biochemistry, John Wiley & Sons Inc., New York.
9. Voet, D. and Voet, J.G, 1959, Principles of Biochemistry, McGraw Hill Book Co., Publicatios, New York.
10. Price and Stevens, 1999, Fundamentals of Enzymology, Oxford University Press.

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PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: I-CC- IV: HORMONAL REGULATION AND SIGNAL TRANSDUCTION

Ins. Hrs. /Week : 5 **Course Credit: 5** **Course Code :**

OBJECTIVES:

- To explain the roles of the endocrine system in maintaining homeostasis and integrating growth and development
- To identify the glands, organs, tissues and cells that synthesize and secrete hormones, hormone precursors and associated compounds and their functions
- To apply endocrinological principles to determine the pathophysiological basis and consequences of specific endocrine disorders

UNIT I

Hormones – classification, biosynthesis, circulation in blood, modification and degradation, biological importance of hormones. Hypothalamic and pituitary hormones: Hypothalamic releasing factors. Anterior pituitary hormones: biological actions, regulation and disorders of growth hormone, TSH, ACTH, gonadotrophins and prolactin. Posterior pituitary hormones – biological actions, regulation and disorders of vasopressin and oxytocin. Hypopituitarism.

UNIT II

Thyroid and parathyroid hormones: Thyroid hormones – synthesis, secretion, regulation, transport, metabolic fate and biological actions. Antithyroid agents. Thyroid functions tests. Hyper and hypothyroidism. Secretion and biological actions of PTH, calcitonin and calcitriol. Hormonal regulation of calcium and phosphate metabolism. Hypercalcemia and hypocalcemia. Rickets and osteomalacia.

UNIT III

Adrenal hormones: Adrenal cortical hormones-Synthesis, regulation, transport, metabolism and biological effects. Adrenal function tests. Addison's disease, Cushing's syndrome, aldosteronism, congenial adrenal hyperplasia, Adrenal medullary hormones – synthesis, secretion, metabolism, regulation and biological effects of catecholamines. Phaeochromocytoma.

UNIT IV

G.I. and pancreatic hormones: Brief account of gastrointestinal hormones. Pancreatic hormones – synthesis, regulation, biological effects and mechanism of action of glucagons, somatostatin and insulin. Gonadal hormones: Biosynthesis, regulation, transport, metabolism and biological actions of androgens. Hypogonadism and gynecomastia. Biosynthesis, regulation, transport, metabolism and biological effects of oestrogen and progesterone. The menstrual cycle. Pregnancy – diagnostic tests and biochemical changes. Foetal monitoring. Amenorrhea.

UNIT V

Signal transduction: Fundamental concepts and definitions of signals, ligands and receptors, endocrine, paracrine and autocrine signaling. Hormone receptors – structure and regulation. Mechanism of action of hormone receptor. Signaling pathways – Intracellular receptors -cytoplasmic and nuclear receptors - Steroid and Thyroid hormone receptors, cell surface receptors-ion channels, G-protein coupled receptors

(GPCR), GTPases activity of G protein, receptor kinases (tyr, ser/thr). Second messengers – cyclic nucleotides (cAMP, cGMP), lipids (phosphatidyl inositol diphosphate and DAG), calcium ions, calmodulin and NO. The Ras-raf MAP kinase cascade, Crosstalk in signaling pathways.

COURSE OUTCOME:

The student will be able to,

1. Have the knowledge about anatomy of endocrine system and also biological functions and regulations of hypothalamic and pituitary hormones.
2. Understanding of basic knowledge about biochemical and physiological effects of thyroid and parathyroid hormones.
3. Have the ability to explain the role of adrenal hormones and its disorders.
4. Gain knowledge about pancreatic and gonadal hormones.
5. Have basic knowledge of nature of signals, components of signaling pathways and their functional properties.

TEXT BOOK(S):

1. Harper's Biochemistry – Murray *et a*l. 26th ed. McGraw Hill, 2003.
2. Text Book of Biochemistry-S.Nagini, Scitech, 2002.
3. Principles of Biochemistry – Mammalian Biochemistry, Smith et al. McGraw Hill, 1983.

REFERENCE BOOK(S):

1. Wilson and Foster, 2015, Williams Textbook of Endocrinology, 13th ed.
2. Endocrinology, Mac E. Hadley Publishers – prentice hall international Inc, 4 edition.
3. Autind and Short, 1980, Mechanisms of hormone action.
4. Williams et al, 2015, Textbook of Endocrinology.
5. Gerhard Krauss, 2003, Biochemistry of Signal Transduction and Regulation. WILEY- VCH Verlag GmbH & Co. KGaA, Weinheim Publications, 3rd Edition.
6. Geoffrey Cooper, Robert E Harsman, 2004, The Cell- A Molecular Approach, ASM Press, 3rd edition.
7. De Robertis and De Robertis, 2001, Cell and Molecular Biology. Wolters Kluwer India Pvt Ltd, 8th edition.
8. Guyton, 2001, Text book of medical physiology, W.B.Saunders publishers, 10^{th} edition.
9. John T.Hanuck, 2006, Cell signaling, Oxford University, 2 edition.
10. J.P. Luzio, R.J. Thompson, 1999, Molecular medical biochemistry, Cambridge University

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PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: I-CP- I: BIO-ANALYTICAL TECHNIQUES AND ENZYMOLOGY PRACTICAL
Ins. Hrs. /Week : 6 **Course Credit: 5** **Course Code :**

1. Preparation of Buffers and Measurement of P^H
2. Separation of amino acids and sugars by Paper Chromatography.
3. Separation of Plant pigments by Paper Chromatography
4. TLC separation of Amino acids/Lipids
5. Estimation of DNA by diphenylamine method
7. Estimation of RNA by orcinol method
8. Separation of proteins by SDS-PAGE. (Demonstration)
9. Determination of specific activity of salivary amylase
10. Effect of pH, temperature and substrate concentration for amylase and urease and determination of Vmax & Km
11. Effect of pH and temperature on enzyme activity (Acid phosphatise /Alkaline phosphatase).
12. Effect of inhibitor on activity of any one enzyme
13. Effect of activator on activity of any one enzyme

TEXT BOOK(S):

1. Dr. J. Jayaraman, 2000, Manuals in Biochemistry, New Age International Pub.
2. P.Palanivelu, 2001, Laboratory manual for Analytical Biochemistry & separation Techniques, MKU University, Madurai.
3. T Plummer, 2001, Practical Biochemistry, McGraw Hill Publishing Company.

REFERENCE BOOK(S):

1. S.K. Sawhney, Randhir Singh, 2005, Introductory practical Biochemistry, 2nd edition.
2. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications, Meerut, 2000.
3. Varley, Varley's Practical Clinical Biochemsitry – Ed. Alan W. Gowenlock (Heinemann Medical Books, London).

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PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: I-EC- I: ECOLOGY AND ENVIRONMENTAL SCIENCES

Ins. Hrs. /Week : 4 **Course Credit: 3** **Course Code :**

OBJECTIVES:

- To study the physical and biological characters of the environment and the interrelationship between biotic and abiotic components of nature as well as relationship among the individuals of the biotic components
- To give students an understanding of how science and the scientific method work to address environmental problems
- To learn about the interaction of human society (urban sprawl, energy use/generation, resource consumption and economics) with the Earth's systems

UNIT I

Environment – Physical environment: atmosphere (air), hydrosphere, lithosphere properties, interrelationship with living organisms. Abiotic and biotic environment and their interactions. Species interactions; types, interspecific competition, herbivory, carnivory, pollination, symbiosis. Population ecology – Population characteristics, population growth curve, population regulation, life history strategies (r and K selection); concept of meta population demes and dispersal, interdemic extinctions, age structured populations.

UNIT II

Community ecology: Nature of communities, community structure and attributes, levels of species diversity and its measurement, edges and ecotones. Concept of habitat and niche, types of niche, niche width and overlap, fundamental and realized niche, resource partitioning, character displacement.

UNIT III

Ecological succession and Ecosystem Ecology: Ecological succession types, mechanisms, concept of climax. Structure and function of ecosystem (terrestrial, forest, grassland and aquatic). ecosystem connections: food chain, food web; detritus pathway of energy flow and decomposition processes; ecological pyramids: pyramids of number, biomass, and energy, mineral cycling (C,N,P,S).

UNIT IV

Pollution: Definition, Causes, Effects and Control measures of Air, Water, Soil, Marine, Noise and thermal pollution, Nuclear hazards, Solid Waste Management: Causes, Effects and Control measures of Urban and Industrial Waste, major drivers of biodiversity change, biodiversity management approaches.

UNIT V

Biogeography and Conservation Biology; Major terrestrial biomes, theory of island biogeography, biogeographically zones of India. Principles of conservation, major approaches to management, Indian case studies on conservation/management stratergy (Project Tiger, Biosphere reserves).

COURSE OUTCOME:

The students will be able to,

1. Understand core concepts of physical environment and species interactions.
2. Knowledge of the environment and the role of human beings in shaping the environment.
3. Ability to correlate ecological dynamics and regulation of vital processes on earth as biogeochemical cycles.
4. Analytical ability to link cause and effect of pollution.
5. Understand the Indian constitutional provisions with respect to the environmental protection, division of powers, and fundamental rights.

TEXT BOOK (S):

1. Edward J.Kormondy, 1996, Concepts of Ecology, 4th edition.
2. Aulay Mackenzine, Andy S.Ball, 1998, Instant Notes Ecology, 2nd edition.
3. PK Yadav Shubhrata R.Mishra. Environmental Biology, Discovery Publishing House. New Delhi.
4. Fundamentals of Ecology, MCDASH , 1993, Second Edition, TATA Mcgow Hill Publishing Company Limited, New Delhi
5. H.D.Kumar, 2008, Modern concepts of Ecology, Vikas Publishing House Pvt Ltd, 8th edition,

REFERENCE BOOKS:

1. P.S. Verma and V.K.Agarwal, 2005, Cell Biology, Genetics, Molecular Biology, Evolution And Ecology, S. Chand Company Ltd.
2. T.K.Saha, 2011, Ecology and Environmental Biology, Books and Allied (P) Ltd, Kolkata.
3. Dr. Biswarup Mukherjee, 2008, Fundamentals of Environment Biology, Silverline publications.
4. S S Negi, 2008, A Hand Book of Environmental Science.
5. P.Panday, 2010, A Text Book of Environmental Pollution.
6. V. Thakur, 2011, A Text Book of Environmental Science.

E-RESOURCES:

http:// www.pdfdrive.com › ecology-and-environment-books
http:// www.freebookcentre.net › Biology › Ecology-Books

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE (AUTONOMOUS), SUNDARAKKOTTAI, MANNARGUDI - 614016.

PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: I-EC- I: BASICS OF PATENT AND BIOETHICS

Ins. Hrs. /Week : 4 **Course Credit: 3** **Course Code :**

OBJECTIVES:

- To encourage innovation by granting inventors a patent for their innovation
- To adhere to the ethical practices appropriate to the discipline at all times
- To adopt safe working practices relevant to the bioindustries & field of research

UNIT I

Patent – Definition, types of patent, issues related to patent, granting process of patent, rights provided by patent, patent protection

UNIT II

Introduction to intellectual property rights (IPR)- Overview, meaning and types Copyright – Introduction, area covered by copyright, types of rights, need of protection of copy right. Trademarks- introduction, types and function

UNIT III

Definition of Ethics and Bioethics, ethics in biosciences (positive and negative effects with classical examples – slow ripening fruits and controlled ripening) Awareness education on genetically engineered organisms

UNIT IV

Containment levels – Definition and types, their impact on environment – recommended biosafety levels for infectious agents, animal facilities. Need for a good laboratory practice- aspiration and responsibility

UNIT V

Ethics in clinical trials and good clinical practices (GCP) – Definition of clinical trials and GCP, general information about clinical trials, need to conduct clinical trials, phases of clinical trials, institutional setups for conducting clinical trials and ethics associated with it.

COURSE OUTCOME:

The students will be able to,

1. Gain awareness about Intellectual Property Rights (IPRs) to take measure for the protecting their ideas.
2. Advice business strategies by taking account of IPRs.
3. Assists in technology upgradation and enhancing competitiveness.
4. Acquire adequate knowledge in the use of genetically modified organisms and its effect on human health.
5. Gain more insights into the regulatory affairs.

TEXT BOOK(S):

1. R. Rallipalli and Geetha Bali, 2007, Bioethics and Biosafety, APH publications.

2. Fleming, DA, and Hunt, DL, 2000, Biological safety principles and practices, ASM Press.

REFERENCE BOOK(S):

1. Antony W Rodger, Copy right, Patent trade mark and related state, Doctrines cases and materials on the law of intellectual property, 7 thedition, Foundation Press
2. Padmanabhan, 2012, Intellectual Property Rights, Publisher- Lexis, Nexis- New Delhi-1, A First edition,

E-RESOURCES:

https://books.google.co.in/books/about/IPR_Biosafety_and_Bioethics.html

SEMESTER II

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PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: II-CC- V: INTERMEDIARY METABOLISM

Ins. Hrs. /Week : 4 **Course Credit: 4** **Course Code :**

OBJECTIVES:

- To understand the energy transformation in living organism
- To learn basic concepts and mechanisms of oxidative phosphorylation and electron transport chain
- To understand the metabolic pathways and regulatory mechanisms

UNIT I

Bioenergetics: Free energy and entropy. Endergonic and exergonic reactions. Phosphoryl group transfers and ATP. Enzymes involved in redox reactions. The electron transport chain– organization and role in electron capture. Electron transfer reactions in mitochondria. Oxidative phosphorylation- F1/F0 ATPase-structure and mechanism of action. ATP/ADP exchange. The chemiosmotic theory. Inhibitors of respiratory chain and Oxidative phosphorylation – uncouplers, ionophores. Regulation of oxidative phosphorylation. Malate /glycerophosphate shuttle.

UNIT II

Carbohydrate metabolism: Glycolysis and gluconeogenesis– pathway, key enzymes and co-ordinate regulation. Pyruvate dehydrogenase complex and the regulation of this enzyme through reversible covalent modification. The citric acid cycle – pathway, energetic and regulation. The pentose phosphate pathway. Metabolism of glycogen and regulation. Glycogen storage diseases, Uronic acid pathaway. Cori's cycle, Glyoxalate pathway. Metabolism of fructose and Galactose.

UNIT III

Lipid metabolism: Lipogenesis-Control of acetyl CoA carboxylase-Role of hormones-Effect of diet on fatty acid biosynthesis. Regulation of biosynthesis of triacylglycerol, phospholipids and cholesterol. Metabolism of triacylglycerol during stress. α, β,γ, Oxidation of fatty acids– Role of carnitine cycle in the regulation of β -oxidation. Ketogenesis and its control. Lipoprotein metabolism.

UNIT IV

Metabolism of amino acids, purines and pyrimidines: Overview of biosynthesis of nonessential amino acids. Catabolism of amino acid– transamination, deamination and decarboxylation, ammonia formation, the urea cycle and regulation of ureogenesis. Importance of glutamate dehydrogenase. Overview of Catabolism of carbon skeletons of amino acids. Metabolism of purines- de novo and salvage pathways for purine biosynthesis-Purine catabolic pathway. Metabolism of pyrimidines -biosynthesis and catabolism. Regulation of biosynthesis of nucleotides. Metabolism of Porphyrin

UNIT V

Metabolic integration and hormonal regulation: Key junctions in metabolism– glucose-6-phosphate, pyruvate and acetyl CoA. Metabolic profiles of brain, muscle, liver, kidney and adipose tissue. Metabolic inter relationships in various nutritional and hormonal states– obesity, aerobic, anaerobic endurance, exercise, pregnancy, lactation, IDDM, NIDDM and starvation.

COURSE OUTCOME:

The student will be able to,

1. Learn basic concepts of Bioenergetics, mechanism of electron transport system and oxidative phosphorylation.
2. Understand the basic knowledge about carbohydrate metabolism.
3. Have the ability to describe the lipid metabolism and its regulation.
4. Know how proteins, amino acids and nucleic acids are metabolized and how they are regulated.
5. Acquire knowledge about the metabolic profile of some important tissues.

TEXT BOOK(S):

1. Murray, 2011, Harper's Biochemistry, 29th edition.Mc. GrawHill Publications.
2. U.Sathyanarayana and Chakrapani, Biochemistry, 7th edition**.**
3. Lehninger, Nelson & Cox, 2013, Principles of Biochemistry, 7th edition. Macmillan worth Publishers.
4. A.I. Jain. 2004. Essentials of Biochemistry, 2nd edition. S. Chand publications,

REFERENCE BOOK(S):

1. Stryer, Freeman, 2002, Biochemistry, 5th edition.
2. Donald Voet, J.G. Voet, Biochemistry, John Wiley, J O H N WI VP & Publisher Kaye Pace
3. Kuchel and Ralston, 1998, Biochemistry, 2nd edition, Schaum's Outlines McGraw Hill.
4. Davidson and Sittman. Lippincott.Willams and Wilkins, 1999, Biochemistry NMS.4th edition.
5. Campbell and Farrell, 2002, Biochemistry, 4th edition, Brooks/Cole Pub Co.
6. Keith N. Frayn, 2009.Metabolic Regulation.
7. P.K. Stumpf, 1994, Outlines of Biochemistry, 4th edition. Wiley Eastern, New Delhi,
8. Voet, D and Voet, J.G, 2009, Biochemistry, John Wiley and Sons, N.Y. USA.
9. Garret, R.H. and Grisham, C.M. 2005, Biochemistry, 3rd Edition. Thomson Learning
10. Zubay G L , 1988, Biochemistry, 4 edition. W M C Brown Publishers.

E-RESOURCES:

https://www.pdfdrive.com/biochemistry-books.html

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PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-CC- VI: CELL BIOLOGY AND PHYSIOLOGY

Ins. Hrs. /Week : 4 **Course Credit: 4** **Course Code :**

OBJECTIVES:

- To understand on integrative physiology at several levels of organization from molecules to living organisms and organ functions
- To understand how these cellular components are used to generate and utilize energy in cells
- To understand the cellular components underlying mitotic cell division

UNIT I

Biomembranes, cell cycle, cell death: Membrane assembly – importins and exportins. Membrane transport. Diffusion (passive and facilitated) active transport (symport, antiport, Na+ K+ ATPase), ion gradients, ion selective channels, porins, endocytosis and exocytosis. The cell cycle: phases, regulation by cyclins and cyclin – dependent kinases. Checkpoints in cell cycle regulation. Programmed cell death – Brief outline of apoptosis. Differences between apoptosis and necrosis.

UNIT II

Tissues: Types of tissue. Epithelium – organization and types. Major classes of cell junctions – anchoring, tight and gap junctions. Major families of cell adhesion molecules (CAMs) – the cadherins (classical and desmosomal). The integrins. The extracellular matrix of epithelial and nonepithelial tissues. ECM components – collagen, fibronectin, laminin and proteoglycans.

UNIT III

Blood: Composition and functions of blood. Separation of plasma and serum. Plasma proteins in health and disease. Red blood cells – formation and destruction. Important aspects of RBC metabolism. The RBC membrane – principle proteins (spectrin, ankyrin, glycophorins). Composition and functions of WBCs. Blood coagulation – mechanism and regulation. Fibrinolysis. Anticoagulants.

UNIT IV

Body Fluids: Lymph – composition and functions. CSF – composition and clinical significance. Formation of urine – structure of nephron, glomerular filtration, tubular reabsorption of glucose, water and electrolytes. Countercurrent multiplication, tubular secretion. Composition, functions and regulation of saliva, gastric, pancreatic, intestinal and bile secretions. Digestion and absorption of carbohydrates, lipids and proteins

UNIT V

Neuromuscular System: Structure of neuron. Propagation of action potential: structure of voltage – gated ion channels. Neurotransmitters - examples, release and cycling of neurotransmitters. The neuromuscular junction – activation of gated ion channels. Structure of skeletal muscle. Muscle proteins – myosin, actin, troponin and tropomyosin. Sequence of events in contraction and relaxation of skeletal muscle. Pathophysiology of Duchenne muscular dystrophy. Cardiac muscle – $Ca2^{+}$ -Na^{+} exchanger, Ca2+ - ATPase. Brief outline of channelopathies. Cardiac myophathy. Smooth muscle – regulation by Ca2+.

COURSE OUTCOME:

The student will be able to,

1. Acquire knowledge of cell cycle, cell division and cell death mechanisms.
2. Have an understanding of the composition of cytoskeleton and extracellular matrix.
3. Understand the components of human blood, characteristics and functions.
4. Gain insights into the urinary system and its disorders.
5. Understand the Physiology of muscle contraction and its disorders.

TEXT BOOK(S):

1. L Stryer, 1989, Biochemistry, 3rd/4th/5th ed, Freeman and Co. NY 4.
2. Murray, McGraw Hill, 2003. Harper's Biochemistry 26th edition.

REFERENCE BOOK(S):

1. Lehninger Nelson Cox Macmillan, 2013, Principles of Biochemistry. 7th edition, Worth Publishers.
2. Bruce Alberts, Molecular Biology of The Cell, 5th edition–Garland Science.
3. De Robertis and Saunders, 1980, Cell and Molecular Biology.
4. Geoffrey M. Cooper
5. The Cell, A molecular approach.
6. C.J. Avers, 1986, Cell Biology, Addision Wesley Co.
7. Molecular biology by Lodish and Baltimore.
8. Lodish, WH Freeman, 2003. Molecular Cell Biology, 5th edition.
9. Smith et al. Mammalian Biochemistry, 1983, Principles of Biochemistry, 7th edition, McGraw Hill.

E-RESOURCES:

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PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-CC- VII: MOLECULAR BIOLOGY

Ins. Hrs. /Week : 5 **Course Credit: 4** **Course Code :**

OBJECTIVES:

- To understand the basic structure and functioning of the genetic materials - DNA
- To emphasize the molecular mechanism of DNA replication, recombination, transcription, translation and gene regulation
- To emphasize the molecular mechanisms of DNA replication, repair, protein synthesis
- To study the discovery of DNA as genetic material

UNIT I

Eukaryotic and Prokaryotic chromosomes: Structure of eukaryotic and prokaryotic chromosomes, chromosomal DNA, banding pattern, c- value, complexity of heterochromatin, centromere, nuclear organizer, telomeres, kinetic complexity of DNA, cot curve, classes of DNA sequences. Histone, Non-histone proteins, and their properties, structure of nucleosome, role of histone in chromatin folding.

UNIT II

DNA Replication: DNA replication in eukaryotes and prokaryotes. Eukaryotic DNA polymerases and their roles, origin of replication, Autonomously Replicating segments (ARS) in yeast; elongation-lagging strand synthesis, termination.

Recombination: DNA recombination: Homologous and Site specific. Homologous recombination: Holliday Model, Messelsson- Radding Model, Rec BCD pathway. Site specific recombination: Lamda phage integration and excision rearrangement.

UNIT III

Transcription: Transcription in prokaryotes and eukaryotes- steps- initiation, elongation and termination of. Eukaryotic RNA polymerases and their structure, Class I, II and III promoters, upstream elements, enhancers and silencers, General transcription factors-Class I, II, III genes and their functions, elongation factors, TBP structure and its role in transcription, mediators. Post transcriptional modification.

UNIT IV

Translation: Genetic code and its features. Wobble hypothesis. Translation machinery, initiation, elongation and termination of translation in prokaryotes and eukaryotes. Translational inhibitors, post-translational modifications, chaperones and protein targeting-translocation.

UNIT V

Gene expression and Regulation: Principles of gene regulation, upregulation, down regulation, induction, repression, global and narrow domain mechanism. DNA methylation in prokaryotes-Dam methylation, Dcm methylation. DNA methylation in eukaryotes-cysteine methylation, CPG islands.

COURSE OUTCOME:

The Students will be able to,

1. Analyze the architecture of eukaryotic and prokaryotic chromosomes.
2. Explain the emergence of DNA replication and recombination.
3. Gives in-depth knowledge of transcription.
4. Name the enzymes, organelles and molecules involved in Translation and describe the role of each.
5. Decipher regulation of gene expression, and its influence on various stages of development.

TEXT BOOK(S):

1. David Freifelder, 2008, Molecular Biology. 2d edition, Narosa Publications, NewDelhi.
2. Cram, 2015, Text Book of Principles of Molecular Biology.

REFERENCE BOOK(S):

1. Geoffrey Cooper, Robert E Harsman, 2004, The Cell- A Molecular Approach, 3rd edition, ASM Press.
2. Lodish *et.al*. 2003, Molecular Cell Biology, 5th edition, WH Freeman & Company.
3. De Robertis and De Robertis, 2001, Cell and Molecular Biology, 8th ed Wolters Kluwer India Pvt Ltd.
4. Alberts *et al.*, 2002, Molecular Biology of the Cell, 4th edition, Garland Science Inc.
5. Gerald Karp, 2004, Cell and Molecular Biology, 4th ed John Wiley & Sons, Inc, New York.
6. Cox, M., Michael., Nelson,L.D. 2008, Principles of Biochemistry, 5thedition.W.H. Freeman and company, Newyork.
7. Dale,W.J. and Schontz, 2007, From Genes to Genomes. V.M. John wiley & sons ltd., England.
8. David. A. Micklos, Greg.A. Freyer and David A. Crotty, 2003, DNA Science A First Course, 2nd edition, Cold Sprind Harbor Laboratory Press, NewYork..
9. Flint. S.J, L.W. Enquist, R.M. Krug, V.R. Racaniello and A.M. Skalka, 2000, Principles of Virology, ASM Press, Washington D.C
10. Kieleczawa,J. 2006, DNA Sequencing II. Jones and Bartlett Publishers, Canada.
11. Koenberg, A.and Baker, A.T. 2005, DNA Replication. 2nd edition. University Science Book, California.
12. Watson, Baker, Bell, Gann, Levine and Losick. 2006, Molecular Biology of the Gene, 5th edition, Pearson Education.

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PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-CC- VIII: PLANT AND MICROBES

Ins. Hrs. /Week : 4 **Course Credit: 4** **Course Code :**

OBJECTIVES:

- To understand the basic concepts of plant and microbes interactions
- To study the basics of Phytochemistry and Bioethics
- To impart knowledge on classification of microbes
- To study the role of secondary metabolites in plants

UNIT I

Plant cell: - Structure and functions. Photo synthesis: - Photo synthetic pigments – chlorophyll, carotenoids and phycobillin. Light reactions – two kinds of chemical system – photo system I and II – evidences in support of light reaction – Hill's reaction, Arnon's work and Emerson effect. Dark reaction – Calvin's cycle (C3 plants) Hatch – Slack cycle (C4 cycle) and CAM plants. Photo respiration.

UNIT II

Cycles of elements: Nitrogen cycle: – Ammonification, nitrification, nitrate reduction and denitrification, nitrogen fixation- symbiotic and non-symbiotic nitrogen fixation. Sulphur cycle, phosphorus cycle and carbon cycle. Plant nutrition: Specific roles of essential elements and their deficiency symptoms in plants. Macro nutrients: - Carbon, Hydrogen, Oxygen, Nitrogen, Sulfur, Phosphorus, Calcium, Potassium, Magnesium and Iron. Micro nutrients: - Manganese, Boron, Copper, Zinc, Molybdenum and Chlorine.

UNIT III

Plant growth regulators: Chemistry, biosynthesis, mode of action and Practical applications of auxins, gibberellins, cytokinins, abscicic acid and Ethylene. Plant growth inhibitors and retardants.

UNIT IV

Secondary metabolites: Nature, distribution and biological functions of alkaloids, terpenes, flavonoids, poly phenols, tannins and steroids. Role of secondary metabolites in pathogens, insects, animals and mankind.

UNIT V

Plant pathology: Introduction-Worms, insects, bacteria, virus and fungi. Types of bacterial, viral and fungal diseases- symptoms-disseminations and its control measures.

COURSE OUTCOME:

The students will be able to,

1. Understood the Mechanism of photosynthesis.
2. Learn the Cycles of elements, phyto-hormones and analyze the importance of nitrogen metabolism.
3. Understand the plant metabolism and the mode of action of phytoregulators.
4. Biological function of secondary metabolites.
5. Understand the plant diseases and its control measures.

TEXT BOOK(S):

1. Goodwin TW, Mercer EI 1983, Introduction to Plant Biochemistry.
2. William G.Hopkins, Introduction to Plant Physiology, John Wiley and sons.

REFERENCE BOOK(S):

1. David L. Nelson and Michael M. Cox, 2013, Principles of Biochemistry, 6th Edition, W. H. Freeman.
2. Harborne JB, 1997, Plant Biochemistry, Academic Press.
3. Taiz and Zeiger, Plant Physiology, 3rd Edition.
4. Devlin N. Robert and Francis H. Witham, Plant Physiology, CBS Publications.
5. Hans Walter Heidt, Plant Biochemistry, 3rd Edition, Elsevier Publishers.
6. Buchanan BB, Gruissem W, Jones RL, 2000, Biochemistry & Molecular biology of Plants, American Society of Plant Physiologists Rockville.
7. Hans Walter Heldt, 1997, Plant Biochemistry and Molecular Biology, Oxford University Press, New York.
8. Lea and Lea wood, 1997, Plant Biochemistry and Molecular Biology, John Wiley and sons.
9. Singhal G, 1999, Concepts in Photobiology: photosynthesis and photomorphogenesis: Springer Science & Business Media.
10. John. W. Anderson and John Brardall, 1994, Molecular activities of plant cell – An Introduction to Plant Biochemistry. Black well Scientific Publications.

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PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-CP- II: PHYTOCHEMISTRY AND MICROBIAL TECHNIQUES PRACTICAL
Ins. Hrs. /Week :6 **Course Credit: 5** **Course Code :**

1. Preparation of extracts of Crude drugs
2. Qualitative and quantitative phytochemical analysis - alkaloids, flavanoids, steroids, tannins, Saponins
3. Determination of physiochemical parameters – moisture content, ash value, extractive values
4. Screening of herbal extracts/products for free radical scavenging and antioxidant activities (any two methods)
5. Separation of plant pigments using column chromatography (Demonstration)
6. Sterilization techniques - Principles, methods - moist heat, dry heat, filter types
7. Media preparation
8. Determination of bacterial growth curve
9. Staining techniques - simple, differential and special staining
10. Assessment of antimicrobial activity by phenol coefficient method and disc diffusion method

TEXT BOOK(S):

1. Kannan N, 1996, Laboratory Manual in General Microbiology. 1st Edition, Palani Paramount Publications, Palani, Tamilnadu.
2. Practical Hand Book of Pharmacognosy. 16th edition: 1, Publisher: Unicorn Publication Pvt. Ltd. ISBN: 978-81-931266-8-4

REFERENCE BOOK(S):

1. Sundararaj T. 2003, Microbiology Laboratory Manual, 2nd Edition,
2. James G Cappuccino & Natalie Sherman, 2004, Microbiology : A Laboratory manual. 6th Edition, Published by Pearson Education.

E-RESOURCES:

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PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-EC- II: DEVELOPMENTAL BIOLOGY

Ins. Hrs. /Week : 4 **Course Credit: 3** **Course Code :**

OBJECTIVES:

- To study the cellular basis of development
- To elucidate the early development process of humans
- To provide an overview of mechanisms underlying the meristem function during growth and development, cell specification, differentiation and organogenesis in the flowering plants

UNIT I

Basic concepts: General concept of organisms development: Potency, commitment, specification, induction, competence, determination & differentiation; morphogenetic gradients; cell fate & cell lineages; genomic equivalence and cytoplasmic determinants; imprinting. General principles of cell-cell communication in development: cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, paracrine factors

UNIT II

Fertilization, development and sex determination in humans: Gametogenesis - Sperm & Egg formation; ultra structure of sperm and ovum, egg types, egg membrane. Fertilization, cleavage, Morula, Implantation, blastulation, gastrulation, formation of germ layers, axis formation - anterior and posterior. Sex determination - chromosomes and environment.

UNIT III

Morphogenesis and organogenesis in animals: Cell aggregation and differentiation in Dictyostelium; axis and pattern formation in Drosophila, amphibia and chick; organogenesis – vulva formation in Caenorhabditis elegans; limb development and regeneration in vertebrates; metamorphosis in amphibians and insects.

UNIT IV

Morphogenesis and organogenesis in plants: Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; floral meristems and floral development in Arabidopsis and Antirrhinum.

UNIT V

Implications of developmental biology: Medical implications of developmental biology - genetic disorders in human development, environmental assaults on human development, Future therapies, Environmental regulation of animal development - Polyphenisms, plasticity and Learning.

COURSE OUTCOME:

The student will be able to,

1. Understand the basic and general concept of organism development.
2. Familiar with the events that lead up to and comprise the process of fertilization. Be able to discuss the critical contributions of the sperm and the egg to the zygote, and how structure informs function.

3. Describe organogenesis and metamorphosis in vertebrate and invertebrate model organisms.
4. Understand the development of shoot and root apical meristems.
5. Explain how environmental factors interfere with the animal development.

TEXT BOOK(S):

1. R.M. Twyman, Instant Notes Developmental Biology, Viva Books Private Limited, New Delhi.
2. Developmental Biology, Paperback, Dr. K.V. Sastry, Dr. Vineeta Shukla. Rastogi Publications, second edition, 2018.
3. Balinsky, An Introduction to Embryology, 5th edition, Cengage Learning India.
4. Strickberger, 2002, Genetics, 3rd edition, Prentice Hall of India.

REFERENCE BOOKS:

1. Gilbert S.F, 2010, Developmental Biology, 9th edition, Sinauer Associates Inc. Massachusetts, USA.
2. Developmental Biology, TMH Edition, Berrill N.J, 1974.
3. Diwan A.P., Dhakad N.K., 1996, Animal Regeneration, Anmol Publications Ltd, India.
4. Browder L.W., Erickson C.A., and Jeffery W.R, 1991,Developmental Biology, Saunder College Publishing House, Philadelphia, USA.

E-RESOURCES:

http://www.pdfdrive.com › developmental-biology-books
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PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-EC- II: NANO TECHNOLOGY

Ins. Hrs. /Week : 4 **Course Credit: 3** **Course Code :**

OBJECTIVES:

- To provide an insight into the fundamentals of Nanoscience and nanotechnology
- To recognize the technological advances and current problems in nanotechnology as an interdisciplinary science
- To elucidate the scientific and engineering principles related to nanoscale structures

UNIT I

Importance of Nanotechnology-History of Nanotechnology-Opportunity at the nano scale-length and time scale in structures-energy landscapes-Interdynamic aspects of inter molecular forces - classification based on the dimensionality- nanoparticlesnanoclusters-nanotubes-nanowires and nanodots- Semiconductor nanocrystalscarbon nanotubes- Influence of Nano structuring on Mechanical, optical, electronic, magnetic and chemical properties

UNIT II

Self-assembly, self-assembled monolayers (SAMs). Langmuir-Blodgett (LB) films, clusters, colloids, zeolites, organic block copolymers, emulsion polymerization, templated synthesis, and confined nucleation and/or growth. Biomimetic Approaches: polymer matrix isolation, and surface-templated nucleation and/or crystallization. Vapor (or solution) – liquid – solid (VLS or SLS) growth - Electrochemical Approaches: anodic oxidation of alumina films, porous silicon, and pulsed electrochemical deposition.

UNIT III

X-ray Diffraction - Thermal Analysis Methods, Differential Thermal Analysis and Differential scanning calorimetry - Spectroscopic techniques, UV-Visible Spectroscopy – IR Spectroscopy – Microwave Spectroscopy - Raman Spectroscopy - Electron Spin Resonance Spectroscopy- - NMR Spectroscopy- Particle size characterization: Zeta Potential Measurement – Particle size Analysis – X-ray Photoelectron spectroscopy

UNIT IV

Fundamentals of the techniques – experimental approaches and data interpretation – applications/limitations of Optical microscopy - Scanning Electron Microscopy – Transmission Electron Microscopy – Atomic Force Microscopy – Scanning Tunneling Microscopy

UNIT V

Semiconductor (metal) nanoparticles and nucleic acid and protein based recognition groups– Application in optical detection methods – Nanoparticles as carrier for genetic material– Nanotechnology in agriculture – Fertilizer and pesticides. Designer proteins, Peptide nucleic acids, Nanomedicine, Drug delivery, DNA computing, Molecular design using biological selection, Harnessing molecular motors, Artificial life, Hybrid materials, Biosensors - Future directions

COURSE OUTCOME:

The Students will be able to,

1. Acquire the knowledge of basic sciences required to understand the fundamentals of Nanomaterials.
2. Acquire the knowledge of electronic, optical and magnetic properties of nanomaterials.
3. Make the students understand about the functional principles of nanotechnology.
4. Provide the knowledge in basics of nanotechnology in biotechnology.
5. Understand the application of Nanomaterials in biotechnology and acquire the knowledge about the DNA, proteins, amino acids, drug delivery, biomedicine etc.,

TEXT BOOK(S):

1. Pradeep. T, 2007, Nano: The Essentials, McGraw – Hill education.
2. Challa. S.S.R, Kumar, Josef Hormes, Carola Leuschaer, Nanofabrication Towards.
3. Biomedical Applications, Techniques, Tools, Applications and Impact", Wiley – VCH, 2005.

REFERENCE BOOK(S):

1. Rao. C. N. R, Mu¨ller. A, Cheetham. A. K, 2006, The Chemistry of Nanomaterials :Synthesis, Properties and Applications, Wiley-VCH.
2. Breachignac. C, Houdy. P, Lahmani. M, 2006, Nanomaterials and Nanochemistry, Springer.
3. Guozhong Cao, 2011, Nanostructures and Nanomaterials: Synthesis, Properties, and Applications, World Scientific Publishing Private, Ltd.,.
4. Niemeyer.C.M. Mirkin C, 2004, A Nanobiotechnology: Concepts, Applications and Perspectives, Wiley – VCH.

E-RESOURCES:

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PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: II-EDC- I: HERBAL DRUG TECHNOLOGY

Ins. Hrs. /Week : 3 **Course Credit: 2** **Course Code :**

OBJECTIVES:

- To provides the necessary background for providers to begin to incorporate herbal medicines into their practice, particularly in regards to their therapeutic properties, efficacy (or lack thereof), and safety concerns, including quality control and potential adverse effects
- To extract, isolate and purify of phyto-constituents present in the medicinal plants
- To emphasize Quality Control and Quality Assurance of Herbal ingredients

UNIT I

Definition of Herbal drug, Importance of Herbal therapies, Herbal verses conventional drugs, Safety in herbal drugs. Toxicity in Herbal drugs and their interactions, General methods of extraction, isolation and purification of phyto-constituents

UNIT II

Good Agricultural Practices, Good practices in collection of plant materials, Primary processing of herbal products. Documentation required other guidelines for Quality Assurance of Herbal drugs.

UNIT III

Drug Regulatory Affairs: Role of Regulatory Affairs Dept, Nomenclature and salient features of regulatory authorities of India, Stability testing protocols of drug products as per ICH guidelines.

UNIT IV

Making and using herbal medicines for common ailments like cold, skin infections and Diarrhea; Analytical Profiles of selected herbs – Brahmi, and Gymnema sylvestre. Antimicrobial and anti-inflammatory drugs, Screening procedures for herbal drugs with current innovations in following therapeutic classes Antioxidant and Antidiabetic.

UNIT V

Quality Control and Quality Assurance of Herbal ingredients as per W.H.O. Guidelines, Herbal product development Lipid orals, tablets, capsules, dermatologic and herbal cosmetics, Methods involved in monoherbal and polyherbal formulations with their merits and demerits.

COURSE OUTCOME:

The Students will be able to,

1. Understand raw material as source of herbal drugs from cultivation to herbal drug product.
2. Know the WHO and ICH guidelines for evaluation of herbal drugs.
3. Explain methods for selection of herbal materials, identification and authentication of herbal materials and processing of herbal materials.
4. Making and using herbal medicines for common ailments.
5. Ensure that the business is achieving the standards it sets for itself.

TEXT BOOK(S):

1. Trease and Evan's Pharmacognosy 15thedition
2. Indian Herbal Pharmacopeia Vol-I and II

REFERENCE BOOK(S):

1. Michael Meguffin, Botanical safety hand book, Christopher Hobbs published by American Herbal Product Association.
2. Ayurvedic Formulary of India, the Indian Medical Practitioners Co-operative Pharmacy and Stores Ltd,IMPCOPS.
3. H.Panda, Hand Book on Ayurvedic Medicines, National Institute of Industrial Research, Delhi 7.
4. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine,Business horizons, New Delhi, First edition, 2003. Robert Verpoorte, Pulok K. Mukharjee.
5. Toxicology and Clinical Pharmacology of Herbal Products, Melanie JohnsCupp. Herbal drug industry by R.D. Choudhary, Ist edition, eastern publisher, New Delhi: 1996.
6. Pulok K Mukarjee, Quality control of herbal drugs, Ist edition, Business horizons
7. C.K. Kokate, Purohit, Gokhlae, 1996, Text book of Pharmacognosy, 4th edition, Nirali Prakashan,
8. Rangare. Text book of Pharmacognosy and Phytochemistry.

E-RESOURCES:

https://www.pdfdrive.com/biochemistry-books.html

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE (AUTONOMOUS), SUNDARAKKOTTAI, MANNARGUDI - 614016.

PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-EDC- I: NUTRITIONAL BIOCHEMISTRY

Ins. Hrs. /Week : 3 **Course Credit: 2** **Course Code :**

OBJECTIVES:

- To learn how nutrients affect biochemical processes and how this can lead to development of nutritionally related diseases
- To review the biological system of energy metabolism
- To understand the research techniques used in basic biochemistry and nutritional biochemistry research

UNIT I

Introduction to the science of nutrition – function of foods and its relation to nutritional and clinical health, essential nutrients, analysis of food, composition, food habits and food groups.

UNIT II

Carbohydrates- kinds, functions, food sources.Fats- kinds, functions, food sources, essential fatty acids and cholesterol. Proteins- kinds, functions, food sources, complete and incomplete proteins.

UNIT III

Bilogical value, Net protein Utilization, Energy Basal metabolism, measurement of BMR, Factors affecting BMR, regulation of body temperature, energy needs, total energy requirements, estimation of energy requirements and value of foods.Balanced diet formulation- Assessment of nutritional status.

UNIT IV

Mineral nutrition: Essential – micro and macro mineral nutrients, distribution, sources, functions and abnormalities.Vitamins – Definition, classification, sources, distribution, functions and abnormalities.

UNIT V

Nutrition at various stages of growth and development; diets for infants, children, adolescents, pregnant women, lactating mothers and older persons.Nutrition challenges of the future – food production and food storages, future foods, new protein foods, new fat foods and changing food habits.

COURSE OUTCOME:

The Students will be able to,

1. Define the nutrition and healthy diet planning concepts.
2. Explain the importance of nutrition.
3. Describe the elements of nutrients.
4. Summarize the deficiencies of nutrition.
5. List the healthy diet plan.

TEXT BOOK(S):

1. Principles of Nutrition & Dietetics.Dr. M. Swaminathan, 2018, The Bangalore printing & publishing Company limited.88, Mysore Road, Bangalore- 560018.

REFERENCE BOOK(S):

2. Dr.M.Swaminathan, 2000, Advanced Text Book on Food & Nutrition –Vol. I. 2nd edition.
3. Dr. M. Swaminathan, 2015, Advanced Text Book on Food & Nutrition volume-II. 2nd edition.
4. Corine Rohinson, 1982, Normal and Therapeutic Nutrition.

E-RESOURCE:

https://libguides.ug.edu.gh/c.php

SEMESTER III

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: III-CC- IX: Clinical Biochemistry

Ins. Hrs. /Week: 6 **Course Credit: 4** **Course Code:**

OBJECTIVES

- To provide an advanced understanding of the biochemical mechanisms and pathophysiological processes responsible for common biochemical disorders
- To provides an overview of normal and abnormal metabolic functions, the impact of disorders on metabolic processes
- To get acquainted with the basics of abnormalities inside the cells during disease

UNIT- I: Disorder of Carbohydrate and Lipid Metabolism (12 Hours)

Disorders of carbohydrate metabolism– glycogen storage diseases, galactosemia, fructose intolerance and fructosuria. Blood sugar homeostasis: Role of tissues and hormones in the maintenance of blood sugar. Hypoglycemia, hyperglycemia, glycosuria. Diabetes mellitus – classification, metabolic abnormalities, diagnosis and management. Disorders of lipid metabolism – lipoproteinaemias. Lipid storage diseases – Gaucher's, Tay Sach's, Niemann Pick diseases. Fatty liver. Atherosclerosis.

UNIT- II: Disorders of Amino acid and Nucleic acid Metabolism (13 Hours)

Disorders of amino acid metabolism– amino aciduria, phenylketonuria, hartnup disease, alkaptonuria, albinism, cystinuria, cystinosis, homocystinuria and maple syrup urine disease. Disorders of purine and pyrimidine metabolism: Hyperuricemia and gout. Hypouricemia. Oroticaciduria. Serology: C reactive protein test, Rheumatoid arthritis (RA) test.

UNIT- III: Liver and Gastric Disorders (13 Hours)

Jaundice- Causes, consequences, biochemical findings, treatment in jaundice, hepatitis and cirrhosis. Liver function test: Tests related to excretory (bile pigments) synthetic (plasma proteins, prothrombin time) detoxifying (hippuric acid, NH3, aminopyrine) and metabolic (galactose) functions. Gall stones. Gastric function tests: Stimulation tests – insulin and pentagastrin. Peptic ulcer, gastritis and Zollinger Ellison Syndrome.

UNIT- IV: Renal and Metabolic Disorders (11 Hours)

Kidney function- Biochemical findings in glomerulonephritis, renal failure and nephrotic syndrome. Nephrolithiasis. Kidney function tests: Glomerular function tests – inulin, urea and creatinine clearance tests, renal plasma flow, plasma microglobulin. Tubular function tests – water load, concentration and acid excretion tests. Abnormal constituents of urine. Clinical enzymology - Serum enzymes and isoenzymes in health and disease – Transaminases (AST, ALT), Acid and Alkaline phosphatases, amylase, LDH and CK.

UNIT- V: Oncology (11 Hours)

Cancer cell – morphology and growth characteristics. Biochemical changes in tumor cells. Differences between benign and malignant tumors. Tumor markers – AFP, CEA and HcG Agents causing cancer – radiation, viruses, chemicals. Multistep carcinogenesis – initiation, promotion, progression. Oncogenes and proto- oncogenes – mechanisms of protooncogene activation. Tumor suppressor genes – p53.

Total Lecture Hours-60

COURSE OUTCOME

The students are able to,

1. Know the clinical aspects of various metabolic disorders.
2. Understand the significance of diagnostic biochemistry.
3. Learn about many diseases result from imbalance in certain enzymes and diagnosis of liver and gastrointestinal diseases.
4. Gain knowledge on the kidney and metabolic disorders.
5. Know about cancer biology, oncogenes and cancer manifestation.

TEXT BOOK(S)

1. Allan Gaw, J. Michael, Murphy, Rajeev Srivastava, A. Robert. 2013. Clinical Biochemistry, 5th Edition. Elsevier Publication, USA.
2. Carl Burtis, R. Edward Ashwood and David Bruns (eds), Tietz E. 2012. Textbook of Clinical Chemistry and Molecular Diagnosis, 5th Edition, Springer Publishers, India.
3. Chatterjee MN and Ranashinde. 2012. Text Book of Medical Biochemistry, 8th Edition, Jaypee Brothers Medical Publisher (P) Ltd, New Delhi.
4. Devlin TM. 2011. Textbook of Biochemistry with Clinical Correlations. 7th Edition. John Wiley & Sons, Inc. Publishers, New York.
5. Graham Basten. 2011. Introduction to Clinical Biochemistry, Interpreting Blood Results. Book Boon. 2nd Edition. Ventus Publishers, USA.

REFERENCE BOOK(S)

1. Dennis Kasper and Eugene Braunwald. 2005. Principles of Internal Medicine. Harrison's Vol 1 & 2, 16th Edition, *McGraw-Hill* Publishers, New York.
2. Harold Varley. 2006. Practical Clinical Biochemistry, 6th Edition, CBS Publishers, Chennai.
3. Lippincott William and Wilikns. 2018. Clinical Chemistry, Principles, Techniques, Correlations with Access, 8th Edition, Michael Bishop publishers, USA.
4. Scriver CR, Beaudet AL, Sly WS, Valle D, Childs B, Kinzler KW, and Vogelstein B.2001. The Metabolic & Molecular Basis of inherited Diseases, 8th Edition, McGraw Hill Publishers, New York.
5. Thomas M Devlin. 2006. Textbook of Biochemistry with Clinical Correlation, 2nd Edition, Wiley and Sons Publishers, New York.

E-RESOURCES

1. https://www.pdfdrive.com/biochemistry-books.ht
2. https://www.enpab.it/images/2018/EbookBiologia%20Clinica%2001_Clinical%20Biochemistry%20and%20Metabolic%20Medicine%20-%20Martin%20Andrew%20Crook.pdf
3. http://www.student.oulu.fi/~taneliha/Harpers_Illustrated_Biochemistry(29th_Edition).pdf
4. https://static1.squarespace.com/static/6019d0bc7dff866728d961d3/t/601a68429c231608a9b8f2a0/1612343363359/biochemistry_satyanarayana_ebook_free.pdf
5. https://www.pdfdrive.com/biochemistry-books.html

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: III-CC- X: Research Methodology and Biostatistics

Ins. Hrs. /Week: 6 **Course Credit: 4** **Course Code:**

OBJECTIVES

- To identify appropriate research topics and define appropriate research problem
- To develop skills in the basic methods of data gathering and analysis using statistical tools and packages
- To provide sufficient background to be able to interpret, conclude and to write the report

UNIT-I: Research **(13 Hours)**

Research- Definition, importance and characteristics, Types- Literary research, Clinical research, Experimental research, Observation and field studies. Research problems- Definition, selection and sources of research problems. Tools and techniques in research- Interview, questionnaire, inventories, scales. Computer programmes used in research - SPSS Protocols. References in research – Books, Journals and Internet Sites.

UNIT-II: Data Presentation **(12 Hours)**

Data- Definition, source, types and collection, -Primary- quantitative methods and qualitative methods and secondary data-from internal and external source. Classification -Chronological, geographical, qualitative and quantitative classification. Tabulation of data-Parts of a table, types- simple and complex table- two way, three way and manifold tabulation. Diagrammatic and graphic presentation of data- Simple Bar, Multiple Bar, Component Bar, Percentage Bar, Pie chart, Pictogram, Cartograms.

UNIT-III: Data Processing **(11 Hours)**

Measures of central tendency- arithmetic mean, median, mode, quartiles, deciles and percentiles. Measures of Dispersion - quartile deviation, mean deviation, standard deviation, Coefficient of variation. Measures of skewness and Kurtosis. Correlation and Regression– Rank correlation –Karl's Pearson's coefficient of correlation and spearman's rank method. Regression analysis.

UNIT-IV: Data Analysis **(11 Hours)**

Sampling distribution and test of significance- Populations and samples, Hypothesis and its testing, characteristics of hypothesis, Null hypothesis- Type I & II errors and alternative hypothesis, Confidential level, Test of significance- Parametric test - Student 't' test &Analysis of variance one way and two way classification– 'f' test and non-parametric test. Chi square test and goodness of fit. Using software for statistical analysis-SPSS.

UNIT-V: Research Reporting **(13 Hours)**

Scientific Writing- Definition and kinds of scientific documents – research paper, review paper, book reviews, thesis, conference and project reports. Thesis writing- Components. Selection of journals for publication- Impact factor– Citation index and H index, Journal finder/ journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc. Publication – role of author, guide, co-authors. Components of a research paper. Preparation and submission of research project proposals to funding agencies.

Total Lecture Hours-60

COURSE OUTCOME

The students are able to,

1. Develop skills in identification of research problem.
2. Understand the various types of data collection and presentation.
3. Acquire basic knowledge on measures of central tendency and variation.
4. Learn the technique of analysis of data using statistical tools, techniques and packages.
5. Learn the technique of result analysis, interpretation and writing the report.

TEXT BOOK(S)

1. Antonisamy S. Prasanna Premkumar and Solomon Christopher. 2017. Principles and Practice of Biostatistics, 1st Edition, Elsevier Publishers, India.
2. Bratati Banerjee. 2018. Mahajan's Methods In Biostatistics For Medical Students And Research Workers, 9th Edition, Jaypee Brothers Medical Publishers, New Delhi.
3. Indranil Shah and Boddy Paul. 2020. Essentials of Biostatistics & Research Methodology, 3rd Edition, Academic Publishers, Kolkata.
4. Prasanth K. 2017. Guide to Research Methodology and Biostatistics, 1st Edition, CBS Publishers, New Delhi.
5. Veer Bala Rastogi. 2015. Biostatistics, 3rd Edition, Medtech Publishers, USA.

REFERENCE BOOK(S)

1. Dubey Diwedi and Usman Srivastava. 2019. Biostatistics and Research Methodology, 1st Edition, Vikas & Co Publishers, Noida.
2. Gupta SP. 2017. Statistical Methods, 43rd Edition, Sultan Chand & Sons Publishers, New Delhi.
3. Sharma Suresh. 2016. Research Methodology and Biostatistics: A Comprehensive Guide for Health Care Professionals, 1st Edition, Elsevier Publishers, India.
4. Wayne W Daniel. 2012. Biostatistics: A Foundation for Analysis in the Health Sciences, (Wiley Series in Probability and Statistics), 10th Edition, John & Wiley Publishers, New Jersey.
5. Wayne W. Daniel and Chad L. Cross. 2014. Biostatistics: Basic Concepts and Methodology for the Health Sciences, 10th Edition, Wiley Publishers, New Jersey.

E-RESOURCES

1. https://digitalguardian.com/blog/what-data-classification-data-classification-definition
2. https://www.formpl.us/blog/research-report
3. https://www.mooc-list.com/tags/biostatistics
4. https://www.mooc-list.com/tags/researchmethodology
5. https://www.westga.edu/academics/research/vrc/assets/docs/tests_of_significance_notes.pdf

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: III- CP-III: Clinical Biochemistry Practical and Internship

Ins. Hrs. /Week: 8 **Course Credit: 5** **Course Code:**

OBJECTIVE

- To provide hands on training on Collection of samples, and quantitative and qualitative determination of blood and urine samples

I. Hematological studies

1. Blood Grouping and Rh typing.
2. Estimation of hemoglobin content.
3. Total RBC count.
4. Total WBC count.
5. Determination of clotting time.
6. Total platelet count.
7. Determination of Prothrombin time.
8. Determination of ESR.

II. Biochemical analysis of urine & blood Collection, preservation (blood and urine)

1. Estimation of blood glucose.
2. Estimation of serum total proteins and A: G ratio.
3. Estimation of serum cholesterol.
4. Estimation of blood and urine urea.
5. Estimation of serum and urine calcium.
6. Estimation of serum and urine uric acid.
7. Estimation of serum bilirubin.
8. Estimation of serum creatinine.
9. Estimation of serum AST / ALT.
10. Estimation of serum acid phosphatase / alkaline phosphatase.

III. Urology Urine - Qualitative tests of urine.

Abnormal constituents - Reducing sugar-Benedict test, protein: -Heat and acetic acid test, and sulfosalicylic acid method, Ketone bodies-Rothera's test, Bile pigment (Fouchet method), bile salt (Hay's test), Urobilinogen-Ehrlich aldehyde test and Bence Jones protein test.

INTERNSHIP-Visit to hospitals

Total Lecture Hours-90

COURSE OUTCOME

The students are able to,

1. Get trained in collection of blood and urine samples and preservation for laboratory analysis
2. Learn the techniques for quantitative and qualitative determination of blood and urine samples
3. Get real time experience in the clinical laboratories through internships

TEXT BOOK(S)

1. Jayaraman J. 2011. Laboratory Manual in Biochemistry, 3rd Edition, New Age International Pvt Ltd Publishers, India.
2. Sadasivam S. Manickam A. 2009. Biochemical Methods, 3rd Edition, New age publishers, India.
3. Sawhney SK. Randhir Singh. 2005. Introductory Practical Biochemistry, 2nd Edition, Alpha Science International, Ltd., United Kingdom.
4. Plummer T. 2001. Practical Biochemistry, 3rd Edition, McGraw Hill Publishing Company, New York, USA.
5. Pattabiraman TN. 1998. Laboratory manual in Biochemistry, 4th Edition, All India publishers, New Delhi.

REFERENCE BOOK(S)

1. Alan H Gowenlock. 1998. Varley's Practical Clinical Biochemistry, 6th Edition, CBS Publishers, India.
2. Godkar B. 2020. Textbook of Medical Laboratory Technology Vol 1 & 2 Paperback, 3rd Edition, Bhalani Publisher, New Delhi.
3. Kanai L Mukerjee. 1996. Medical Lab Technology, Vol I& II, 1st Edition, Tata Mcgraw Hill Publishers, New York, USA.
4. Ranjna Chawla. 2014. Practical Clinical Biochemistry Methods and Interpretations (Paperback). 4th Edition, Jaypee Brothers Medical Publishers, Tamil Nadu.
5. Kanai L Mukerjee. 1996. Medical Lab Technology Vol I& II, 3rd Edition, Tata McGraw Hill Publishers, New Delhi.

E-RESOURCES

1. https://www.elsevier.com/journals/clinical-biochemistry/0009-9120/guide-for-authors
2. http://rajswasthya.nic.in/RHSDP%20Training%20Modules/Lab.%20Tech/Biochemistry/Dr.%20Jagarti%20Jha/Techniques%20In%20Biochemistry%20Lab.pdf
3. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistry-pdf.pdf?sequence=1&isAllowed=y
4. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistry-pdf.pdf?sequence=1&isAllowed=y
5. https://www.pdfdrive.com/medical-biochemistry-4th-edition-medial-biochemistry-e194558015.html
6. https://www.pdfdrive.com/clinical-biochemistry-e33663835.html

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: III - EC-III: Bioinformatics and Medical Coding

Ins. Hrs. /Week: 6 **Course Credit: 3** **Course Code:**

OBJECTIVES

- To understand the basic concepts, principle tools and techniques in bioinformatics ces
- To learn drug designing through computer based modification programs using synthetic or natural source
- To know the important application of bioinformatics is in the field of drug discovery
- To understand the importance of medical transcription

UNIT-I: Bioinformatics **(11 Hours)**

Introduction, definition, history and scope of Bioinformatics. Application of Bioinformatics. Biological databases: Type of databases-primary, secondary and composite databases. Protein Databases- Types and importance-Primary databases of protein – SWISS PROT, TrEMBL, PIR, PDB. Secondary databases of protein-PROSITE, PRINTS, MHCPep, Pfam. Primary nucleic acid database – EMBL, GEN BANK, DDBJ.

UNIT-II: Tools for Database Search **(12 Hours)**

Database searching-Types of database searching, Primary database searching-FASTA, basic FASTA programs, BLAST, PSI-BLAST, basic BLAST programs, Secondary database searching- Motif search, types of Motif, Pattern search, Parameters, Factors affecting database searching, Similarity and Identity, Sequence alignment, Pair wise sequence alignment, Local alignment, Global alignment, Multiple sequence alignment, Homologues gene, Orthologous and Paralogous gene sequences.

UNIT-III: Protein Primary Structure Analyses and Prediction **(13 Hours)**

Different levels of protein structure, Methods of protein structure prediction-Experimental methods and computational methods. Bioinformatics and drug design-Definition, drug design, types-ligand based and structure based drug design, Quantitative Structure Activity Relationships (QSAR), drug discovery and development. Methods of drug designing– CAMD, docking program.

UNIT-IV: Introduction to Medical Terminology **(11 Hours)**

Medical Terminology I -Etymology, Medical Words. Medical Terminology II-Medical Instruments, Medical Specialties, Diagnostic Medicine, Root words, prefix, suffix, abbreviations, symbols. Documentation of medical records, International classification of Diseases (ICD) - introduction, classification, ICD-10, ICD-11, advantages and limitations.

UNIT-V: Medical Coding **(13 Hours)**

Introduction to medical coding, Medical coding systems-Diagnostic codes, procedural codes, pharmaceutical codes. Medical transcription-definition, types, process, advantages and disadvantages, work flow, using email for file transfer, File Transfer Protocol (FTP), online and offline medical transcription, Essentials of Medical Transcription guidelines, Reimbursement, Introduction to Diagnosis Coding.

Total Lecture Hours-60

COURSE OUTCOME

The students are able to,

1. Gain knowledge and awareness of the basic principles and concepts of Bioinformatics.
2. Understand the various tools used in Bioinformatics.
3. Know the tools of pair wise sequence analysis.
4. Understand the concepts of terminologies in medical coding.
5. Understand the guidelines of medical transcriptionist.

TEXT BOOK(S)

1. Mount DW. 2005. Bioinformatics Sequence and genome analysis, 2nd Edition, CBS Publishers. New Delhi.
2. Perambur S Neelakanta. 2020. Textbook of Bioinformatics, A: Information-theoretic Perspectives of Bioengineering And Biological Complexes, 2nd Edition, World Scientific Publishing Co Pvt Ltd., Singapore.
3. Rastogi SC. 2014. Bioinformatics- Methods and Applications- Genomics, Proteomics and Drug discovery, 4th Edition, PHI Learning Pvt. Ltd., New Delhi.
4. Rastogi SC. 2019. Bioinformatics, Concepts, Skills and Applications. 2nd Edition. CBS Publishers, New Delhi.
5. Zhumur Ghosh, Bibekanand Mallick. 2008. Bioinformatics- Principles and Applications, 1st Edition, Oxford University Press, Oxford, England.

REFERENCE BOOK(S)

1. Alokjha, Priyanka Arora. 2002. Medical Transcription made easy, 22nd Edition, Macmillan Publisher, Coimbatore, Tamil Nadu.
2. Arthur M. Lesk. 2008. Introduction to Bioinformatics, 3rd Edition, Oxford University Press, Oxford, England.
3. Attwood TK. and DJ. Parry-Smith. 2004. Introduction to Bioinformatics, 5th Edition, Pearson Education Ltd., New York.
4. Baxevanis A. and BF. Ouellette, NJ. Hoboken. 1998. Bioinformatics; A practical Guide to the Analysis of Genes and Proteins, 2nd Edition, Wiley Interscience Publishers, Hoboken, New Jersey.
5. Higgins D. and W. Taylor (Eds). 2000. Bio informatics- Sequence, structure and databanks, 1st Edition, Oxford University Press, Oxford, England.
6. Karen Smiley. 2012. Medical billing and coding for Dummies, 3rd Edition, John Wiley & Sons, New Jersey.
7. Westhead DR., JH. Paris and RM. Twyman. 2003. Bioinformatics –Instant Notes, 1st Edition, Viva Books Private Ltd., Chennai, Tamil Nadu.

E-RESOURCES

1. https://www.pdfdrive.com/basics-of-bioinformatics-lecture-notes-of-the-graduate-summer-school-on-bioinformatics-of-china-d165983343.html
2. https://www.pdfdrive.com/introduction-to-bioinformatics-oxford-university-press-inc-d33405190.html
3. http://mgcub.ac.in/pdf/material/20200406015638ec227591f9.pdf
4. http://elearning.nokomis.in/uploaddocuments/Revenue%20Cycle%20Management%20in%20Healthcare/Chapter%202-20Medical %20 Transportation /PPT/2. Medical%20 Transcription. pdf
5. https://www.slideshare.net/BabliGupta1/medical-terminology-51194446?next_slideshow=1

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: III- EC-III: Industrial Biotechnology

Ins. Hrs. /Week: 6 **Course Credit: 3** **Course Code:**

OBJECTIVES

- To provide knowledge and understanding on fermentation technology
- To learn about the role of microbes and applications of enzymes in various bio processing
- To understand the concepts in environmental biotechnology

UNIT- I: Fermentation Technology (13 Hours)

Principles of fermentation, surface, submerged and solid state fermentations. Batch, fed batch, semi-continuous and continuous culture techniques. Design and operation of fermentors, Agitation and aeration, Types of fermentors - continuous stirred tank fermentor (CSTF), air-lift fermentor, Types of reactions in fermentations, Selection and characteristics of industrial microorganisms, Primary and secondary metabolites, Strategies for strain improvement and maintenance of the industrial strains, raw materials, different types of fermentation media, recovery of products, steps in downstream processing.

UNIT- II: Microbial Technology (11 Hours)

Production of ethyl alcohol and beer by yeast, Fermentative production of antibiotics - pencillin, streptomycin, tetracycline, Organic acids - citric acid, lactic acid, acetic acid, Enzymes - amylase, proteases, streptokinase, Amino acids - glutamic acid, lysine and Vitamins - B12, B2, and vitamin C. Production of biogas from agricultural wastes.

UNIT- III: Enzyme Technology (12 Hours)

Immobilization of enzymes and cells – methods of immobilization, effect of partition on kinetic properties of enzymes, immobilization of multienzyme systems, enzyme reactors, packed bed reactors, fluidized bed reactors, problems in using immobilized biocatalysts, Industrial applications of immobilized enzymes. Principle and applications of protein engineering. Principle, types and applications of enzyme biosensors.

UNIT- IV: Bioprocess Technology (12 Hours)

Single cell protein- Production and applications, Microbial transformations (bioconversions): Types and applications, steroidal transformations. Biofertilizers – Blue-green algal fertilizers (Azolla, Aneabena), seaweed fertilizers, Mycorrhiza, Biocontrol agents- Siderophores, biopesticides – Insecticidal toxin of Bacillus thuringiensis, mode of action and control, Bacculoviruses.

UNIT- V: Environmental Biotechnology (12 Hours)

Waste monitoring, treatment and management of non-hazardous solid waste, non-degradable solid waste, colour codes, medical solid waste. Composting- process and decomposition stages, vermicomposting, Utilization of cellulose. Bioremediation- microorganisms and techniques- in situ and ex-situ Bioremediation. Microbial degradation of xenobiotics. Biopolymers and Bioplastics. Bioleaching and biosorption.

Total Lecture Hours-60

COURSE OUTCOME

The students are able to,

1. Gain knowledge of principles and applications of fermentation process.
2. Know about the role of microbes in fermentation technology.
3. Acquire knowledge in basic principles of enzyme technology.
4. Learn the principal and applications in bio processing.
5. Discuss the principle strategies available in waste and waste water management.

TEXT BOOK(S)

1. Brown, TA. 2010. Gene cloning and DNA analysis: an introduction, 6th Edition, Wiley-Blackwell publishers, New Jersey.
2. Glick BR and Pasterak JJ. 2010. Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th Edition, ASM Press, Washington.
3. Gupta PK. 2016. Elements of Biotechnology, 2nd Edition, Rastogi Publications, Meerut, Uttar Pradesh.
4. Ignacimuthu, 2004. Plant Biotechnology, 2nd Edition, Oxford & IBH publishing company, New Delhi.
5. Kumar HD. 1998. A Textbook on Biotechnology, 2nd Edition, East West Press, New Delhi.
6. Slater A. Scott NW. Fowler MR. 2016. Plant Biotechnology, the Genetic Manipulation of Plants, 2nd Edition, Oxford University Press, United Kingdom.

REFERENCE BOOK(S)

1. Chrispeels and Jones and Bartlett. 2002. Plants, genes and crop biotechnology, 2nd Edition. Boston: Jones and Bartlett Publishers, Burlington, USA.
2. Dubey RC. 2014. A text book of Biotechnology, 5th Revised Edition, S. Chand Publishers, New Delhi.
3. Ernst L Winnacker. 2002. From genes to clones - Introduction to gene technology. 4th Edition, VCR Publishers, Weinheim.
4. Glick BR. and Pasternak JJ. 2003. Molecular Biotechnology: Principles and Applications of Recombinant DNA, 3rd Edition, ASM Press, Washington.
5. Stanbury, PF Whitaker A and Stephen JH.1995. Principles of fermentation technology. 2nd Edition, Elsevier Publishers, USA

E-RESOURCES

1. https://www.pdfdrive.com/modern-industrial-microbiology-and-biotechnology-e33452862.html
2. https://www.pdfdrive.com/handbook-of-industrial-chemistry-and-biotechnology-e184739059.html
3. https://www.pdfdrive.com/molecular-biotechnology-principles-and-applications-of-recombinant-dna-4th-edition-e162050162.html
4. https://www.pdfdrive.com/plant-biotechnology-principles-and-applications-e158417113.html
5. https://www.pdfdrive.com/fermentation-microbiology-and-biotechnology-e33544124.html

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: III- EDC-II: Applied Pharmacognosy

Ins. Hrs. /Week: 4 **Course Credit: 2** **Course Code:**

OBJECTIVES

- To understand the fundamental concepts in pharmacognosy
- To understand the various methods of preparations of crude drugs
- To know and understand the Adulteration and Deterioration that occurs in herbal/natural drugs and methods of detection of the same
- To study about herbal remedies and their validations including methods of screening

UNIT-I: Introduction to Pharmacognosy (10 Hours)

Definition, history, scope and development of Pharmacognosy - Sources of Drugs – Plants, Animals, Marine & Tissue culture - Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins). Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine

UNIT-II: Classification and Quality Control of Drugs (08 Hours)

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs - Quality control of Drugs of Natural Origin: Adulteration of drugs of natural orgin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

UNIT-III: Cultivation, Collection, Processing and Storage of Drugs (09 Hours)

Cultivation and Collection of drugs of natural origin Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants - Preparation of crude and commercial drugs. Making infusion, decoction, lotion, washers, insect repellents, tincture, making herbal syrups, compresses, poultice.

UNIT-IV: Analytical Pharmacognosy (09 Hours)

Introduction, Types of Adulteration/ Substitution of Herbal drugs - Causes and Measures of Adulteration - Sampling Procedures - Determination of Foreign Matter- DNA Finger printing techniques in identification of drugs of natural origin - Detection of heavy metals - Pesticide residues, phytotoxin, microbial contamination in herbs and their formulations

UNIT-V: Biological Screening of Herbal Drugs (09 Hours)

Biological screening of herbal drugs. Introduction and need for Phytopharmacological screening - New strategies for evaluating natural products - In vitro evaluation techniques for antioxidants, antimicrobial, anticancer, antidiabetic, hepatoprotective, cardio protective and antifertility drugs - Toxicity studies as per OECD guidelines.

Total Lecture Hours-45

COURSE OUTCOME

The students are able to,

1. Know about traditional system of medicine.
2. Understand the classifications of crude drugs.
3. Learn the technique of preparations of crude drugs.
4. Understand the adulteration and deterioration that occurs in herbal/natural drugs.
5. Learn herbal remedies and their validations, including methods of screening.

TEXT BOOK(S)

1. Acharya Vipul Rao. 2005. Herbs that Heal, Kindle Edition, Diamond Pocket Books, New Delhi.
2. Gokhale GB, Kokate CK, Purohit AP. 2002. Text Book of Pharmacognosy, 6th Edition, Nirali Prakasham Publishers, Pune.
3. Kokate KC. 2008. Pharmacognosy.55th Edition. Nirali Publisher, Pune.
4. Rajpal V. 2002. Standardization of Botanicals. Testing and extraction methods of medicinal herbs, Vol. I, 4th Edition, Eastern Publishers, New Delhi.
5. Trease GE and Evans WC.1972. Pharmacognosy, 16th Edition. Saunders Edinburgh, New York.

REFERENCE BOOK(S)

1. Kumar NC. 2004. An Introduction to Medicinal Botany and Pharmacognosy, Emkay Publications, New Delhi.
2. Marie A. Chisholm-Burns, Terry L. Schwinghammer, Patrick M. Malone, Jill M. Kolesar, Kelly Lee C and Brandon Bookstaver P. 2019. Pharmacotherapy Principles and Practice, 5th Edition, MGH Publishers, New York, USA.
3. Prasan R Bhandari, 2016. KD Tripathi's MCQs in Pharmacology, 4th Edition, Jaypee Medical Publishers, New Delhi.
4. Sharma HL and Sharma KK. 2007. Principles of *Pharmacology, 1st Edition, Paras Medical Publishers,* Hyderabad, India.
5. Sougata Sarkar, Vartika Srivastava and Manjushree Mohanty. 2020. *Postgraduate* Pharmacology, 1st Edition, *Paras Medical Publishers,* Hyderabad, India.

E-RESOURCES:

1. https://guides.lib.umich.edu/c.php?g=282760&p=1884068
2. https://www.phcogres.com/currentissue.asp
3. https://www.elsevier.com/books/trease-and-evans-pharmacognosy/evans/978-0-7020-2933-2
4. https://pubs.acs.org/doi/10.1021/np058229l
5. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.2042-7158.1949.tb12463.x

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: III- EDC-II: Diagnostic Biochemistry

Ins. Hrs. /Week: 4 **Course Credit: 2** **Course Code:**

OBJECTIVES

- To make the students know the clinical biochemistry, diagnostic biochemistry experiments as well as to analyze and interpret the results
- To learn qualitative and quantitative analysis of constituents of biological fluids such as urine, blood and their estimation using standard methods
- To aware the students for diagnosis of disorders in human regarding human based metabolic disorder and inborn error

UNIT-I: Clinical Chemistry Tests (09 Hours)

Clinical chemistry tests- Blood group, glycosylated haemoglobin, Glycosuria and Hypoglycemia: introduction and types fructosamine, Glucose tolerance test., uric acid, Calcium, phosphorus, Iron, Copper, Cerebrospinal fluid analysis.

UNIT-II: Clinical Enzymology (08 Hours)

Enzymes: Alkaline Phosphatases (ALP), Acid phosphatases (ACP), Aspartate Transaminases (AST), Alanine Transaminases (ALT), lactate dehydrogenase (LDH), Creatine phosphokinase (CPK), Creatine kinase myocardial band (CPK-MB), Alpha amylase, Hormones- T3, Thyroid stimulating hormone (TSH), Luteinizing hormone (LH). Immunoglobulins- IgA, IgM, IgE.

UNIT-III: Serology (09 Hours)

Serodiagnostic procedures- precipitation tests, VDRL test, Vidal test, (Slide and tube method) Brucella agglutination test, antistreptolysin O (ASO) test, Rheumatoid arthritis (RA) test,c-reactive protein (CRP) test. Complement fixation test, skin test- Montaux test, Lepramin test.

UNIT-IV: Haematology (10 Hours)

Complete haemogram : Components of Complete Blood Count, values for components of Complete Blood Count- WBC or Leukocyte count, WBC differential count, RBC or erythrocyte count, Hematocrit , Hemoglobin, MCV, MCH, MCHC, RDW, Platelet count, MPV. Complete urine analysis, complete motion analysis, semen analysis.

UNIT-V: Blood Analysis (09 Hours)

Blood bank, blood group and Rh factor, Coomb's test, Coagulation studies, Prothrombin test (PT), Partial PT, Plasma fibrinogen. Test for amino acidurias- Test for phenyl ketonuria, DNPH, Test for keto acids, sodium nitroprusside test for cystinuria and homocysteine.

Total Lecture Hours-45

COURSE OUTCOME

The students are able to,

1. Learn the clinical chemistry and tests related to blood grouping.
2. Identify, formulate and solve the problems of endocrine disorders in the area of hormones.
3. Acquire the knowledge in serodiagnostic procedures.

4. Perform complete urine analysis in laboratory.
5. Understand Blood grouping. analysis. and estimation

TEXT BOOK(S)

1. Jayaraman J. 2011. Laboratory Manual in Biochemistry, 3rd Edition, New Age International Pvt Ltd Publishers, India.
2. Pattabiraman TN. 1998. Laboratory manual in Biochemistry, 4th Edition, All India publishers, New Delhi.
3. Plummer T. 2001. Practical Biochemistry, 3rd Edition, McGraw Hill Publishing Company, New York, USA.
4. Sadasivam S. Manickam A. 2009. Biochemical Methods, 3rd Edition, New age publishers, India.
5. Sawhney SK. Randhir Singh. 2005. Introductory Practical Biochemistry, 2nd Edition, Alpha Science International, Ltd., United Kingdom.

REFERENCE BOOK(S)

1. Alan H Gowenlock. 1998. Varley's Practical Clinical Biochemistry, 6th Edition, CBS Publishers, India.
2. Godkar B. 2020. Textbook of Medical Laboratory Technology Vol 1 & 2 Paperback, 3rd Edition, Bhalani Publishers, New Delhi.
3. Jacqes Wallach.1982. Interpretation of Diagnostic test – A Synopsis, 5th Edition, Little Brown and Company, New York.
4. Kanai L Mukerjee. 1996. Medical Lab Technology, Vol I& II. 1st Edition, Tata Mcgraw Hill Publishers, New Delhi.
5. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer. 2002. Techniques of practical Biochemistry. Biomedical Instrumentation and Measurement, 2nd Edition, Cambridge University Press, United Kingdom.

E-RESOURCES

1. https://www.pdfdrive.com/biochemistry-books.html
2. https://www.enpab.it/images/2018/EbookBiologia%20Clinica%2001_Clinical%20Biochemistry%20an20Metabolic%20Medicine%20-%20Martin%20Andrew%20Crook.pdf
3. http://www.student.oulu.fi/~taneliha/Harpers_Illustrated_Biochemistry,(29th Edition).pdf.
4. https://static1.squarespace.com/static/6019d0bc7dff866728d961d3/t/601a68429c231608a9b8f2a0/1612343363359/biochemistry_satyanarayana_ebook_free.pdf
5. https://www.pdfdrive.com/vitamin-d-volume-1-biochemistry-physiology-and-diagnostics-e187576453.html
6. https://www.pdfdrive.com/clinical-studies-in-medical-biochemistry-e185475424.html

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SEMESTER IV

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: IV-CC- XI: Immunology

Ins. Hrs. /Week: 6 **Course Credit: 4** **Course Code:**

OBJECTIVES

- To presents the basic defense mechanism of animals
- To make the students to understand the concept of immunology
- To understand about immune response and immunological techniques

UNIT-I: Basics of Immunology and Immune System (16 Hours)

Elements of Immunology. Definition, Types - Innate immunity- classification- active and passive - mechanism of innate immunity and acquired immunity- classification- active and passive- mechanism of acquired immunity. Humoral and cell mediated immunity. Primary and secondary immune response. Cells of the immune system - Lymphocytes- their origin and differentiation, Types - B Cell, T cell and NK cells. Antigen presenting cells- macrophages, dendritic cells, langerhans cell.

UNIT –II: Components of Immune Cells (14 Hours)

Antigens vs immunogens – types – determinants – Haptens. Factors influencing immunogenicity. Antigen - Types and classifications. Antibody – Structure, Types - based on light and heavy chain, properties and their biological functions, poly clonal sera, monoclonal antibody. Lymphoid organ – Types- Primary Lymphoid organ - Thymus, Bone marrow, Bursa and Secondary Lymphoid organ- Spleen, Lymph node, Theories of Antibody formation. Genetic basis of antibody diversity.

UNIT- III: Antigen and Antibody Process (15 Hours)

Hematopoiesis and development of B and T lymphocytes - fate of stem cell. T cell, B cell receptors, Antigen recognition, processing and presentation to T cells- Endogenous antigens processing Pathway-Cytosolic pathway- Proteasome mediated processing, Transfer of peptides by TAP proteins, Generation of Class I MHC Peptides and Exogenous antigens processing pathway -Endocytic pathway- MHC assembly and transport to peptide loading compartment, Peptide loading (CLIP exchange) and MHC peptide transport. Interaction of T and B cells. Plasma cells, Immunological memory.

UNIT-IV: Immunological Reaction and Disorder's (16 Hours)

Complement –characteristic features, activation-MAC, Classical pathway and Alternative pathway- biological functions. Cytokines-structure and functions, Interferon and interleukins.Immuno regulation: Tolerance. Suppression, Autoimmunity - Autoimmune diseases – pathogenesis treatment. Hypersensitivity- Types & Mechanism. Primary and secondary Immuno deficiency disorders- AIDS and other immunodeficiency disorders.

UNIT-V: Antigen Antibody Reaction (14 Hours)

Transplantation-Definition, types, graft acceptance, graft rejection- types- Mechanism of Graft rejection and prevention, immune suppressive drugs, HLA Typing, MHC genes and products. Tumor immunology. Antigen – Antibody Interactions-Agglutination and precipitation. Immunodiffussion and Immunoelectrophoresis. Principle and applications of

RIA, ELISA and Fluorescent Antibody techniques.

Total Lecture Hours-75

COURSE OUTCOME

The students are able to,

1. Understand the role of Immunity and cells of immune system.
2. Acquire knowledge on the structure and properties of components of Immune cells.
3. Learn Antigen and Antibody and the processes.
4. Identify immunological reactions and their consequences.
5. Describe the antigen antibody reactions.

TEXT BOOK(S)

1. Anil K. Sharma. 2019. Immunology: An Introductory Textbook, 1st Edition, Jenny Stanford Publishers, California.
2. Gupta SK. 2017. Essentials of Immunology, 2nd Edition, ARYA Publishers, New Delhi.
3. Kenneth Murphy. 2017. Janeway's Immunobiology, 9th Edition, W.W. Norton & Company Publishers, New York.
4. Mohanty SK. 2019. Essentials of Microbiology & Immunology, 1st Edition, Paras Medical Publishers, New Delhi.
5. Robert R. Rich. 2020. Clinical Immunology- Principles And Practice, 5th Edition, Elsevier Publishers, India.
6. Shyamasree Ghosh. 2020. Computational Immunology Basics, 1st Edition, CRC Press Publishers, England.

REFERENCE BOOK(S)

1. Abul K. Abbas, Andrew H. Lichtman, and Shiv Pillai. 2020. Cellular and Molecular Immunology, 10th Edition, Elsevier Publishers, India.
2. Ashim K. Chakravarty. 2016. Immunology and Immunotechnology, 1st Edition, Oxford Publishers, England.
3. Jenni Punt, Sharon A Stranford, Patricia P Jones and Judith A Owen. 2019. Kuby Immunology, 8th Edition, Macmillan Education Publishers, London.
4. Peter J. Delves, Seamus J. Martin, Dennis R. Burton and Ivan M. Roitt. 2016. Roitt's Essential Immunology, 13th Edition, Wiley-Blackwell Publishers, New Jersey.
5. Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne, Janis Kuby. 2002. Immunology, 5th Edition, W.H.Freeman Publishers, New York.

E-RESOURCES

1. https://www.nature.com/ni/video
2. https://www.cell.com/immunity/home
3. https://www.wpunj.edu/sec/vsec/science_courses/bio/BIOimmuANIM.html
4. https://www.youtube.com/watch?v=K09xzIQ8zsg
5. https://nptel.ac.in/content/syllabus_pdf/102105083.pdf

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SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

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SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2020 – 2021)

DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: IV-CC- XII: Genetic Engineering

Ins. Hrs. /Week: 6 **Course Credit: 4** **Course Code:**

OBJECTIVES

- To learn genetics, and the advent of DNA research and the ability to change gene expressions
- To learn changes in human capacities, as to whether they are due to physical, cognitive or emotional
- To apply the recent advances of Genetic engineering techniques in various fields

UNIT-I: Genetics (10 Hours)

Introduction to genetics. Transmission genetics. Mendelian genetics. Mendelian analysis of inheritance. Genes, chromosomes, alleles, homozygous, heterozygous and mechanism of Mendelian inheritance. Mendel's laws. Linkage – definition, simple measurement and salient features. Salient features of autosomal dominant, recessive, codominance; X-linked recessive, codominance and dominance; Y-linked characters. Extra nuclear inheritance.

UNIT-II: Genetic Techniques (12 Hours)

Restriction Endonucleases – types and functions; restriction mapping Nucleic acid probes and their applications – cloned probes, oligonucleotide probes; labeling of nucleic acid probes. Nucleic acid hybridization techniques – liquid and dot blot technique; Southern and Northern hybridization; in situ hybridization; whole mount in situ hybridization. FISH. Polymerase chain reaction – types and applications. Chemical synthesis of genes, DNA fingerprinting, DNA sequencing. DNA Foot printing and Sequence generation, Next generation sequencing. DNase Foot Printing assay. Artificial Intelligence in Phylogeny and AI in next sequence generation sequencing

UNIT-III: Vectors (13 Hours)

Cloning vectors – salient features. Plasmids as vectors – properties, natural plasmids, pBR 322, pSC 101, pUC, bluescript. Mechanism of cloning in plasmid vectors. Bacteriophage vectors – λ phage, X-vector – packing of X-vector in vitro. Cosmid vectors, cosmid cloning. DNA (single stranded) vectors – development of M13 vector, PEMBL vector, λ 2AP viral vectors. SV 40, retrovirus, adenovirus, recombinant vaccinia virus vectors. Baculo virus vector for insects. Transposons as vectors. High capacity cloning vectors – bacterial artificial chromosomes, phage P1, yeast artificial chromosomes and PACs.

UNIT-IV: Cloning Strategies and Expression Vectors (12 Hours)

Cloning strategies – genomic and cDNA cloning. cDNA library. Expression vectors – vectors for maximizing protein synthesis, fusion proteins. Expression vectors – expression of cloned genes in E. coli. Cloning and expression of cloned genes in Bacillus subtilis. Cloning in yeasts; yeast expression vectors, over expression in yeast. Expression in baculovirus system. Recombination, selection and screening methods and processes.

UNIT-V: Gene Transfer Methods in Animal Cells (13 Hours)

Gene transfer methods in animal cells – calcium phosphate co precipitation, electroporation, microinjection, using viral vectors. Transfer, cotransfer, selectable markers like TK, PSV, PRSV and reporters genes. Gene targeting in animal cells; transfer and expression of cloned genes in Drosophila. Gene knockout. Methods for production of transgenic animals (mice, sheep, goat, fish, pig, cow etc.,) – retroviral, DNA microinjection and engineered stem cell methods. Applications of transgenic animals; transgenic animals as models/in the prevention of human diseases like cystic fibrosis, muscular dystrophy and anticancer therapy.

Total Lecture Hours-60

COURSE OUTCOME

The students are able to,

1. Have basic understanding of Mendelian genetics.
2. Learn the techniques of gene manipulation.
3. Acquire clear understanding of cloning vector, development and their application.
4. Understand the cloning strategies and expression vectors.
5. Gain adequate knowledge on gene transfer methods and selectable markers and their applications.

TEXT BOOK(S)

1. Dubey RC. 2014. Book on Biotechnology, 5th Edition, S. Chand and company Publishers, New Delhi.
2. Jogand SN. 2006. Gene Biotechnology, 2nd Edition, Himalaya Publishing House, Bengaluru, Karnataka.
3. Singh BD. 2007. Biotechnology, 3rd Edition, Kalyani Publishers, Chennai, Tamil Nadu.
4. Tyagi ID. 2005. Biotechnology and Genetic Engineering, 1st Edition, Jain Brothers Publishers, Bengaluru, Karnataka.
5. Verma PS. and Agarwal VK. 2009. Genetic Engineering, 1st Edition, S. Chand Publishers, New Delhi.
6. Wulf Crueger. 2016. Biotechnology: A Textbook of industrial microbiology**,** 2nd Edition, CBS Publishers, New Delhi, India.

REFERENCE BOOK(S)

1. Brown TA. 2006. Gene Cloning and DNA Analysis: An Introduction, 5th Edition, Wiley Blackwell Publishers, Hoboken, New Jersey.
2. Gardner AG. Simmons MJ. 2006. Principles of Genetics, 8th Edition, John Wiley and Sons Publishers, New Jersey.
3. Griffiths AJF. Wessler SR, Doebley J and Carroll SB. 2010. Introduction to Genetic Analysis, 10th Edition, W. H. Freeman Publishers, New York.
4. Harry LeVine, Harry LeVine. 2006. Genetic Engineering: A Reference Handbook Illustrated Edition, ABC-CLIO Publishers, Santa Barbara, California.
5. Primrose SM. and Twyman RM. 2006. Principles of Gene Manipulation and Genomics, 7th Edition, Blackwell Publishers, Hoboken, New Jersey.

E-RESOURCES

1. https://www.mooc-list.com/tags/genetics
2. https://www.mooc-list.com/tags/genetically-modified-organisms
3. https://ncert.nic.in/ncerts/l/lebo105.pdf
4. https://www.pdfdrive.com/introduction-to-biotechnology-and-genetic-engineering-e18777191.html
5. https://www.pdfdrive.com/an-introduction-to-genetic-engineering-e40034206.html
6. https://www.pdfdrive.com/genetic-engineering-e33644320.html
7. https://www.pdfdrive.com/molecular-biotechnology-principles-and-applications-of-recombinant-dna-e33452385.html

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