

M. Sc. BIOCHEMISTRY

SYLLABUS

Programme Code : 2PSBIC

2022-2024



**SENGAMALA THAYAR EDUCATIONAL TRUST
WOMEN'S COLLEGE (AUTONOMOUS)**

(Affiliated to Bharathidasan University, Tiruchirappalli)
(Accredited by NAAC) | (AnISO 9001:2015 Certified Institution)

**Sundarakkottai, Mannargudi-614 016,
Thiruvarur (Dt.), Tamil Nadu, India.**

PROGRAMME OUTCOME (PO) FOR M.Sc., DEGREE (SCIENCE)

PO No.	<p align="center">Programme Outcomes <i>(Upon completion of the M.Sc. Degree Programme, the postgraduate will be able to)</i></p>
PO-1	Disciplinary Knowledge: demonstrate in-depth knowledge and understanding of theories, policies, and practices in one or more disciplines that form a part of a Post Graduate program of study in Master of Science.
PO-2	Critical Thinking and Problem Solving: apply analytic thought to a body of knowledge, analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence, identify relevant assumptions or implications, formulate coherent arguments, critically evaluate practices, policies and theories by following scientific approach to knowledge development: solve problems and extrapolate the same to real life situation.
PO-3	Information/digital literacy and Communication Skills: use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources, and use appropriate software for analysis of data: communicate thoughts and ideas analytically and effectively in writing and orally using appropriate media, and present complex information in a clear and concisemanner to different groups.
PO-4	Research-related skills: conduct independent inquiry in a chosen scientific discipline, demonstrate sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesising and articulating; recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; plan, execute and report the results of an experiment or investigation.
PO-5	Scientific reasoning and Reflective Thinking: analyse, interpret and draw conclusions from quantitative/qualitative data and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective; critically and sensibly evaluate life experiences, with self awareness and reflexivity of both self and society.
PO-6	Multidisciplinary Approach, Innovation and Entrepreneurship: propose novel ideas of interdisciplinary approach in providing better solutions and new ideas for the sustainable developments; identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.
PO-7	Moral and ethical awareness/reasoning: embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use

	ethical practices in all work, demonstrate the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopt objective, unbiased and truthful actions in all aspects of work.
PO-8	Self directed Learning: work independently, identify appropriate resources required for a project, and manage a project till completion.
PO-9	Lifelong Learning: engage in continuous learning for professional growth and development, acquire knowledge and skills, adapt to changing environment and adapt to changing trades and demands of work place through knowledge/skill development/reskilling.
PO-10	Multicultural Competence, Social Interaction and Effective Citizenship: understand the values and beliefs of multiple cultures, global perspectives, engage and interact respectfully with diverse groups and elicit views of others, mediate disagreements and help reach conclusions in group settings, and demonstrate empathetic social concern and equity centered national development.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO No.	Program Specific Outcomes <i>M.Sc. Biochemistry</i>
PSO-1	Understand and infer the principles and biological processes at the cellular and molecular level in cell biology, genetics, molecular biology, immunology, plant biochemistry, metabolism and enzymology.
PSO-2	Understand and Discuss the functions, principles and the structures of macromolecules and their participation in molecular interactions.
PSO-3	Appraise the dynamics and kinetics of biological macromolecules and their possible interactions and apply the same in the diagnosis of disease, genetic engineering, vaccine development and nutritional research.
PSO-4	Understand the principles and procedures in drug docking, drug designing and development, and application of bioinformatics towards drug discovery.
PSO-5	Develop skills to enable and begin a career in research laboratories, industries as well as to generate self-employability in the field of biochemistry.
PSO-6	Understand, evaluate and implement advanced techniques to predict, analyse, alter, induce and investigate various biochemical and pathological processes and reactions within the body for prevention and treatment of diseases.
PSO-7	Assess and turn ideas into actions related to biochemical mechanisms and processes in industries, industrial production and health.



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SUNDARAKKOTTAI, MANNARGUDI – 614016.
TAMILNADU, INDIA.

M.Sc., BIOCHEMISTRY

**CHOICE BASED CREDIT SYSTEM – LEARNING OUTCOMES BASED CURRICULUM
FRAMEWORK (CBCS - LOCF)**

(For the candidates admitted in the academic year 2022–2023)

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.	Course	Course Code	Title of the Course	Inst. Hrs/ Week	Credit	Exam Hrs	Marks		
							CIA	ESE	Total
I	Core Course I (CC)	22PBC101	Chemistry of Biomolecules	6	5	3	25	75	100
	Core Course II (CC)	22PBC102	Analytical Techniques	6	5	3	25	75	100
	Core Course III (CC)	22PBC103	Cell Biology and Human Physiology	6	5	3	25	75	100
	Core Practical I (CP)	22PBC104P	Bio-Analytical Techniques Practical	6	3	6	40	60	100
	Elective Course I (EC)	22PBCE1A/ 22PBCE1B	Ecology and Environmental Sciences/Microbial Biochemistry	6	4	3	25	75	100
	Value Added Course I (VAC)	22PBCVA11	Biochemistry in Daily Life	-	2*	3	25	75	100*
TOTAL				30	22	-	-	-	500
II	Core Course IV (CC)	22PBC205	Enzymology	6	5	3	25	75	100
	Core Course V (CC)	22PBC206	Metabolism and Regulation	5	5	3	25	75	100
	Core Course VI (CC)	22PBC207	Molecular Biology	5	5	3	25	75	100
	Core Practical II (CP)	22PBC208P	Enzymes and Molecular Biology Practical	6	3	6	40	60	100
	Elective Course II (EC)	22PBCE2A/ 22PBCE2B	Developmental Biology/ Genetic Engineering	5	4	3	25	75	100
	Extra Disciplinary Course (EDC) – I	22PBCED1A/ 22PBCED1B	Herbal Technology/ General Biochemistry and Nutrition	3	2	3	25	75	100
TOTAL				30	24	-	-	-	600
III	Core Course VII (CC)	23PBC309	Immunology	6	5	3	25	75	100
	Core Course VIII (CC)	23PBC310	Clinical Biochemistry	5	5	3	25	75	100
	Core Course IX (CC)	23PBC311	Research Methodology	5	5	3	25	75	100
	Core Practical III (CP)	23PBC312P	Clinical Biochemistry and Immunology Practical with Internship	6	3	6	40	60	100
	Elective Course III (EC)	23PBCE3A/ 23PBCE3B	Plant Biochemistry /Bioethics and IPR	5	4	3	25	75	100
	Extra Disciplinary Course (EDC) – II	23PBCED2A/ 23PBCED2B	Pharmaceuticals/ Clinical Lab Technology	3	2	3	25	75	100
TOTAL				30	24	-	-	-	600
IV	Core Course X (CC)	23PBC413	Endocrinology	6	5	3	25	75	100
	Core Course XI (CC)	23PBC414	Bioinformatics	6	5	3	25	75	100
	Entrepreneurship / Industry Based Course Project	23PBCI41	Medical Laboratory Techniques	6	5	3	25	75	100
		23PBCPW	Dissertation (2 reviews-20+20=40 marks; Report Valuation=35 marks) Viva = 25 Marks	12	5	-	25	75	100
	Value Added Course II (VAC)	23PBCVA42	Biochemistry of Common Disorders	-	2*	3	25	75	100*
TOTAL				30	20	-	-	-	400
G.TOTAL				120	90	-	-	-	2100

Summary of Curriculum Structure of PG Programmes

Sl. No.	Types of the Course	No. of Courses	No. of Credits	Marks
1.	Core Course	11	55	1100
2.	Core Practical	3	9	300
3.	Elective Course	3	12	300
4.	Entrepreneurship/ Industry Based Course	1	5	100
5.	Project	1	5	100
6.	Extra Disciplinary Course	2	4	200
	Total	21	90	2100
	Value Added Courses *	2*	4*	200*

***The value added courses credit will not be included in the total CGPA.
These courses are extra credit courses.**

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	22PBCE1A	Ecology and Environmental Sciences
I	Elective Course (EC) – I	22PBCE1B	Microbial Biochemistry
II	Elective Course (EC) – II	22PBCE2A	Developmental Biology
II	Elective Course (EC) – II	22PBCE1B	Genetic Engineering
III	Elective Course (EC) – III	23PBCE3A	Plant Biochemistry
III	Elective Course (EC) – III-	23PBCE3B	Bioethics & IPR

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	22PBCED1A	Herbal Technology
II	Extra Disciplinary Course (EDC) – I	22PBCED1B	General Biochemistry and Nutrition
III	Extra Disciplinary Course (EDC) – II	23PBCED2A	Pharmaceutics
III	Extra Disciplinary Course (EDC) – II	23PBCED2B	Clinical Lab Technology

VALUE ADDED COURSES (VAC) OFFERED BY THE DEPARTMENT

Semester	Nature of the Course	Course Code	Title of the Course
I	Value Added Course (VAC) – I	22PBCVA11	Biochemistry in Daily Life
IV	Value Added Course (VAC) – II	23PBCVA42	Biochemistry of Common Disorders



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M.Sc., BIOCHEMISTRY

(For the candidates admitted in the academic year 2022 – 2023)

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)
b | } | Unit I |
| 12. a (or)
b | | |
| 13. a (or)
b | } | Unit III |
| 14. a (or)
b | | |
| 15. a (or)
b | } | Unit V |

Section – C (3 x10 = 30)

Answer any THREE questions in 1200 words

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

SEMESTER - I



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: I-CC-I: Chemistry of Biomolecules

Ins. Hrs. / Week: 6

Course Credit: 5

Course Code: 22PBC101

UNIT-I: Carbohydrates

(19 Hours)

Carbohydrates- Definition, classification, structure, properties and functions. Monosaccharide- Classification- Glucose, Fructose and Galactose- structure, properties and functions. Disaccharides- Sucrose, Lactose and Maltose- structure, properties and functions. Polysaccharide- classification- Homo polysaccharides- Starch and Glycogen - structure, properties and functions. Hetero polysaccharides-Heparin and Hyaluronic acid- structure, properties and functions. Sugar derivatives-glycosamino glycans and proteoglycans. Glycoprotein – Blood group and bacterial cell wall polysaccharides, O- linked and N- linked oligosaccharides, Lectins.

UNIT- II: Aminoacids and Proteins

(19 Hours)

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

UNIT-III: Chemical synthesis of Peptide and Characterization

(17 Hours)

Chemical synthesis of peptides by Merrifield method. Identification of source and extraction of proteins. Methods of isolation, characterization and purification of proteins- Based on size, shape, charge and mobility. Protein sequencing methods- Protein sequencer; N-terminal and C-terminal amino acid analysis.

UNIT-IV: Fatty acids and Lipids

(18 Hours)

Fatty acids- Definition, nomenclature, classification, properties and biological significance. Lipids- Definition, classification and biological significance of lipids. Simple lipids- Fats and oils- Compound lipids- phospholipids, sphingolipids, glycolipids- classification, structure and biological functions. Derived lipids-Steroids – structure and functions of cholesterol, bile acids, sex hormones, ergosterol. Structure and biological role of prostaglandins.

UNIT-V: Nucleic Acid**(17 Hours)**

Nucleic acid- Definition, types. Structure of nucleosides and nucleotides- phosphoric acid, sugar and nitrogenous bases- purines, pyrimidines, DNA - Double helical structure, A, B and Z forms, triple and quadruple structures, properties of DNA. DNA sequencing methods. Chemical synthesis of DNA. RNA- types - mRNA, tRNA and rRNA - structure and biological role. Renaturation and denaturation of nucleic acid.

Total Lecture Hours-90**COURSE OUTCOME**

The students should be able to,

1. Understand the structure and properties of carbohydrates.
2. Gain the knowledge about the structure and properties of amino acids and proteins.
3. Enrich the knowledge on isolation and identification on the structure, configuration and organization of proteins.
4. Understand the structure and functions of fatty acids and lipids.
5. Obtain basic knowledge about nucleic acids.

TEXT BOOK(S)

1. Deb AC. 2016. Fundamentals of Biochemistry. 7th Edition, NCBA Publishers, New Delhi.
2. Jain JL, Sunjay Jain and Nitin Jain. 2018. Fundamentals of Biochemistry. Updated Edition. 2020. S.Chand Publishers, New Delhi.
3. Nagini S. 2007. Text Book of Biochemistry, 2nd Edition, Scitech Publishers, India.
4. Poonam Agarwal. 2020. Review of Biochemistry. 5th Edition. CBS Publishers, New Delhi.
5. Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, 2003. Harper's Illustrated Biochemistry, 26th Edition, McGraw-Hill Medical Publishers, New York.
6. Vasudevan DM. 2018. Biochemistry. 9th Edition. Jaypee Brothers Medical Publishers, New Delhi.

REFERENCE BOOK(S)

1. Anders Liljas. 2019. Textbook of Structural Biology, 2nd Edition, World Scientific Publishers, Singapore.
2. Berg JM, Tymoczko JL and Stryer L. 2019. Biochemistry, 9th Edition, WH. Freeman Publishers, New York, USA.
3. David L. Nelson and Michael M. Cox. 2017. Lehninger Principles of Biochemistry, 7th Edition, WH Freeman Publishers, New York, USA.
4. Lehninger AL, Nelson DL and Cox MM. 2020. Principles of Biochemistry, 8th Edition, WH Freeman Publishers, New York, USA.
5. Satyanarayana U and Chakrapani U. 2020. Biochemistry, 5th Updated edition, Elsevier Publishers, India.

E-RESOURCES

1. http://www1.biologie.uni-hamburg.de/b-online/library/biology_107/bi107vc/fa99/terry/sugars.html
2. <https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod10.pdf>
3. <https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod11.pdf>
4. <https://nptel.ac.in/content/storage2/courses/104103071/pdf/mod12.pdf>
5. <https://www.pdfdrive.com/biochemistry-books.html>



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: I-CC- II: Analytical Techniques

Ins. Hrs. /Week: 6

Course Credit: 5

Course Code: 22PBC102

UNIT – 1: Units of measurement of solutes in solution (17 Hours)

Normality, Molarity, molality and milliosmol. Ionic strength. pH, pOH, Henderson – Hesselbalch equation, buffers, pH of body fluids. Measurement of pH by indicators, Zwitterions. pH dependent ionization of amino acids and proteins. Viscosity, surface tension and Donnan membrane equilibrium. Principles of electrochemical techniques – measurement of pH by glass electrode and hydrogen electrode. Oxygen electrode – principles, operation of a Clarke electrode and its applications.

UNIT- II: Centrifugation (19 Hours)

Principles, basic principles and laws of sedimentation. Preparative and analytical ultracentrifuges. Sedimentation equilibrium methods. Types of separation methods in preparative centrifuges. Differential and density gradient centrifugation. Analysis of sub-cellular fractions. Estimation of purity of macromolecules and detection of conformational changes. General approaches to biochemical investigations. Organ and tissue slice technique. Cell disruption and homogenizing techniques. Cell sorting and cell counting. Cytophotometry and Flow cytometry, manometric techniques.

UNIT- III: Chromatography (18 Hours)

Theory and practice, column chromatography, column efficiency and resolution. Types of adsorption chromatography- hydroxyapatite chromatography and hydrophobic-interaction chromatography (HIC). Types of partition chromatography- normal phase and reverse phase-liquid chromatography, chiral and counter current chromatography. Paper chromatography, ion-exchange chromatography. Exclusion chromatography, chromatofocussing, affinity chromatography. Principles and application of GLC, LC, LPLC and HPLC. Selection of chromatographic systems.

UNIT- IV Electrophoresis (19 Hours)

Principles, support media, factors affecting electrophoresis. Types of electrophoretic techniques- zonal and disc electrophoresis. High and low voltage electrophoresis. Principles and applications of PAGE. Isoelectric focusing, Isotachopheresis, PFGE and capillary electrophoresis. Electrophoresis of proteins and nucleic acids.

UNIT –V Spectroscopy:**(17 Hours)**

Basic laws of light absorption, optical rotatory dispersion, circular dichroism, X-ray diffraction. UV and visible light spectrophotometry, spectrofluorimetry. Atomic flame photometry, Plasma emission spectroscopy, infra-red spectrophotometry. Basic principles, instrumentation and application of mass spectrometry, Tandem mass spectroscopy, ESR and NMR. Radiochemical methods, basic concepts, detection, counting methods and applications, autoradiography, Cerenkov radiation. Enzymes monitoring techniques and assay methods.

Total Lecture Hours-90**COURSE OUTCOME**

The students should be able to,

1. Analyze, communicate and discuss General principles of biochemical investigation
2. Discuss about the working principles, tools and techniques of analytical techniques
3. Illustrate the basic principles of centrifugation, various types of centrifuges and methods for sub cellular fractionation
4. Understand the knowledge for the separation of proteins/peptides by selecting appropriate separation techniques.
5. Analyze characterize certain functionalities of biomolecules by using spectroscopic technique.

TEXTBOOK(S)

1. Wilson and Walker. 2000. A biologist's guide to principles and techniques of practical biochemistry. 5th Edition. Cambridge University Press
2. Boyer, R. 2000. Modern Experimental Biochemistry. 3rd Edition. Addison Wesley Longman.
3. Upadhyay, Upadhyay and Nath. 1997, Biophysical Chemistry Principles and Techniques. Himalaya Publications.
4. Sambrook. 2001. Molecular Cloning. Cold Spring Harbor Laboratory,
5. Friefelder and Friefelder. 1994. Physical Biochemistry – Applications to Biochemistry and Molecular Biology. WH Freeman & Co.
6. Pavia et al. 2000. Introduction to Spectroscopy. 3rd Edition. Brooks/Cole Pub Co.,

REFERENCE BOOK(S)

1. Avinash Upadhyay, Kakoli Upadhyay and Nirmalendu Nath. 2014. Biophysical Chemistry (Principles and Techniques), 4th Edition, Himalaya Publishers, Hyderabad.
2. Ghosal Sabari and Srivastava A. 2009. Fundamentals of Bio Analytical Techniques and Instrumentation, 2nd Edition, PHI Learning Pvt. Ltd. India.
3. Kothari CR. 2004. Research Methodology, Methods and Techniques, 2nd Edition, New Age International Publishers, India.
4. Rajan Katoch. 2011. Analytical Techniques in Biochemistry and Molecular Biology. 1st

- Edition, Springer New York Dordrecht Heidelberg London Publishers, United Kingdom.
5. Rodney Boyer. 2012. Biochemistry Laboratory: Modern Theory and Techniques, 2nd Edition, Prentice Hall Publishers, United Kingdom.
 6. Seader JD. Henley J and Keith Roper D. 2011. Separation process principles -Chemical and Biochemical Operations, 3rd Edition, John Wiley & Sons Publishers, United Kingdom.
 7. Wilson and Walkers. 2018. Principles and Techniques of Biochemistry and Molecular Biology, 8th Edition, Cambridge University Press Publishers, England.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. [https://www.chem.purdue.edu/courses/chm333/Spring % 202013 /Lectures /Spring % 202013 %20Lecture%20-%204.pdf](https://www.chem.purdue.edu/courses/chm333/Spring%202013/Lectures/Spring%202013%20Lecture%20-%204.pdf)
3. <https://nptel.ac.in/content/storage2/courses/102103047/PDF/mod3.pdf>
4. <https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod5.pdf>
5. <https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod2.pdf>
6. <https://www.pdfdrive.com/analytical-techniques-in-biochemistry-and-molecular-biology-e189149927.html>
7. <https://www.pdfdrive.com/instant-notes-analytical-chemistry-e912659.html>
8. <https://www.pdfdrive.com/analytical-biochemistry-e46164604.html>



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: I-CC- III: Cell Biology and Human Physiology

Ins. Hrs. /Week: 6

Course Credit: 5

Course Code: 22PBC103

UNIT-I: Biomembranes, Cell Cycle and Cell Death (19 Hours)

Biomembranes- Structural organization- Models of a plasma membrane. 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: Organization and Communication of Cell (17 Hours)

The Cytoskeleton: Components of Cytoskeleton, Structure and basic functions of Microtubules, Microfilaments, Intermediate filaments. Micro bodies-Peroxisomes, and Glyoxysomes and their functions. Types of tissue. Major classes of cell junctions – anchoring, tight and gap junctions. Cell adhesion molecules (CAMs) – the cadherins (classical and desmosomal) and integrins. ECM components – collagen, fibronectin, laminin and proteoglycans.

UNIT-III: Body Fluids (19 Hours)

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. Lymph – composition and functions. CSF – composition and clinical significance.

UNIT-IV: Digestive and Excretory System (18 Hours)

Structure and Functions of Kidney. Structure of nephron. Formation of urine – glomerular filtration, tubular reabsorption of glucose, water and electrolytes. Counter current multiplication, tubular secretion.

Composition, functions and regulation of salivary, gastric, pancreatic, intestinal and biliary secretions. Digestion and absorption of carbohydrates, lipids and proteins

UNIT-V: Neuromuscular System**(17 Hours)**

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 – Ca^{2+} - Na^{+} exchanger, Ca^{2+} -ATPase. Brief outline of channelopathies. Cardiac myopathy. Smooth muscle – regulation by Ca^{2+} .

Total Lecture Hours-90**COURSE OUTCOME**

The students are able to,

1. Acquire enhanced knowledge on cell cycle, cell division and cell death mechanisms.
2. Illustrate the organization of cytoskeleton and importance of cell communication.
3. Describe the composition and importance of body fluids.
4. Understand the functions of important physiological systems including digestive and excretory systems.
5. Understand the physiology of neuromuscular system and its functions.
6. Identify and state the function of the various types of muscles

TEXT BOOK(S)

1. Cooper M. 2000. The cell molecular approach. 2nd Edition. ASM Press, Washington, USA.
2. Kim E. Barrett, Susan M. Barman, Heddwyn L. Brooks and Jason XJ. Yuan. 2019, Ganong's Review of Medical Physiology, 26th Edition. Mcgraw-Hill Publishers, New York.
3. Nitin Ashok John, Chatterjee CC. 2019. Human Physiology Volume – 1, 13th Edition. CBS Publishers, New Delhi.
4. Nitin Ashok John, Chatterjee CC. 2019. Human Physiology Volume – II, 13th Edition. CBS Publishers, New Delhi.
5. West ES, Todd WR, Mason HS. 2011. Textbook of Biochemistry, 4th Edition. Bruggen Oxford IBH Publishers, USA.

REFERENCE BOOK(S)

1. Ajoy Paul TB. 2018. Cell and Molecular Biology, 4th Edition. Books pvt ltd, Calcutta.
2. David L. Nelson and Michael Cox. 2021. Lehninger Principles of Biochemistry, 8th Edition. W.H.Freeman & Co Ltd., New York, USA.
3. Gerald Karp. 2013. Cell Biology, 7th Edition. John Wiley & Sons Publishers, United Kingdom.
4. Jain AK. 2019. Textbook of Physiology with Free QA Physiology (2 Volume Set), 8th Edition. Arya Medical (APC) Publishers, New Delhi.
5. Lodish. 2003. Molecular Cell Biology, 5th Edition. WH Freeman& Co Ltd., New York, USA.

6. Smith EL. Hill RL. Robert LI. Lefkowitz RJ. Philip H. Abraham W. 1983. Principles of Biochemistry: Mammalian Biochemistry, 7th Edition. McGraw-Hill Education Publishers, New York.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <http://www.ebooks-for-all.com/bookmarks/detail/Cell-Biology.html>
3. <https://ia801901.us.archive.org/26/items/KSembulingam..pdf>
4. <http://www.bio-nica.info/Biblioteca/Bolsover2004CellBiology.pdf>
5. <https://www.pdfdrive.com/biochemistry-books.html>



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: I -CP-I: Bio- Analytical Techniques Practical

Ins. Hrs. /Week: 6

Course Credit: 3

Course Code: 22PBC104P

EXPERIMENTS

1. Separation of amino acids, sugars and chloroplast pigments by Paper Chromatography.
2. Separation of Amino acids/Lipids by TLC
3. Isolation of mitochondria from cabbage.
4. Estimation of carbohydrate by Anthrone method
5. Estimation of proteins by Lowry's method.
6. Estimation of fat
7. Estimation of DNA by diphenylamine method
8. Estimation of RNA by orcinol method
9. Estimation of haemoglobin content
10. Determination of Blood group
11. Determination of Rh factor
12. Determination of Erythrocyte Sedimentation Rate (ESR)
13. To study different stages of mitosis by temporary preparation in onion root tip
14. To study different stages of meiosis by temporary preparation in onion flower buds/ grasshopper testes.
15. Enumeration of Red blood cells (RBC) – Demonstration
16. Enumeration of White blood cells (WBC) – Demonstration
17. Differential Leucocyte count – Demonstration
18. Demonstration of sodium and potassium by Flame photometry
19. Separation of proteins by SDS-PAGE – Demonstration.

Total Hours-90

COURSE OUTCOME

The students should be able to,

1. Perform Chromatographic techniques.
2. Analyze and report on experiments and observations in physiology of cell.
3. Perform Hematological parameters.
4. Understand the principles and procedure for electrophoretic techniques.
5. Acquire knowledge on the separation and estimation procedures for biomolecules.
6. Differentiate the stages of mitosis and meiosis.

TEXT BOOK(S)

1. Jayaraman J. 2011. Manuals in Biochemistry, 3rd Edition, New Age International Publishers, India
2. Palanivelu P. 2001. Laboratory manual for Analytical Biochemistry & separation Techniques, 6th Edition, MKUUniversity, Madurai.
3. Plummer T. 2001. Practical Biochemistry, 3rd Edition, McGraw Hill Publishing Company, New York, USA.
4. Sabari Ghosal, Anupama Sharma Avasthi. 2019. Fundamentals of Bioanalytical Techniques and Instrumentation, 2nd Edition, IK International Pvt. Ltd., New Delhi, India.
5. Bruce Alberts and Dennis Bray 2013, Essential Cell Biology. 4th Edition, Garland Science.
6. Cooper, G.M. and Hausman, RE. 2009. The Cell .A Molecular Approach. 5th Edition, Sunderland.
7. Ganesh M. K. & Shivashankara A. R., 2012, Laboratory Manual for Practical Biochemistry Jaypee publications, 2nd Edition.

REFERENCE BOOK(S)

1. Ed. Alan W. Gowenlock. 1998. Varley's Practical Clinical Biochemistry, 4th Edition, Heinemann Medical Books, London.
2. John F. Robyt, Bernard J. White. 1990. Biochemical Techniques: Theory and Practice, Illustrated, Waveland Press.
3. Sawhney SK, Randhir Singh. 2005. Introductory practical Biochemistry, 2nd Edition, Alpha Science International Limited, United Kingdom.
4. Sharma BK. 2000. Instrumental Methods of Chemical Analysis. 23rd Edition, Goel publications, Meerut.
5. Geoffrey M. Cooper and Robert. E. Hausman, 2009. The Cell: A Molecular Approach;, Sinauer Associates, 5th Edition, USA
6. Bruce Alberts, 2008. Molecular Biology of the cell: Garland Publishing, 5th Edition.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <http://www.chemguide.co.uk/analysis/chromatography/paper.html>.
3. <https://www.iitg.ac.in/biotech/MTechLabProtocols/Estimation%20of%20DNA%20by%20DPA.pdf>
4. <https://www.iitg.ac.in/biotech/MTechLabProtocols/SDS%20PAGE.pdf>.
5. https://www.khanacademy.org/science/ap-biology/heredity/meiosis-and-genetic-diversity/a/phases-of-meiosis_



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2022 – 2023)

DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: I-EC- I: Ecology and Environmental Sciences

Ins. Hrs. /Week: 6

Course Credit: 4

Course Code: 22PBCE1A

UNIT- I Fundamentals of Environmental Sciences (17 Hours)

Definitions, principles and scope. Structure and composition of spheres- atmosphere (air), hydrosphere, lithosphere and Biosphere. Abiotic and biotic environment and their interactions. Population ecology – Population characteristics, population growth curve, population regulation, life history strategies (r and K selection); concept of meta population demes and dispersal, interdemec extinctions, age structured populations.

UNIT-II: Environmental Biology (18 Hours)

Definition, community concept, Types and Interaction (Predation, Herbivory, Parasitism and Allelopathy), Biological invasions. Edge effect. Species diversity. Ecological Habitat and Niche, Ecosystem stability and services, Factors affecting Ecosystem.

UNIT-III: Ecosystem (17 Hours)

Ecological succession types, mechanisms, concept of climax. Structure and function of ecosystem (Deserts, Forests, Rangelands, Wetlands, Lotics, Lentics, Estuarine (Mangroves), Oceanics). Energy flow in ecosystems, energy flow models, food chains and webs, ecological pyramid: pyramid of number, biomass and energy, biogeochemical cycles.

UNIT-IV: Environmental Pollution and Control (19 Hours)

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, plastic waste - sources, consequence and management, major drivers of biodiversity change.

UNIT-V: Current Environmental Issues in India (19 Hours)

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 strategy (Project Tiger, Biosphere reserves). Global Environmental issues - biodiversity loss, climate change, ozone layer depletion, sea level rise, international efforts for Environmental Protection- current environmental issues in

India related to water resource projects (Narmada Dam, Tehri Dam, Almatti Dam, Kaveri and Mahanadi).

Total Lecture Hours-90

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. Aulay Mackenzine, Andy S. Ball. 1998. Instant Notes Ecology, 2nd Edition. CRC Press, Florida, USA.
2. Dash MC. 2013. Fundamentals of Ecology, 3rd Edition, TATA Mcgow Hill Publishing Company Limited, New Delhi, India.
3. Edward J. Kormondy. 1996. Concepts of Ecology, 4th Edition, Prentice Hall India Learning Private Limited, New Delhi, India.
4. Kumar HD. 2008. Modern concepts of Ecology, 8th Edition, Vikas Publishing House Pvt Ltd., New Delhi, India.
5. Singh JP, Singh SP, Gupta SR, Chand S. 2014. Ecology Environmental Science and Conservation, 4th Edition, S.Chand publishers, New Delhi, India.

REFERENCE BOOK(S)

1. Verma PS and Agarwal VK. 2005. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, 4th Edition, S. Chand Company Ltd, New Delhi, India.
2. Cunningham WP and Saigo BW. 2007. Environmental Science-A Global Concern, 8th Edition, McGraw Hill Publishers, New York.
3. Negi SS. 2008. A Hand Book of Environmental Science, Bishen Singh Mahindra pal publishing company, Uttarakhand, India.
4. Panday P. 2010. A Text Book of Environmental Pollution. 1st Edition, Narendra Publishing Company, New Delhi, India.
5. Kormondy EJ. 2000. Concepts of Ecology, 4th Edition, Prentice Hall of India, New Delhi.
6. William D. Bowman, 2020, Ecology, 5th Edition. Oxford University Press, USA.

E-RESOURCES

1. <https://sangu.ge/images/EssentialsofEcology.pdf>
2. <https://vulms.vu.edu.pk/Courses/ZOO507/Downloads/general-ecology.pdf>

3. <http://www.freebookcentre.net/biology-books-download/General-Ecology.html>
4. <https://www.cambridge.org/9780521588027>
5. [http:// www.pdfdrive.com > ecology-and-environment-books](http://www.pdfdrive.com/ecology-and-environment-books)



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: I- EC-I: Microbial Biochemistry

Ins. Hrs. /Week: 6

Course Credit: 4

Course Code: 22PBCE1B

UNIT-I: Introduction to Microbiology (16 Hours)

Scope and history of Microbiology. A brief introduction to major group of microorganisms- Bacteria, viruses, fungi, Protozoa, algae. Ultra structure of bacteria, Chemical composition of cell wall, Types of microscopy. Staining techniques-simple, differential and special staining techniques and negative staining-principle and procedure.

UNIT-II: Microbial Growth and Nutrition (19 Hours)

Nutritional types of microorganisms, nutritional requirements. Principles of microbial nutrition- chemoautotrophs, chemo-heterotrophs, photoautotrophs and photo-heterotrophs. Factors influencing the growth of microorganisms – temperature, pH, Osmotic pressure, moisture, radiations and different chemicals, Physiology of growth – Significance of various phases of growth. Growth measurements – batch, continuous and synchronous.

UNIT-III: Pathogenic and Beneficial Microbes (19 Hours)

A brief account of medically important bacteria. Retroviruses, Viroids, Prions and emerging viruses such as HIV, Avian and swine flu viruses. Medically important fungi and protozoans. Beneficial applications of microbes: Human Microflora, Pre and Probiotics, Industrially important microbes. Microbes and Health: Gut microbiota and diseases, approaches for engineering gut microbiota, therapeutic uses of gut microbiota, Bacteriophages in control of bacteria.

UNIT- IV: Metabolic diversity (18 Hours)

Energy from oxidation of inorganic electron donors; Iron oxidation; Methanotrophy and methylotrophy; Nitrate and Sulfate reduction; Acetogenesis; Methanogenesis; Fermentation-energetics and redox constraints; Anaerobic respiration; Chlorophylls and other pigments involved in microbial photosynthesis; Anoxygenic and oxygenic photosynthesis; Autotrophic CO₂ Fixation: Calvin cycle, Reverse Citric Acid cycle, Hydroxy-propionate cycle.

UNIT-V: Medical Microbiology (18 Hours)

Diseases of various organ systems: Causative agent, clinical symptoms, pathogenesis, mode of transmission, prevention and treatment of the following viral diseases (a) Respiratory diseases:

common cold, influenza, measles. (b) Neurological diseases: Dengue, Rabies (c) Liver diseases: Viral hepatitis, Immunodeficiency disease: - AIDS.

Total Lecture Hours- 90

COURSE OUTCOME

The students should be able to,

1. Understand the scope and relevance of Microbiology as a scientific discipline
2. Analyze the nutritional requirements of microorganisms and their uptake.
3. Elucidate the growth and growth factors of microorganisms.
4. Gain knowledge about microbial metabolic diversity. The interdisciplinary approach helps to apply the acquired knowledge in various fields.
5. Acquire knowledge on basics in microscopy, culture methods and staining techniques.

TEXT BOOK(S)

1. Chakroborty P. 2003. A Text book of Microbiology, 2nd Edition, New Central Book Agency (P) Ltd Publishers, New Delhi.
2. Kanika Sharma. 2011. Textbook of Microbiology – Tools and Techniques. 1st Edition, Ane Books Pvt. Ltd Publishers, New Delhi.
3. Madigan MT. and JM Martinko. 2006. Brock's Biology of Microorganisms, 11th Edition, Pearson Education Inc Publishers, London.
4. Rajan S. 2007. Medical Microbiology, 1st Edition, MJP Publishers, Chennai.
5. Rajan S. 2007. Parasitology, 1st Edition, SRS Publications, Chennai.

REFERENCE BOOK(S)

1. Alan J Cann. 2015. Principles of Molecular Virology. 6th Edition, Academic press, California.
2. Ann Giudici Fettner. 1990. The science of viruses. 2nd edition, Quill, William Marrow, New York.
3. Ananthanarayanan, R. and Jeyaram Paniker, C.K. 2013. Textbook of Microbiology. 9th Edition, University Press, Oxford, England.
4. Black, J.G. 2013. Microbiology: Principles and Explorations, 6th Edition, John Wiley and Sons, Inc Publishers, Hoboken, New Jersey.
5. David Greenwood, Mike Barer, Richard Slack and Will Irving. 2012. Medical Microbiology. A Guide to Microbial Infections: Pathogenesis, immunity, Laboratory investigation and Control, 18th Edition, Churchill Livingstone, London.

E-RESOURCES

1. <http://drs.cift.res.in/bitstream/handle/123456789/4559/Staining%20methods.pdf?sequence=1&isAllowed=y>
2. https://www.slideshare.net/shiningpearl18/haematoxylin-and-its-typesppt?next_slideshow=1
3. http://www.freebookcentre.net/medical_books_download/Medical-Microbiology.html

4. http://www.freebookcentre.net/medical_books_download/Medical-Microbiology-for-Graduate-Students.html
5. https://www.freebookcentre.net/medical_books_download/Microbiology-by-Angela-Echeverri.html
6. https://www.freebookcentre.net/medical_books_download/The-History-and-Scope-of-Microbiology.html



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: I -VAC-I – Biochemistry in Daily life
Course Credit: 2* Course Code: 22PBCVA11

UNIT –I: Introduction to Biochemistry

Biochemistry: Definition of life, different forms of life, microorganisms to human beings. Building blocks of life. Introduction to the common macro and micro constituents of unicellular and multi cellular organisms.

UNIT –II: Food and Nutrition

Importance of food for existence of life. Modes of nutrition in life forms –Comparable and contrasting features. Functional foods: Definition, development of functional foods, benefits and sources of functional foods in Indian diet. Effects of processing conditions and storage. Development of nutraceutical and functional foods.

UNIT –III: Enzymes

Introduction and essentiality to life forms. Use of enzyme in beverages- fruit juices, beer, wine, and distilleries; dairy, baking, oils and fats, plantation products, animal products. Malting and germination of grains – process, characteristics, nutritional benefits and uses. Use of enzymes in Domestic use products like detergents, Textiles and Leather industry.

UNIT –IV: Human Health and Disease

Nutrition (Health), definition, classification, food and nonfood sources. Nutraceuticals; use of nutraceuticals in traditional health sciences. Role of omega-3 fattyacids, carotenoids, dietary fiber, phytoestrogens; glucosinolates;organo-sulphur compounds in health and disease (prevention and control).

UNIT –IV: Prebiotics and Probiotics

Prebiotics and probiotics: Mechanics and usefulness ofprobiotics and prebiotics in gastrointestinal health and otherbenefits. Beneficiary microbes; prebiotic ingredients in foods;types of prebiotics and their effects on gut microbes.

COURSE OUTCOME

The students should be able to,

1. Acquire basic knowledge about Biochemistry

2. Understand the basic concepts in food, health, Disease
3. Demonstrate the usefulness and concepts of Prebiotics & Probiotics
4. Describe the types and application of enzymes.
5. Evaluate on food processing & fortification

TEXT BOOK(S)

1. Birn AE., Pillay Y & Holtz T. 2009. Textbook of international health: Global health in adynamic world, 3rd Edition, Oxford University Press Publishers, England.
2. Chakrabarty, Kaveri and Chakrabarty AS. 2019. Textbook of Nutrition in Health and Disease, 1st Edition, Springer Publishers, New York, USA.
3. Chatterjea MN and Rana Shinde. 2007. Textbook of Medical Biochemistry, 7th Edition, Jaypee Brothers Publishers, Chennai, Tamil Nadu.
4. Krishna Das KV. 2013. Clinical Medicine (A Textbook of Clinical Methods and Laboratory Investigations), 4th Edition, Jaypee Brothers Medical publishers, Chennai, Tamil Nadu.
5. Seyed Mohammad Nabavi, Grazia Donofrio and Seyed Fazel Nabavi. 2020. Nutrients and Nutraceuticals for Active & Healthy Ageing, 1st Edition, Springer Publishers, New York, USA.
6. Palmer T. and Bonner P. 2007. Enzymes: Biochemistry, Biotechnology, Clinical Chemistry, 2nd Edition, Horwood Publishers, United Kingdom.

REFERENCE BOOK(S)

1. Carl A. Burtis, Edward. Ashwood and David E. Bruns. 2011. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 5th Edition, Saunders Publishers, United States.
2. Kaplan A, Jack KE, Opheim B, Toivola B and Lyon AW. 1995. Clinical Chemistry Interpretation and techniques, 4th Edition, Williams and Wilkins Publishers, United States.
3. Simon Langley-Evans. 2015. Nutrition, health and disease: A lifespan approach, 2nd Edition, John Wiley & Sons Publishers, New Jersey, United States.
4. Vibha Rani, Umesh and Yadav. 2018. Functional Food and Human Health, 1st Edition, Springer Publishers, New York, USA.
5. William S. Hoffman. 1964. The Biochemistry of Clinical Medicine, 3rd Edition, Year Book Medical Publishers, Chennai, Tamil Nadu.

E RESOURCES

1. https://www.researchgate.net/publication/327247966_Chapter06_Carbohydrates-III_Regulation_of_Blood_Glucose_Diabetes_Mellitus
2. <https://www.slideshare.net/ImranIqbal7/metabolic-disorders-2019>
3. <https://www.slideshare.net/veerundh/veerendhar-nadh-38767743>
4. <https://drive.google.com/file/d/10C4EYN0Sv2LPI9ZzhoV->
5. <https://drive.google.com/file/d/1UyLEp6iXyKrqXuVwh->
6. <https://drive.google.com/file/d/1tghNWPyuqPiqK1R11ZzUrFwcoMiuoMa/>
7. <https://pharmacologyonline.silae.it/files/newsletter/2009/vol3/44.Jagdish.pdf>

SEMESTER-II



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-CC-IV: Enzymology

Ins. Hrs./Week: 6

Course Credit: 5

Course Code: 22PBC205

UNIT-I: Overview of Enzymes (18 Hours)

Enzymes - Definition, Scope, properties, structure and functions. Historical aspects of enzymology. Nomenclature and classification of enzymes, according to IUB-EC-1964. 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: Mechanism of Enzyme Action (19 Hours)

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, action of TPP, NAD/NADP, FMN, FAD, Coenzyme A, lipoic acid and biotin. Mechanism of enzymes action: mechanism of action of lysozyme, chymotrypsin and carboxypeptidase. Multienzymes system-Pyruvate dehydrogenase, and Fatty acid synthase complex.

UNIT- III: Enzyme Kinetics (19 Hours)

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, feedback inhibition.

UNIT- IV: Enzyme Catalysis (17 Hours)

Criteria of chemical reactions - Collision & transition state theories. 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; with a reference to LDH and CK.

UNIT- V: Enzyme Applications

(17 Hours)

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. Nonprotein enzymes - Abzymes and Ribozymes. Enzyme Engineering. Total Lecture Hours-75

Total Lecture Hours-90

COURSE OUTCOME

The students should be able to

1. Analyze the structure/function relationships in bio catalyzed reactions
2. Describe and use the equations of enzyme kinetics
3. Understand the mechanisms of enzyme catalysis.
4. Explore the use of enzymes in medicine, food, organic synthesis, genetics and other areas sectors that favor a wide reach for them.
5. Acquire knowledge about the catalytic mechanisms employed by the most well-characterized enzymes
6. Illustrate the mechanisms of enzyme regulations

TEXT BOOK(S)

1. Alan J. Barrett J. Fred Woessner, and Neil D. 2012. Handbook of Proteolytic Enzymes, 3rd Edition, Rawlings Publishers.
2. Jain JL. 2005. Fundamentals of biochemistry, 6th Edition, S.Chand Publishers, New Delhi.
3. Nicholas C. 1989. Fundamentals of Enzymology, 2nd Edition, Oxford Science Publishers,
4. Palmer T. and Bonner P. 2007. Enzymes: Biochemistry, Biotechnology, Clinical Chemistry, 2nd Edition, Horwood Publishers, United Kingdom.
5. Satyanarayana U. 2019. Fundamentals of Biochemistry, Allied & Books Pvt Ltd, Calcutta, India.

REFERENCE BOOK(S)

1. Dixon M. and Webb JF. 1979. Enzymes, 2nd Edition, Longman Publishers, London.
2. Marangoni, 2002, Enzyme kinetics. A modern approach, 1st Edition, John Wiley Publishers, United Kingdom.
3. Price and Stevens. 1999. Fundamentals of Enzymology, 3rd edition, Oxford University Press, New York.
4. Stryer I. 1988. Biochemistry, 2nd Edition, W.H. Freeman & Co., Publishers, New York.
5. Trevor Palmer, 1991. Understanding enzymes, 3rd Edition, Ellis-Horwood Limited Publishers, United Kingdom.
6. Voet D. and Voet JG. 1990. Biochemistry, 4th Edition, John Wiley & Sons Inc., Publishers, New York, USA.

7. White A. 1959. Principles of Biochemistry, 3rd Edition, McGraw Hill Book Co., Publishers, New York.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <https://www.chem.purdue.edu/courses/chm333/Spring%202013/Lectures/Spring%202013%20Lecture%2013-14.pdf>
3. <https://www.chem.purdue.edu/courses/chm333/Spring%202013/Lectures/Spring%202013%20Lecture%2015.pdf>
4. <https://www.chem.purdue.edu/courses/chm333/Spring%202013/Lectures/Spring%202013%20Lecture%2016-%2017.pdf>
5. https://www.rgpv.ac.in/campus/PY/enzymes_ppt.pdf.
6. <https://www.pdfdrive.com/biocatalysts-and-enzyme-technology-e183753676.html>
7. <https://www.pdfdrive.com/enzyme-kinetics-enzymes-e5167787.html>



**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-CC –V: Metabolism and Regulation

Ins. Hrs. /Week: 5

Course Credit: 5

Course Code: 22PBC206

UNIT-I: Bioenergetics

(13 Hours)

Free energy and entropy. Endergonic and exergonic reactions. 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 and ionophores. Malate/ glycerophosphate shuttle.

UNIT-II: Carbohydrate Metabolism

(17 Hours)

Glycolysis, and gluconeogenesis – pathway, key enzymes and co-ordinate regulation. Pyruvate dehydrogenase complex and the regulation through reversible covalent modification. The citric acid cycle – pathway, energetic and regulation. The pentose phosphate pathway. Glycogen metabolism – glycogenesis and glycogenolysis, Regulation of glycogen phosphorylase; glycogen synthase by effectors, covalent modification and hormones. Metabolism of fructose and Galactose.

UNIT-III: Lipid Metabolism

(17 Hours)

Biosynthesis and regulation of fatty acid and triacylglycerol; biosynthesis of phospholipids and cholesterol. Metabolism of triacylglycerol during stress. α , β and γ oxidation and regulation of fatty acids– Role of carnitine cycle in the regulation of β -oxidation. Ketogenesis and its control. Lipoprotein metabolism - exogenous and endogenous pathways. .

UNIT-IV: Metabolism of amino acids, purines and pyrimidines

(16 Hours)

Overview of biosynthesis of nonessential amino acids. Catabolism of amino acid– transamination, deamination, ammonia formation, the urea cycle and regulation of ureogenesis.. 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.

UNIT-V: Metabolic integration and hormonal regulation (12 Hours)

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

Total Lecture Hours-75

COURSE OUTCOME

The students should be able to,

1. Understand the fundamental energetic of biochemical processes.
2. Acquire the knowledge about the metabolisms and regulations of carbohydrate.
3. Describe the lipid metabolism and its regulation.
4. Comprehend the metabolic fates of amino acids, Purine and Pyrimidine nucleotides.
5. Explain how diet and hormonal signalling regulate metabolic pathways and acquire knowledge about metabolic profile of some important tissues.
6. Recall the key regulatory points in metabolic pathways.

TEXT BOOK(S)

1. Ajit Pandya. 2015. A Text book of Metabolism - Lipids, Proteins and Carbohydrates, Kindle Edition, Amazon Asia-Pacific Holdings Private Limited, Singapore.
2. Denise R Ferrier. 2013. Biochemistry (Lippincott's Illustrated Reviews), 6th Edition, Lippincott Williams and Wilkins Publishers, New York, USA.
3. Keith N Frayn and Rhys D. Evans. 2019. Human Metabolism A Regulatory Perspective, 4th Edition, John Wiley Publishers, United Kingdom.
4. Reginald H. Garrett, Charles M. Grisham. 2010. Biochemistry, 4th Edition, Mary Finch Publishers.
5. Robert Murray K, Darryl K, Granner A, Peter A. Mayes, and Victor W. Rodwell. 2012. Harper's Illustrated Biochemistry, 29th Edition, McGraw-Hill Medical Publishers, New York.
6. Voet D, and Voet JG. 2010. Biochemistry, 4th Edition, John Wiley & Sons, Inc. Publishers, New York.

REFERENCE BOOK(S)

1. Berg JM, Tymoczko JL, and Stryer L. 2012. Biochemistry, 7th Edition, Freeman and Company, New York.
2. David A Bender, Shauna MC Cunningham. 2021. Introduction to Nutrition and Metabolism, 6th Edition, CRC Press, Florida, USA.
3. David Nelson L and Michael Cox. 2021. Lehninger Principles of Biochemistry. 8th Edition, W.H.Freeman & Co Ltd., New York.
4. Sareen S Gropper, Jack L Smith, & Timothy P Carr. 2018. Advanced Nutrition and Human Metabolism, 7th Edition, Cenage Learning Publishers, USA

5. Victor Rodwell and David Bender. 2018. Harper's Illustrated Biochemistry, 31st Edition, Paperback – Illustrated, McGraw-Hill Education, New York. .

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-e164892141.html>
3. <https://www.pdfdrive.com/lippincotts-biochemistry-6th-edition-e41485405.html>
4. <https://www.pdfdrive.com/biochemistrystrayer-e25312085.html>
5. <https://www.pdfdrive.com/bioenergetics-and-metabolism-e38219817.html>
6. <https://www.pdfdrive.com/bioenergetics-and-metabolism-mitochondria-chloroplasts-peroxisomes-e50401113.html>
7. <https://www.pdfdrive.com/bioenergetics-and-metabolism-e48697954.html>



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-CC- IX: Molecular Biology
Ins. Hrs. /Week: 5 Course Credit: 5 Course Code: 22PBC207

UNIT-I: Introduction and Organization of Chromosome (14 Hours)

Terms and definitions – DNA is the Genetic Material: Griffith's Experiment, Avery, Hershey & Chase Experiment. RNA as the Genetic Material: Conrat & Singer Experiment with TMV – Central Dogma. Organization of prokaryotic genome: Bacterial genome, viral genome – types of RNA and their role.

Structural organization of eukaryotic chromosomes. Types and basic structure of chromosomes. Chromosomal Proteins – Histones and Protamines – nucleosomes – levels in the organization of Metaphase Chromosome. Special types of Chromosomes: Polytene and Lamp brush chromosomes. Duplication and segregation of Chromosomes.

UNIT-II: Transposons and Extra chromosomal DNA (15 Hours)

Discovery of IS elements, Transposons in Bacteria (Tn elements), Maize (Ac/Ds and Sp/Dsp elements), Drosophila (P elements) and Yeast (Ty elements). Transposition, Genetic and evolutionary significance of transposons.

Maternal Inheritance, Structure, gene contents and functions of Chloroplast and Mitochondrial DNA, theory of prokaryotic endosymbionts. Plasmids: Definition, Types, Structure, Properties, gene content. Use in rDNA technology.

UNIT-III: DNA replication and Recombination (14 Hours)

Models – Messelson and Stahl Experimental proof for Semi-conservative replication - Rules, requirements, problems and molecular mechanism of the replication of linear and circular (Rolling circle Model) DNA in prokaryotes and eukaryotes. DNA polymerases – structure and function. Replication of RNA – RNA and DNA mediated.

Recombination-Homologous and non-homologous recombination - Site specific recombinations & transposition of DNA.

UNIT-IV: Transcription and Translation (15 Hours)

RNA types (tRNA, mRNA, rRNA, Ribozyme, snRNA, hnRNA, RNAi, RNA-P and microRNA), structure and functions. Transcription mechanism in prokaryotes and eukaryotes – initiation, elongation and termination, Post transcriptional modifications. Antibiotic inhibitors of transcription.

Translation-Genetic code and its features. Wobbling hypothesis. Machinery, initiation, elongation and termination of translation in bacteria and eukaryotes. Translational proof reading, translational inhibitors, post-translational modifications, chaperones and protein targeting-translocation, heat shock proteins, glycosylation; SNAPs and SNAREs. Bacterial signal sequences. Mitochondrial, chloroplast and nuclear protein transport. Endocytosis – viral entry. Ubiquitin TAG protein destruction.

UNIT –V: Chromosomal changes and consequences

(17 Hours)

Changes in the chromosome number: euploidy and aneuploidy and related genetic disorders. Changes in the chromosome structure: addition, deletion, inversion and translocation and related genetic disorders.

Mutation-Definition, chemical basis and types. Mutagens: Physical, chemical and Biological. Mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal versus somatic mutants, insertional mutagenesis. DNA repair mechanism: thymine dimer, light activation, excision, recombinational, SOS and mismatch repair.

Total Lecture Hours 75

COURSE OUTCOME

The students should be able to

1. Recall the pioneering experiments involved in molecular biology
2. Predict the mechanisms concerned with the mobile genetic elements
3. Apply the isolation procedures of nucleic acids
4. Explain the mechanism of Prokaryotic replication, transcription and regulation.
5. Describe the mechanism of Eukaryotic replication, transcription and regulation.
6. Analyze the steps involved in the induction of transcription
7. Evaluate the cellular mechanism of Gene expression and regulation.
8. Enumerate the features of Genetic code and translation mechanism.
9. Evaluate the errors and correction mechanisms of informational molecules and synthesize the DNA molecules artificially

TEXT BOOK(S)

1. Ajay Paul. 2007. Textbook of Cell and Molecular Biology. Books and Allied, Kolkata
2. Cram, 2015, Text Book of Principles of Molecular Biology.
3. David Freifelder, 2008, Molecular Biology. 2nd Edition, Narosa Publications, NewDelhi.
4. David Freifelder, 2008. Molecular Biology. 2nd Edition, Narosa Publications. New Delhi.
5. Geoffrey Cooper, Robert E Harsman, 2004, The Cell- A Molecular Approach, 3rd Edition, ASM Press.
6. Molecular cell Biology. 5th Edition By Harvey Lodish, Arnold Berk, Chris A Kaser.

REFERENCE BOOK(S)

1. Lodish et.al. 2003, Molecular Cell Biology, 5th Edition, WH Freeman & Company.

2. De Robertis and De Robertis. 1990. Cell and Molecular Biology. Saunders, Philadelphia.
3. De Robertis and De Robertis, 2001, Cell and Molecular Biology, 8th Edition, 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 Edition, John Wiley & Sons, Inc, New York.
6. Cox, M., Michael., Nelson, L.D. 2008, Principles of Biochemistry, 5th Edition. 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.
13. Gerald Karp. 2008. Cell and Molecular Biology. 5th Edition. John Wiley and Sons, New York.
14. Lewin's. 2017. GENES XII. 12th Edition. Jones and Bartlett Publishers, Inc; Burlington, Massachusetts, USA.

E-RESOURCES

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2. <https://drive.google.com/file/d/1tghNWPyuqPiqK1Rl11ZzUrFwcoMiuoMa/view?usp=sharing>
3. https://drive.google.com/file/d/17_C3p_9TNDS2KRa5TqUelyNZQ6qQ5wS6/view?usp=sharing



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2022 – 2023)

DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-CP-II: Enzymes and Molecular Biology Practical

Ins. Hrs. /Week: 6

Course Credit: 3

Course Code: 22PBC208P

EXPERIMENTS

1. Preparation of buffers and measurement of pH
2. Verification of Beer-Lambert's law and determination of absorption co-efficient.
3. Separation of proteins by SDS-PAGE (Demonstration).
4. Estimation of proteins by Lowry / Bradford method.
5. Effect of pH, temperature and substrate concentration for Amylase and determination of V_{max} & K_m value.
6. Effect of pH, temperature and substrate concentration for Urease and determination of V_{max} & K_m value.
7. Effect of pH and temperature on Acid phosphatase activity
8. Effect of pH and temperature on enzyme activity of Alkaline phosphatase
9. Effect of inhibitor on the activity of any one enzyme.
10. Effect of activator on any one enzyme activity.
11. Isolation of Plasmid DNA.
12. Isolation of Genomic DNA.
13. Separation of DNA by agarose gel electrophoresis.
14. Estimation of DNA by Diphenylamine method.
15. Estimation of RNA by Orcinol method.

Total Hours-90

COURSE OUTCOME

The students should be able to,

1. Understand the knowledge on biochemical techniques, enzyme screening which help them to acquire experiential learning.
2. Describe the knowledge on molecular characterization of nucleicacids

TEXT BOOK(S)

1. Jayaraman J. 2011. Manuals in Biochemistry, 3rd Edition, New Age International Publishers, India
2. Marangani AG. 2003. Enzyme Kinetics – A modern Approach, 1st Edition, John Wiley & Sons Publishers, New York, USA.

3. Palanivelu P. 2001. Laboratory manual for Analytical Biochemistry and separation Techniques, 6th Edition, MKU University, Madurai.
4. Plummer T. 2001. Practical Biochemistry, 3rd Edition, McGraw Hill Publishing Company, New York, USA.
5. Sabari Ghosal, Anupama Sharma Avasthi. 2019. Fundamentals of Bioanalytical Techniques and Instrumentation, 2nd Edition, IK International Pvt. Ltd., New Delhi, India.
6. Deepak Som. 2018. Practical Manual of Molecular Biology, 2nd Edition. Kaav Publications, New Delhi.

REFERENCE BOOK(S)

1. Khalid Z. Masoodi, Sameena Maqbool Lone, 2021. Advanced methods in Molecular Biology and Biotechnology, 1st Edition, Academic Press, USA.
2. Chaitanya KV. 2013. Cell & Molecular Biology- A Lab manual. Kindle edition, Practice Hall India Learning Private Limited, New Delhi.
3. Alan W. Gowenlock. 1998. Varley's Practical Clinical Biochemistry, 4th Edition, Heinemann Medical Books, London.
4. John F. Robyt, Bernard J. White. 1990. Biochemical Techniques: Theory and Practice, Illustrated, Waveland Press.
5. Sawhney SK, Randhir Singh. 2005. Introductory practical Biochemistry, 2nd Edition, Alpha Science International Limited, United Kingdom.
6. Sharma BK. 2000. Instrumental Methods of Chemical Analysis. 23rd Edition, Goel publications, Meerut.
7. Wiley VCH, Weinheim. 2019. Practical Enzymology, 3rd Edition, Wiley-VCH Publishers, New York, USA.

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2. <http://www.chemguide.co.uk/analysis/chromatography/paper.html>.
3. <https://www.iitg.ac.in/biotech/MTechLabProtocols/Estimation%20of%20DNA%20by%20DPA.pdf>
4. <https://www.kau.edu.sa/Files/0016333/Subjects/Enzymology%20BIOC231.pdf>
5. <https://www.iitg.ac.in/biotech/MTechLabProtocols/SDS%20PAGE.pdf>.
6. <https://www.pdfdrive.com/biochemistry-books.html>
7. <https://www.sciencedirect.com/book/9780128244494/advanced-methods-in-molecular-biology-and-biotechnology>
8. <https://www.mdpi.com/1420-3049/23/2/463>
9. https://www.researchgate.net/publication/224870589_Agarose_Gel_Electrophoresis_for_the_Separation_of_DNA_Fragments
10. <https://www.kopykitab.com/A-Practical-Book-Of-Pharmacognosy-And-Phytochemistry-II>



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-EC- II: Developmental Biology

Ins. Hrs. /Week: 5

Course Credit: 4

Course Code: 22PBCE2A

UNIT- I: General Concept of Organisms Development (13 Hours)

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

UNIT-II: Gametogenesis, Fertilization & Early Development (17 Hours)

Fertilization, development and sex determination in humans: Gametogenesis - Sperm & Egg formation; ultra structure of sperm and ovum, Cell surface molecules in sperm – egg recognition. egg types, egg membrane. Embryo sac development. Double fertilization in plants. Fertilization, cleavage, morula, implantation, blastulation, gastrulation, formation of germ layers.

UNIT-III: Morphogenesis and Organogenesis in Animals (17 Hours)

Cell aggregation and differentiation in Dictyostelium; axis and pattern formation in Drosophila, amphibia and chick; organogenesis – vulva formation in Caenorhabditis elegans; Eye lens induction, limb development and regeneration in vertebrates; Differentiation of neurons. Post embryonic development – Metamorphosis, environmental regulation of normal development. Sex determination.

UNIT-IV: Morphogenesis and Organogenesis in Plants (13 Hours)

Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; Transition to flowering, floral meristems and floral development in Arabidopsis and Antirrhinum. Programmed cell death, aging and senescence.

UNIT-V: Impact of Environment and Evolution (15 Hours)

Medical implications of developmental biology - genetic disorders in human development, Teratogenesis: Teratogenic agents and their effects on embryonic development; stem cell therapy. Environmental regulation of animal development - Polyphenisms, plasticity and Learning.

Total Lecture Hours-75

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. Browder LW, Erickson CA and Jeffery WR.1991. Developmental Biology. 3rd Edition, Saunder College Publishing House, Philadelphia, USA.
2. Gilbert SF. 2010. Developmental Biology, 9th Edition. Sinauer Associates Inc. Massachusetts, USA.
3. Sarin C. 1990. Genetics. Tata McGraw–Hill Publishing Co. Ltd., New Delhi.
4. Sastry KV, Vineeta Shukla. 2018. Developmental Biology. 2nd Edition, Rastogi Publications, Meerut.
5. Strickberger, 2002. Genetics, 3rd Edition, Prentice Hall of India, New Delhi.

REFERENCE BOOK(S)

1. Alberts B. 2002. Developmental Biology. 3rd Edition. Garland Science, USA.
2. Balinsky, 2012. An Introduction to Embryology, 6th Edition, Cenage Learning India, Uttar Pradesh.
3. Brain K Hall, Wendy M Olson, 2006. Keywords and Concepts in Evolutionary Developmental Biology, New Edition. Hardward University Press, Cambridge,USA.
4. Diwan AP, Dhakad NK. 1996. Animal Regeneration, 3rd Edition, Anmol Publications Ltd, India.
5. Gilbert SF. 2010. Developmental Biology, 9th Edition, Sinauer Associates Inc. Massachusetts, USA.

E-RESOURCES

1. <https://www.freebookcentre.net/Biology/Developmental-Biology-Books.html>
2. <https://lib-ebooks.com/developmental-biology-12th-edition-pdf/>
3. <https://www.worldcat.org/title/developmental-biology/oclc/698642961>
4. <https://sites.google.com/a/indonesia-fb48a.web.app/yjuikuopoiukuy/-pdf-download-development-biology-by-scott-f-gilbert>
5. <http://www.freebookcentre.net/Biology/Plant-Biology-Books.html>



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-EC-II: Genetic Engineering

Ins. Hrs. /Week: 5

Course Credit: 4

Course Code: 22PBCE2B

UNIT – I: Introduction to Genetic engineering (15 Hours)

Isolation (Mechanical, cDNA, Shot gun) and purification of nucleic acid, PCR; Enzymes in molecular biology – restriction endonuclease, ligases, reverse transcriptase, nucleases, polymerase, alkaline phosphatase, terminal transferase, T4 polynucleotide kinase; linker, adaptors & homopolymers.

UNIT – II: Expression cassette (15 Hours)

Promoters (constitutive, inducible, tissue specific), terminators, reporters, markers (antibiotic resistant, herbicide resistant, antimetabolite), Vectors in gene cloning – Plasmids (pBR322, pUC), Bacteriophages (Phage λ , M13), cosmids, phagemids, yeast plasmid vector, viral vectors (adenovirus, adeno associated virus, baculo virus, herpes virus, retrovirus, cauliflower mosaic virus, tobacco mosaic virus, potato virus X), artificial chromosome (BAC, YAC, HAC), shuttle vector, Expression vector.

UNIT – III: Gene transfer methods (15 Hours)

Transformation – physical method (electroporation, micro-injection, particle bombardment, liposome mediated transfer), chemical method (PEG mediated, DEAE Dextran mediated, CaPO₄ mediated gene transfer), Biological method (Agrobacterium mediated gene transfer). Expression systems – prokaryotes (Bacteria) and eukaryotes (yeast, mammalian and, insect cell lines)

UNIT – IV: Screening and selection methods (15 Hours)

Insertional inactivation, blue-white selection, colony - in situ hybridization, in vitro selection, in vitro translation, radioactive antibody test, immunological techniques, DNA labelling, dot blot hybridization, Molecular beacons. Gene Silencing, RNA interference, antisense therapy, gene knockout. Blotting techniques – southern, northern, western and south-western.

UNIT – V: Molecular Techniques (15 Hours)

RFLP, RAPD, AFLP, DNA Finger printing, DNA Foot printing, Microarray (DNA & Non-DNA). Libraries - Genomic library; C-DNA library & its types; BAC library; YAC library; Methyl filtration libraries; COT fractionation based libraries. Bioethics & Biosafety in genetic engineering; IPR & Patenting.

Total Lecture Hours-75

COURSE OUTCOME

The students should be able to

1. Remember the various underlying principles of genetic engineering and enzymes concerned with it
2. Understand the methodologies of gene transfer
3. Apply the analytical procedures involving DNA
4. Analyze the uptake of genes following screening procedures
5. Evaluate the methods of recombinant selection and construct gene cassettes and vectors

TEXT BOOK(S)

1. Dubey RC. 2014. Book on Biotechnology, 5th Edition, S. Chand and company Publishers, New Delhi.
2. Jognand SN. 2006. Gene Biotechnology, 2nd Edition, Himalaya Publishing House, Bengaluru, Karnataka.
2. Singh BD. 2007. Biotechnology, 3rd Edition, Kalyani Publishers, Chennai, Tamil Nadu.
3. Tyagi ID. 2005. Biotechnology and Genetic Engineering, 1st Edition, Jain Brothers Publishers, Bengaluru, Karnataka.
4. Verma PS. and Agarwal VK. 2009. Genetic Engineering, 1st Edition, S. Chand Publishers, New Delhi.
6. WulfCrueger. 2016. Biotechnology: A Textbook of industrial microbiology, 2nd Edition, CBS Publishers, New Delhi, India.
5. Glick R. and J. J. Pasternak. 2002. Molecular Biotechnology, 3rd Edition. ASM Press, Washington, USA.
6. Old R.W and S.B. Primrose. 1989. Principles of gene manipulation, 4th Edition. Blackwell Scientific Publications, London.

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.
6. David M Glove. 1984. Gene cloning - The mechanisms of DNA manipulations. Chapman and Hall, New York.
7. Ernst L Winnacker. 2002. From genes to clones - Introduction to gene technology. VCR Pub., Weinheim.
8. James D Watson. et al. 1992. Recombinant DNA. WH freeman and Co., NY

E-RESOURCES

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2. https://drive.google.com/file/d/17_C3p_9TNDS2KRa5TqUelyNZQ6qQ5wS6/view?usp=sharing
3. <https://www.mooc-list.com/tags/genetics>
4. <https://www.mooc-list.com/tags/genetically-modified-organisms>
5. <https://ncert.nic.in/ncerts/l/lebo105.pdf>
6. <https://www.pdfdrive.com/an-introduction-to-genetic-engineering-e40034206.html>
7. <https://www.pdfdrive.com/genetic-engineering-e33644320.html>



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: II-EDC- I: Herbal Technology

Ins. Hrs. /Week: 3

Course Credit: 2

Course Code: 22PBCED1A

UNIT-I: Introduction to Herbal medicines (9 Hours)

history and scope - definition of medical terms - role of medicinal plants in Indian systems of medicine; Ayurveda, Yoga, Siddha, Unani and Homeo. Cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants.

UNIT-II: Pharmacognosy (8 Hours)

Systematic position, medicinal uses of the herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka. Drug Formulations Types, Advantages and Disadvantages. Packing Materials.

UNIT-III: Phytochemistry (9 Hours)

active principles and methods of their testing - identification and utilization of the medicinal herbs; Catharanthus roseus (cardiotonic), Withania somnifera (drugs acting on nervous system), Clerodendron phlomoides (anti-rheumatic) and Centella asiatica (memory booster).

UNIT -IV: Analytical Pharmacognosy (10 Hours)

Drug adulteration - types, methods of drug evaluation – Biological testing of herbal drugs - screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids and phenolic compounds).

UNIT -V: Conservation of herbs (9 Hours)

Medicinal plant banks micro propagation of important species (Withania somnifera, neem and tulsi) - Herbal foods in weight management, diabetes mellitus and hypertension. Future of Pharmacognosy.

Total Lecture Hours-45

COURSE OUTCOME

The students should be able to

1. Describe the medicinal value of plants
2. Outline the medicinally used traditional herbs

3. Apply the various methods involved in preservation of medicinal plants and conservation of rare plants
4. Investigate the phytochemical reactions of secondary metabolites
5. Evaluate secondary metabolites and prepare therapeutic formulations

TEXT BOOK(S)

1. Glossary of Indian medicinal plants, R.N. Chopra, S.L. Nayar and I.C. Chopra, 1956. C.S.I.R, New Delhi.
2. The indigenous drugs of India, Kanny, Lall, Dey and Raj Bahadur, 1984. International Book Distributors.
3. Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.
4. Ayurvedic drugs and their plant source. V.V. Sivarajan and Balachandran Indra 1994. Oxford IBH publishing Co.
5. Ayurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1998. Banarsidass, Delhi. 4. Principles of Ayurveda, Anne Green, 2000. Thomsons, London.

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. Panda, H. 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, 1st Edition, eastern publisher, New Delhi: 1996.
6. Pulok K Mukarjee, Quality control of herbal drugs, 1st edition, Business horizons
7. Kokate, C.K., Purohit, Gokhlae, 1996, Text book of Pharmacognosy, 4th Edition, Nirali Prakashan,
8. Rangare. Text book of Pharmacognosy and Phytochemistry.

E-RESOURCES:

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <http://ww8.discoverherbs.com/>
3. <https://www.intechopen.com/chapters/62180>
4. <https://www.ustm.ac.in/bsc-herbal-science/>

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DEPARTMENT OF BIOCHEMISTRY

Semester: II-EDC-I: General Biochemistry and Nutrition

Ins. Hrs./Week: 3

Course Credit: 2

Course Code: 22PBCED1B

UNIT-I: Carbohydrates

(9 Hours)

Structure of atoms, molecules and chemical bonds. Carbohydrates: Definition, classification, structure, properties and functions. Definition, structure, properties and functions of Monosaccharide- glucose, fructose and galactose; Disaccharides- sucrose, maltose and lactose; Polysaccharides-Glycogen, starch and hyaluronic acid.

UNIT-II: Proteins

(9 Hours)

Definition, classification, structure, properties and functions of amino acids and Proteins. Structure of peptide bond, organizational levels of protein structure- Primary, secondary, supersecondary, tertiary and quaternary structure. Forces stabilizing protein structure- Vander waals, electrostatic, hydrogen, Hydrophobic interactions.

UNIT-III: Lipids

(9 Hours)

Fatty acids- Definition, nomenclature, classification, properties and biological significance. Lipids- Definition, classification and biological significance of lipids. Simple lipids- Fats and oils; Compound lipids- phospholipids, sphingolipids, glycolipids; Derived lipids-Steroids.

UNIT-IV: Vitamins

(9 Hours)

Source, classification, structure, daily requirement, deficiency manifestation and biological significances of fat soluble vitamins - A, D, E, K and water soluble vitamins-ascorbic acid, thiamine, riboflavin, pantothenic acid, niacin, pyridoxine, biotin, folic acid and cyanocobalamin.

UNIT-V: Nutrition

(9 Hours)

Introduction, classification, calorific value of foods, Bomb Calorimeter, Respiratory Quotient, determination of RQ, RQ for carbohydrate, protein, fats and mixed diets, utilization of energy, Basal Metabolic Rate (BMR)-measurement, normal values, factors affecting BMR, significance.

Total Lecture Hours-45

COURSE OUTCOME

The students should be able to,

1. Describe about the properties, classification and functions of carbohydrates

2. Acquire the knowledge about properties, classification and significance the proteins
3. Explain the importance of fatty acids and lipids
4. Understand the significance of water soluble and fat soluble vitamin
5. Summarize the nutrition with reference to food and energy requirement

TEXT BOOK(S)

1. Ferrier DR. 2013. Lippincott's Illustrated Reviews: Biochemistry, 5th Edition, Lippincott Williams & Wilkins, Baltimore.
2. Insel P., RE. Turner, D. Ross. 2007. Nutrition, 3rd Edition, Jones & Bartlett Publishers, Burlington, Massachusetts.
3. Jain JL, Sunjay Jain and Nitin Jain. 2018. Fundamentals of Biochemistry, 7th Edition, Chand Publishers, New Delhi.
4. Martha H. and A. Marie. 2012. Biochemical, Physiological, and Molecular Aspects of Human Nutrition, 3rd Edition, Chand Publishers, New Delhi.
5. Vasudevan DM. 2018. Biochemistry, 9th Edition, Jaypee Brothers Medical Publishers, Chennai, Tamil Nadu.

REFERENCE BOOK(S)

1. Bender DA, Botham KM, Kennelly PJ, Rodwell VW and Weil PA. 2015. Harper's Illustrated Biochemistry, 30th Edition, McGraw-Hill publishers, New York.
2. Berg JM, Tymoczko JL, Gatto GJ and Stryer L. 2015. Biochemistry, 8th Edition, WH Freeman & Co., New York, USA.
3. Bowman and Robert M. 2006. Present Knowledge in Nutrition, 9th Edition, International Life Sciences Inst. Press, Washington.
4. Indrani TK. 2003. Nursing Manual of Nutrition and Therapeutic Diet, 1st Edition, Jaypee Brothers medical publishers (P) Ltd., Chennai, Tamil Nadu.
5. Kusum Gupta (L. C.Guple, Abhishek Gupta). 2003. Food and Nutrition Facts and Figures, 5th Edition, Jaypee brothers Medical publications (P) Ltd., New Delhi, India.
6. Shubhangi Joshi. 2002. Nutrition and Dietetics, 2nd Edition, Tata McGraw-Hill publishers, New Delhi.
7. Swaminathan M. 2004. Handbook of Food and Nutrition, 2nd Edition, The Bangalore printing and publishing Co.Ltd. (Bangalore press), Bangalore, Karnataka.
8. Voet D, Voet JG and Pratt CW. 2015. Fundamentals of Biochemistry, 4th Edition. John Wiley & Sons, New York, USA.

E-RESOURCES

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2. <https://www.pdfdrive.com/biochemistry-books.html>
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4. <https://drive.google.com/file/d/1UyLEp6iXyKrqXuVwh->
5. <https://drive.google.com/file/d/1tghNWPyuqPiqK1R111ZzUrFwcoMiuoMa/>

SEMESTER-III



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: III-CC- VII: Immunology

Ins. Hrs. /Week: 6

Course Credit: 5

Course Code: 23PBC309

UNIT-I: Basics of Immunology and Immune System (19 Hours)

Elements of Immunology. Definition, Types - Innate immunity- 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 – Stem cell- 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 (17 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 (18 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 (19 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

(17 Hours)

Immunization practices- active and passive immunization. Vaccines- killed, attenuated-toxoids. Recombinant vector vaccines- DNA vaccines, synthetic peptide vaccines- anti idiotypic vaccines. 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. Immunodiffusion and Immunoelectrophoresis. Principle and applications of RIA, ELISA and Fluorescent Antibody techniques.

Total Lecture Hours-90

COURSE OUTCOME

The students are able to,

1. Demonstrate the basic knowledge of immunological processes at a cellular level, compare and contrast the key mechanisms and cellular players of innate, adaptive immunity and how they relate
2. Summarize central immunological principles, concepts and the mechanisms of protection against infectious agents
3. Outline key events and cellular players in antigen presentation, and how the nature of the antigen will shape resulting effector responses
4. Elucidate the genetic basis for immunological diversity and the generation of adaptive immune responses and understand all aspects of important techniques used for the study of immunological reaction.
5. Comprehend and explain the basis of immune regulation and explain the basis of allergy, allergic diseases.

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



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2022 – 2023)

DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: III-CC- VIII: Clinical Biochemistry

Ins. Hrs. /Week: 5

Course Credit: 5

Course Code: 23PBC310

UNIT- I: Disorder of Carbohydrate and Lipid Metabolism (16 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 (14 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 (16 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 Disorders (14 Hours)

Causes, consequences, biochemical findings, treatment in glomerulonephritis, renal failure nephrotic syndrome and 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. Normal and abnormal constituents of urine. Clinical enzymology - Serum enzymes and isoenzymes in health and disease – Transaminases (AST, ALT) acid. Alkaline phosphatases, amylase, LDH and CK.

UNIT- V: Oncology (15 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-75

COURSE OUTCOME

The students are able to,

1. Discuss the intensive knowledge related to life style diseases
2. Explain the clinical laboratory test for liver, gastrointestinal and kidney diseases.
3. Diagnose clinical disorder by estimating biomarkers
4. Obtain in depth idea on oncologic aspects
5. Acquire clinical knowledge on metabolic disorders.

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](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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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: III-CC- IX: Research Methodology

Ins. Hrs. / Week: 5

Course Credit: 5

Course Code: 23PBC311

UNIT- I: Research Ethics

(18 Hours)

Philosophy- definition, nature, scope and concept. Ethics- definition, moral philosophy, nature of moral judgments and reactions. Ethics with respect to science and research - Scientific misconducts- falsification, fabrication, and plagiarism- Use of plagiarism software- Turnitin, Urkund and other open source software tools. Redundant publications- duplicate and overlapping publications. Publication ethics- definition and importance. Publication misconduct- definition, concept, problems that lead to unethical behavior, types, violation of publication ethics, authorship and contributor ship. Software tool to identify predatory publications developed by SPPU. Subject specific ethical issues- authorship, Conflicts of interest.

UNIT-II: Research

(16 Hours)

Research- Definition, importance and characteristics. Research problems- Definition, selection and sources of research problems. References in research – Books, Journals and Internet Sites. Scientific Writing- Definition and kinds of scientific documents – research paper, review paper, book reviews, thesis, conference and project reports. Components of a research paper. Preparation and submission of research project proposals to funding agencies. Selection of journals for publication- Impact factor– Citation index and H index, Thesis writing- Components.

UNIT-III: Data Presentation

(12 Hours)

Data- Definition, source, types and collection, Primary and secondary data. Classification- chronological, alphabetical, geographical, qualitative and quantitative classification. Frequency distribution. Tabulation of data-components, rules and classifications. Diagrammatic presentation of data- Simple Bar, Multiple Bar, Component Bar, Percentage Bar, Pie chart, Pictogram, Cartograms. Graphical presentation of data-rules and classification.

UNIT-IV: Data Processing

(15 Hours)

Measures of central tendency- Definition, arithmetic mean—Direct and shortcut method; median-individual data, discrete series, continuous series; mode-grouping table and analysing table method. Measures of Dispersion - quartile deviation, mean deviation, standard deviation, Coefficient of variation. Correlation-types, Karl Pearson coefficient of correlation and Regression—Rank correlation coefficient. Regression analysis.

UNIT-V: Data Analysis**(14 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- 'F' test. Chi square test and goodness of fit.

Total Lecture Hours-75**COURSE OUTCOME**

The students are able to,

1. Acquire awareness of ethical aspects on research and development including plagiarism issues and equal opportunities/equal treatment
2. Develop skills in identification of research problem.
3. Develop the ability to apply the methods while working on a research project work and appreciate the technique of result analysis, interpretation and writing the report
4. Discuss the methods of processing of data in research studies, classify and explain the various methods of central tendency and dispersion, determine the measures of asymmetry in research
5. Explain the basic concepts in testing of hypothesis, types of errors, steps and limitations of hypothesis testing

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. 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](https://www.westga.edu/academics/research/vrc/assets/docs/tests%20of%20significance%20notes.pdf)

V. Immunology

1. Haemagglutination reaction- Blood Grouping and Rh typing
2. Widal test - rapid slide test for typhoid
3. VDRL test - test for syphilis
4. Latex agglutination test for rheumatoid factor and Pregnancy
5. Immunoelectrophoresis
6. Skin Prick Test
7. Radial Immunodiffusion

VI. Internship-Visit to hospitals

Total Hours-90

COURSE OUTCOME

The students are able to,

1. Explain the clinical significance of the laboratory tests
2. Perform the hematology based analysis
3. Acquire knowledge in collection of blood and urine samples and preservation for laboratory analysis
4. Analyze the biochemical parameters in blood quantitatively
5. Analyze the biochemical parameters in urine quantitatively and qualitatively
6. Apply important techniques used for the study of immunological reaction.
7. 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.
6. Robert R. Rich. 2020. Clinical Immunology- Principles and Practice, 5th Edition, Elsevier Publishers, India.

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.
 6. Ashim K. Chakravarty. 2016. Immunology and Immunotechnology, 1st Edition, Oxford Publishers, England.

E-RESOURCES

1. <https://www.elsevier.com/journals/clinical-biochemistry/0009-9120/guide-for-authors>
2. <http://rajswashya.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>
7. <https://www.cell.com/immunity/home>



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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DEPARTMENT OF BIOCHEMISTRY

M.Sc., BIOCHEMISTRY

Semester: III-EC- III: Plant Biochemistry

Ins. Hrs. /Week: 5

Course Credit: 4

Course Code: 23PBCE3A

UNIT-I: Plant-Water Relationship (15 Hours)

Structure and properties and significance of water - osmotic and non-osmotic uptake of water. Ascent of sap-cohesion theory: root pressure, transpiration, physiology of stomatal action, Translocation of solutes and assimilates. Mass flow, Membrane permeability mineral uptake: Passive and active. Role of essential elements; Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps.

UNIT-II: Photosynthesis (15 Hours)

Absorption spectrum, Action spectrum, role of pigments, enhancement effect, photosystems I & II, Photo phosphorylation, Carbon Assimilation: Calvin cycle, Hatch & Slack pathway, CAM pathway. Photorespiration. Respiration-Aerobic and anaerobic. Stages of respiration- Glycolysis, Pyruvate oxidation, Krebs's Cycle and oxidative phosphorylation, energetics of respiration.

UNIT-III: Plant Nutrition (15 Hours)

Essential Nutrients for Plant Growth: Nutrient functions and deficiency symptoms-Nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, boron, copper, chlorine, iron, manganese, molybdenum and zinc. Effects of toxicity and deficiency, Nitrogen cycle-nitrogen fixation – symbiotic and a symbiotic nitrogen fixation – nitrogenase, nitrate assimilation, sulphur metabolism, sulphate as a mineral nutrient, sulphate assimilation, phosphorus cycle and potassium cycle.

UNIT-IV: Plant Growth Regulatory Substances (16 Hours)

Plant growth regulators-Introduction and classification. Auxins, gibberellins, cytokinins, ethylene and abscissic acid - their chemical nature, physiological effects and function. Role of hormones in flowering, senescence and abscission- Secondary metabolites – alkaloids, flavonoids, terpenoids and anthocyanins.

UNIT-V: Plant Physiology and Reproduction (14 Hours)

Physiology of reproduction in plants-vegetative propagation, sexual reproduction, asexual reproduction and physiological aspects of sex determination in plants.physiology of germination / dormancy / photoperiodism / vernalization. Plant tissue culture (an elementary treatment), Biochemistry of disease resistance in plants.

Total Lecture Hours: 75

COURSE OUTCOME

The students are able to,

1. Gain knowledge of the physiology of plant with reference to water relationships of plants.
2. Acquire the knowledge about mechanism of photosynthesis.
3. Know the functions and deficiency symptoms of some important plant nutrients.
4. Explain plant growth and plant growth regulatory substances.
5. Understand the physiology and mechanism of plant reproduction.

TEXT BOOK(S)

1. Srivastava HS and Shankar N. 2008. Plant physiology and Biochemistry, 1st Edition, 7th Reprint (1st Edition): 2018-19, Rastogi Publications, Meerut.
2. Pandey SN and Sinha BK. 2008. Plant Physiology, 4th Edition, VIKAS publishing House Pvt Ltd, New Delhi.
3. Buchanan B, Gruissem W, and Jones R. 2015. Biochemistry and Molecular Biology of Plants, 2nd Edition, Wiley-Blackwell Publishers, USA.
4. Lincoln Taiz and Eduardo Zeiger. 2012. Plant Physiology, 5th Edition, Amazon press, Washington.
5. Goodwin TW and Mercer EI. 1983. Introduction of Plant Biochemistry 2nd Edition, Pergamon Press, Oxford.
6. Harbone JB. 1997. Plant Biochemistry, 5th Edition. Harcourt Asia (P) Ltd., India and Academic Press, Singapore.

REFERENCE BOOK(S)

1. Taiz L and Zeiger E. 2010. Plant Physiology. 5th Edition. Sinauer Associates, Inc. Publishers, USA.
2. Kumar A and Purohit S. 2003. Plant Physiology- Fundamentals and Applications, 2nd Edition, Agrobios Publishers, India.
3. Hopkins W Gad NPA. Hüner. 2009. Introduction to Plant Physiology, 4th Edition, John Wiley & Sons Publishers, USA.
4. Steward FC. 1964. Plants at Work (A summary of Plant Physiology), 22nd Edition, Addison- Wesley Publishing Co., Inc. Reading, Massachusetts, Palo alto, London.
5. Lawlor DW. 1989. Photosynthesis, 3rd Edition, metabolism, Control & Physiology, ELBS/Longmans, London.
6. Plummer D. 1989. Biochemistry—the Chemistry of life, 1st Edition, McGraw Hill Book Co., London, New York. New Delhi, Paris, Singapore, Tokyo.
7. Dey PM and Harborne JB. 2000. Plant Biochemistry, 1st Edition, Harcourt Asia (P) Ltd., India & Academic Press, Singapore.

E-RESOURCES

1. <http://www.esalq.usp.br/lepse/imgs/conteudo/Plant-Physiology-by-Vince-Ordog.pdf>
2. <https://ncert.nic.in/textbook/pdf/kebo112.pdf>
3. <https://www.ctahr.hawaii.edu/oc/freepubs/pdf/pnm3.pdf>
4. <https://ncert.nic.in/textbook/pdf/kebo113.pdf>
5. <https://byjus.com/biology/plant-growth-regulators/>
6. <https://icar.org.in/files/mAgMicro.pdfv>



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI- 614016
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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: III-EC- III: Bioethics and IPR

Ins. Hrs. /Week: 5

Course Credit: 4

Course Code: 23PBCE3B

UNIT – I: Bioethics

(15 Hours)

Principles of bioethics: Legality, morality and ethics, autonomy, human rights, beneficence, privacy, justice, equity etc. The expanding scope of ethics from biomedical practice to biotechnology, bioethics vs. business ethics, ethical dimensions of IPR, technology transfer and other global biotech issues.

UNIT- II: Bio- Safety

(15 Hours)

Definition of bio-safety, Biotechnology and bio-safety concerns at the level of individuals, institutions, society, region, country and world. Bio-safety in laboratory: laboratory associated infection and other hazards, assessment of biological hazards and level of bio safety. Bio safety regulation: bio safety regulations in handling of recombinant DNA products and process in industry and in institutions.

UNIT- III: Introduction to Intellectual Property

(14 Hours)

Definition and types of IP: Patents, Trademarks, Copyright & Related Rights, Industrial Designs, Geographical Indications, protection of plant varieties and farmer's right. IP Legislations in India, IP Offices in India, Relevancy of IP to Biotechnology, Protection of GMOs.

UNIT- IV: Concept and basics of patents

(15 Hours)

Definition- patent, invention, novelty, patentability, rights of patentee, patent agent, Patentable inventions and non patentable inventions, types of patent applications-provisional, ordinary, conventional, PCT, Patents of addition. Infringement of patents.

UNIT-V: Filing of patent applications

(16 Hours)

Procedure for obtaining patent: specifications-provisional-complete, submission and examination of application, opposition, grant and sealing of patents, forms and fees. Patent searching: Prior art, searching databases; IPO-inPASS, USPTO, esp@cenet (EPO), WIPO-PATENTSCOPE.

Total Lecture Hours-75

COURSE OUTCOME:

The students are able to,

1. Understand the basic principle and expanding scope of Bioethics.
2. Acquire knowledge regarding the importance of Bio safety concerns and Bio safety regulations.
3. Understand the basics and importance of various Intellectual Property Rights.
4. Analyse the concept behind patents, patentability, patent applications and infringement of patents.
5. Acquire the knowledge in drafting patent specifications and acquaint with the procedures for filing patent application.
6. Develop the skills in searching the data bases for patent prior art.

TEXT BOOKS:

1. Principles of cloning, Jose Cibelli, Robert P. lanza, Keith H. S . Campbell, Michael D. West, Academic Press, 2002 Glimpses of Biodiversity – B. Bltosetti
2. Ethics in engineering, Martin. M.W. and Schinzinger. R. III Edition, Tata McGraw- Hill, New Delhi. 2003.
3. Safety Assessment by Thomas, J.A., Fuch, R.L. (2002), Academic Press.
4. Biological safety Principles and practices) by Fleming, D.A., Hunt, D.L.,(2000). ASM Press.
5. Biotechnology - A comprehensive treatise. Legal economic and ethical dimensions VCH. Bioethics by Ben Mephram, Oxford University Press, 2005.
6. Bioethics & Biosafety by R Rallapalli & Geetha Bali, APH Publication, 2007.
7. Bioethics & Biosaftey By Sateesh Mk (2008), Ik Publishers.
8. Biosafety And Bioethics Rajmohan Joshi Publishers.

REFERENCE BOOKS

1. Beier, F.K., Crespi, R.S. and Straus, T. Biotechnology and Patent protection Oxford and IBH Publishing Co. New Delhi, 2007.
2. Intellectual property rights and Bio-Technology (Biosafety and Bioethics), Anupam Singh, Ashwani Singh, NPH, New Delhi, 2012.
3. Sasson A, Biotechnologies and Development, UNESCO Publications..1988
4. Regulatory Framework for GMOs in India, Ministry of Environment and Forest, Government of India, New Delhi, 2006 .
5. Cartagena Protocol on Biosafety, Ministry of Environment and Forest, Government of India, New Delhi, 2006.

E-RESOURCES

1. <http://books.cambridge.org/0521384737.htm>
2. <http://online.sfsu.edu/%7Eroner/GEessays/gedanger.htm>
3. http://www.actahort.org/members/showpdf?booknrarnr=447_125
4. <http://www.cordis.lu/elsa/src/about.htm>
5. <http://www.csmt.ewu.edu/csmt/chem/jcorkill/bioch480/bioLN98.html>
6. <http://www.accessexcellence.org/AE/AEPC/BE02/ethics/ethintro.html>



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: III-EDC- II: Pharmaceutics

Ins. Hrs. /Week: 3

Course Credit: 2

Course Code: 23PBCED2A

UNIT-I: General Principles of Pharmacology (09 Hours)

History of Drugs, Nature and Sources of drugs, Classification of drugs, Dosage forms of the drugs, Subdivision of pharmacology, routes of drug administration, absorption and distribution of drugs, factors influencing drug absorption and elimination of drugs.

UNIT- II: Drug metabolism (09 Hours)

Definition – First Pass Metabolism, Chemical Pathways of Drug Biotransformation - Phase I reactions (Oxidation, Reduction, Hydrolysis) - Phase II reactions (Conjugation). Drug metabolising enzymes – Microsomal and Non microsomal enzymes.

UNIT- III: Common Drugs in physiological period (09 Hours)

Drug Use During Infancy and in the Elderly (Pediatrics & Geriatrics), Drug use during Pregnancy and Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepirac, Diclofenac, Ketorolac, Ibuprofen, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

UNIT – IV: Drugs acting on various systems I (09 Hours)

Cardiovascular Disorders - Hypertension, Congestive Heart Failure, Angina, Acute Myocardial Infarction. CNS-sedative- hypnotic, GI tract drugs for peptic ulcer, diarrhoea and constipation.

UNIT-V: Drugs acting on various systems II (09 Hours)

Endocrine Disorders-Diabetes mellitus and Thyroid Disorders. Hematopoietic Disorders-Anemias, Joint and Connective Tissue Disorders-Rheumatic Diseases, Gout and Hyperuricemia

Total Lecture Hours: 45

COURSE OUTCOME

The students are able to,

1. Learn the history, source, nature and classification of drugs and drug administration.
2. Acquire knowledge on the chemical pathways of drug biotransformation and physiological importance of xenobiotic metabolism.
3. Acquire knowledge about usage of drugs in physiological periods.
4. Understand the drug action on Cardiac and GI system.
5. Illustrate the drug action on Endocrine, Joint and Connective Tissue.

TEXT BOOK(S)

1. Gordan Gibson, G. and Paul Skett. Nelson Thornes, 1999. Introduction to Drug Metabolism, 3rd edition, UK.
2. Haque SS and Randhawa SS. 2017. Pharmaceutical Biochemistry. 2nd edition, S.Vikas and Company
3. Harbans Lal, 2018. Essentials of Pharmaceutical Biochemistry. 2nd edition, CBS publishers and Distributors.
4. Jayashree Ghosh, 2010. A Textbook of Pharmaceutical Chemistry, 3rd edition, S.Chand & Company Ltd., New Delhi.
5. Kadam SS, Mahadik R. 1998. Text Book of Medicinal Chemistry, Vol. 15th edn. Nirali Prakashan Publishers.
6. Tripathi KD. 2010. Essentials of Medical Pharmacology, 7th edition, Jaypee Publishers.

REFERENCE BOOK(S)

1. Abdul wahab and Shahid Ullah khan, 2015. Handbook of Pharmaceutical Biochemistry for Health Professionals. LAP LAMBERT Academic Publishing.
2. Bertram Katzung, 2012. Clinical Pharmacology, 12th edition, Lange Publishers.
3. Donald Cairns, 2012. Essentials of Pharmaceutical Chemistry, 4th edition, Pharmaceutical Press.
4. Robert K. Murray, Daryl K. Granner, Peter A. Mayer and Victor W. Rodwell, Mc Graw Hill, New York, 2006. Harper's Biochemistry. 25th edition. Tata Mcgraw Hill Publishing company.
5. Thomas L. Lemke, David A. Williams, Victoria F. Roche and S. William Zito, Foye's Wolters Kluwer, 2012. Foye's Principles of medicinal Medicinal Chemistry. 7th edition, Lippincott Williams & Wilkins publisher.
6. Vyas SP, Kohli DV. 2019. Pharmaceutical Biochemistry, 1st edition, CBS Publishers.

E- RESOURCES

1. <https://guides.lib.uiowa.edu/c.php?g=132196&p=863259>
2. <https://libguides.library.usyd.edu.au/c.php?g=508174&p=3476667>
3. <https://guides.library.usciences.edu/ChemistryBioChemPharmaceuticalChem>
4. <https://epgp.inflibnet.ac.in/>
5. <https://guides.lndlibrary.org/pharmacy/pharm-books>



SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016
(For the Candidates admitted in the academic year 2022 – 2023)

DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: III-EDC- II: Clinical Lab Technology

Ins. Hrs. /Week: 3

Course Credit: 2

Course Code: 23PBCED2B

UNIT-I: Collection, transport, analysis of specimen (9 Hours)

Blood, routine urine, feces, sputum, semen, CSF Documentation of samples & results. Disposal of laboratory/ hospital waste-Non infectious waste, biomedical waste, infected sharp waste disposal, infected non sharp disposal – color coding as per guidelines.

UNIT-II: Determination of Blood group and Rh factor (9 Hours)

Determination of Blood group and Rh factor, Basic blood banking procedures- cross matching, screening test. Blood transfusion and hazards.

UNIT-III: Estimation of blood and Urine (9 Hours)

Estimation of blood sugar by Enzymatic method, HbA1C, Qualitative and quantitative analysis of urine sample- NPN-urea, uric acid, creatinine. Mineral, vitamin and CSF analysis.

UNIT-IV: Immuno diagnostics (9 Hours)

Widal test, VDRL test, ASO, RA, CRP and Complement fixation Test. RIA, ELISA, Skin test – Montaux and Lepramin test.

UNIT-V: Assay of enzymes and hormones (9 Hours)

Assay of clinically important enzymes- LDH, creatine kinase, transaminases, phosphatases - Estimation of clinically important hormones – Insulin, Thyroid and Reproductive hormones and its clinical significance.

Total Lecture Hours: 45

COURSE OUTCOME:

The students are able to,

1. Acquire knowledge about Collection and preservation of biological samples.
2. Estimate the various constituents in biological sample.
3. Perform the routine procedures adopted in blood bank.
4. Analyze and interpret the values for both normal and disease conditions.
5. Assay the enzymes and hormones &interpret clinical implications.

TEXT BOOK(S)

1. Kanai L Mukherjee and Anuradha Chakravarthy Medical Laboratory Technology IVth edition, Vol I, 2022
2. Ramnik Sood, Text Book of Medical Laboratory Technology, Jaypee Publishers, 2006
3. Tietz, N. (2018) Fundamentals of Clinical Chemistry and Molecular Diagnostics 8th edition, W.B. Saunders Company

REFERENCE BOOK(S)

1. Bergey's manual of determinative bacteriology by Edited by John G. Holt
REF Desk QR81.A5 1994 ISBN: 0683006037.
2. Laboratory test handbook : concise, with disease index by David S. Jacobs, REF RB38.2
L327 2004 ISBN: 9781591950806.

E-RESOURCES:

- 1 <https://www.youtube.com/watch?v=QNYIX5Ne9IQ>
- 2 <https://www.slideshare.net/doctorrao/agglutination-tests-and-immunoassays>
- 3 <https://microbenotes.com/introduction-to-precipitation-reaction/>

SEMESTER-IV



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: IV-CC- X: Endocrinology

Ins. Hrs. /Week: 6

Course Credit: 5

Course Code: 23PBC413

UNIT-I: Hypothalamic and Pituitary Hormones (18 Hours)

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.

UNIT-II: Thyroid and Parathyroid Hormones (18 Hours)

Thyroid hormones: Synthesis, secretion, regulation, transport, metabolic fate and biological actions. Antithyroid agents. Thyroid functions tests. Hyper and hypothyroidism. Synthesis, secretion, biological actions and disorders of PTH. Calcitonin and calcitriol. Hormonal regulation of calcium and phosphate metabolism. Paget's Disease, Rickets and osteomalacia.

UNIT- III: G.I. and Pancreatic Hormones (18 Hours)

G.I. hormones: Brief account of gastrointestinal hormones. Adipocyte hormones: Adiponectin and leptin. Appetite and satiety control. Obesity and Metabolic syndrome. Pancreatic hormones: Synthesis, regulation, biological effects and mechanism of action of insulin and glucagon. Somatostatin, Pancreatic polypeptide and Insulin like growth factors. Hypo and hyperglycemia and Diabetes mellitus.

UNIT-IV: Adrenal and Gonadal Hormones (18 Hours)

Adrenal cortical hormones: Synthesis, regulation, transport, metabolism and biological effects. Adrenal medullary hormones: Synthesis, secretion, metabolism, regulation and biological effects of catecholamines. Adrenal function tests. Adrenal disorders: Addison's disease, Cushing's syndrome, Congenital Adrenal hyperplasia and Pheochromocytoma. 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. Inhibin. The menstrual cycle. Amenorrhea and PCOS.

UNIT-V: Signal Transduction (18 Hours)

Definitions of signals, ligands, receptors, endocrine, paracrine, autocrine, intracrine and neuroendocrine signaling. Hormone receptors: Intracellular receptors -cytoplasmic and nuclear receptors. Cell surface receptors-ion channels, G-protein coupled receptors (GPCR), 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.

Total Lecture Hours-90

COURSE OUTCOME

The students are able to,

1. Acquire knowledge about anatomy of endocrine system and also biological functions and regulations of hypothalamic and pituitary hormones and their significance in body function.
2. Understand the basic knowledge about biochemical and physiological effects of thyroid and parathyroid hormones.
3. Explain the role of G.I and pancreatic hormones and its disorders.
4. Gain knowledge about synthesis, biological effects and disorders of adrenal and gonadal hormones.
5. Acquire basic knowledge of nature of signals, components of signaling pathways and their functional properties.

TEXT BOOK(S)

1. Mac E. Hadley, Jon E. Levine, Jonathan Levine. 2009, Endocrinology, 6th Edition. Benjamin Cummings Publishers, USA.
2. Nagini S. 2007. Text Book of Biochemistry, 2nd Edition, Scitech publishers, India.
3. Norman Levin. 2019. Manual of Endocrinology and Metabolism, 5th Edition, Wolters Kluwer Publishers, Philadelphia, USA.
4. Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell. 2003. Harper's Illustrated Biochemistry, 26th Edition, McGraw-Hill Medical Publishers, New York.
5. Smith EL, Hill RL, Robert LI. Lefkowitz RJ, Philip H, Abraham W. 1983. Principles of Biochemistry: Mammalian Biochemistry, 7th Edition, McGraw-Hill Education Publishers, New York.

REFERENCE BOOK(S)

1. Arthur C. Guyton and Hall. 2006. Text Book of Medical Physiology, 11th Edition, Elsevier India pvt. Ltd., New Delhi.
2. Bernhard K and Winfried B. 2016. Hormones and the Endocrine System: A text Book of Endocrinology, 1st Edition, Springer Nature Publishers, India.
3. De Robertis and De Robertis. 2001. Cell and Molecular Biology, 8th Edition, Wolters Kluwer Publishers, India.
4. Lary Jameson J. 2017. Harrison's Endocrinology, 20th Edition, McGraw Hill Publishers, New York.
5. Melmed S, Polonsky KS, Larsen PR, Kronenberg HM. 2016. Williams Textbook of Endocrinology, 13th Edition, Elsevier Publishers, India.
6. Wilson and Foster. 1992. Textbook of Endocrinology, 8th Edition. W. B. Saunders publishers, USA.

E-RESOURCES

1. <https://www.pdfdrive.com/biochemistry-books.html>
2. <https://www.pdfdrive.com/textbook-of-biochemistry-with-clinical-correlations-e184776201.html>
3. <https://www.studynama.com/community/threads/endocrinology-study-notes-ebook-pdf-download-for-mbbs-medical-students.892>
4. <https://www.news-medical.net/health/Pituitary-Gland-Hormones-and-Functions.aspx>
5. <https://www.pdfdrive.com/williams-textbook-of-endocrinology-expert-consult-e189818749.html>
6. <https://www.pdfdrive.com/harrison-endocrinology-e34584578.html>
7. <https://www.pdfdrive.com/endocrinology-basic-and-clinical-principles-e33437813.html>



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: IV-CC- XI: Bioinformatics

Ins. Hrs. / Week: 6

Course Credit: 5

Course Code: 23PBC414

UNIT- I: Bioinformatics (18 Hours)

Bioinformatics-An overview, definition, components, importance and fields related to bioinformatics, Bioinformatics tools- Definition, classification- homology and similarity tools, sequence analysis tools, structural analysis tools, molecular modeling and visualizing tools. Literature databases – NCBI – PubMed.

UNIT-II: Databases in Bioinformatics (18 Hours)

Database- Introduction, properties, classification of biological database- generalized and specialized, types- sequence databases- BLAST, FASTA, structure database- RasMal, Primary database- PIR, GenBank, DDBI, PDB and Secondary database- SCOP, CATH, PROSITE, functions of databases; Nucleic acid sequence databases- EMBL, DDBJ, GSDB- salient features. Protein sequence databases- SWISSPROT, PIR, EXProt, NCBI, TrEMBL.

UNIT-III: Protein structure prediction (18 Hours)

Protein-Levels of protein structure. Protein structure prediction-Protein identification and Characterization tools-AACOMIdent, PROSEARCH. Primary structure analysis and prediction tool-PeptideMass. Secondary structure analysis and prediction tool-Chou Fasman method, GOR method, Hidden Markov Methods (HMMs). Tertiary structure analysis and prediction tool-homology modeling, threading - fold recognition and abinitio method .

UNIT-IV: Biological Sequence analysis (18 Hours)

Sequence alignment- global and local alignments. Biological Sequence analysis- Pairwise sequence alignment- Dot matrix method, Dynamic programming, word method. Multiple sequence alignments – progressive method. Phylogenetic Analysis-Phylogenetic tree- structure, construction-phenetic method-neighbour joining method- BIONJ, Cladistic method- Maximum likelihood method-PAML.

UNIT-V: Accessing databases and downloading file (18 Hours)

Accessing Zinc database, Marvin Sketch, PubChem, PDB, Autodock, virtual screening in Pyrx, Molinspiration, Protein structure visualization tool- Discovery studio visualizer.

Total Lecture Hours-90

COURSE OUTCOME

The students are able to,

1. Acquire knowledge to search and retrieve information from biological databases, tools and to analyze their search results using software available on the internet.
2. Understand the methods used in sequence bioinformatics such as sequence alignment, phylogenetic analysis and pattern recognition.
3. Enrich the methods used in structural bioinformatics such as classification of protein structures, structure prediction, and simulations.
4. Solve given biological problems by using appropriate bioinformatic methods and databases
5. Demonstrate an understanding of the possibilities of the bioinformatics, limitations and role in society

TEXT BOOK(S)

1. Westhead D.R, Parish J.H and Twyman R.M. 2003. Instant notes in Bioinformatics, 1st Edition.
2. Attwood.T.K. Parry D.J. and Smith. 2001. Introduction to Bioinformatics, 1st Indian Report.
3. Alok Gha, Priyanka Arora- Medical Transcription Made easy.
4. Terry Tropin M Shai, RHIA, CCS-P, AHIMAICD-10-CM- Coding guidelines made easy 2017.

REFERENCE BOOK(S)

1. David W Mount, 2004. Bioinformatics: Sequence and Genome analysis, 2nd Edition, CBS Publishers, New Delhi.
2. Attwood T.K, Parry Smith D.J, and Samiron Phukan, 2007. Introduction to Bioinformatics, Pearson Education, UK.
3. Michael Gromiha M. 2010. Protein Bioinformatics - From Sequence to Function, Elsevier India Pvt. Ltd, New Delhi.
4. Mount D. 2004. Bioinformatics: Sequence and Genome Analysis, Cold Spring Harbor Laboratory Press, New York.
5. Baxevanis A.D, and Francis Ouellette B.F, 2009. Bioinformatics- A Practical Guide to the Analysis of Genes and Proteins, Wiley India Pvt Ltd, New Delhi.
6. Bosu O, and Thukral S.K, 2007. Bioinformatics Databases, Tools and Algorithms, Oxford Univ. Press, New Delhi.

E-RESOURCES

- 1 <https://nptel.ac.in/courses/102/106/102106065/>
- 2 <http://www.digimat.in/nptel/courses/video/102106065/L65.html>
- 3 <https://www.slideshare.net/sardar1109/bioinformatics-lecture-notes>



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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: IV Entrepreneurship /

Industry Based Course: Medical Laboratory Techniques

Ins. Hrs. /Week: 6

Course Credit: 5

Course Code: 23PBCI41

UNIT-I: Collection, transport, analysis of specimen (18 Hours)

Blood, routine urine, feces, sputum, semen, CSF, amniotic fluid, intestinal fluid - documentation of samples & results. Disposal of laboratory/ hospital waste-Non infectious waste , biomedical waste, infected sharp waste disposal, infected non sharp disposal – color coding as per guidelines.

UNIT-II: Hamatology (18 Hours)

Determination of Blood group and Rh factor, Basic blood banking procedures- cross matching, screening test. Blood transfusion and hazards. Determination of prothrombin time, clotting time, bleeding time, ESR and PCV.

UNIT-III: Blood and Urine analysis (18 Hours)

Estimation of blood sugar Enzymatic method, HbA1C, Assay of clinically important enzymes- Estimation of clinically important hormones – Insulin, Thyroid and Reproductive hormones and its clinical significance .Qualitative and quantitative analysis of urine sample- NPN-urea, uric acid, creatinine. Mineral, vitamin.

UNIT-IV: Immuno diagnostics (18 Hours)

Immuno diagnostics -Widal test, VDRL test, ASO, RA, CRP and Complement fixation Test. RIA, ELISA,, Skin test – Montaux and Lepramin test.

UNIT-V: Histopathology (18 Hours)

Histopathology – Introduction, tissue processing and embedding ,section ,cutting and problem encountered, staining, Decalification ,Frozen section, cytology, fine needle aspiration cytology.

Total Lecture Hours: 90

COURSE OUTCOME:

The students are able to,

1. Acquire knowledge about Collection and preservation of biological samples.
2. Estimate the various constituents in biological sample.
3. Perform the routine procedures adopted in blood bank.
4. Analyze and interpret the values for both normal and disease conditions.
5. Assay the enzymes and hormones &interpret clinical implications.

6. Illustrate the histopathological and cytology procedures.

TEXT BOOK(S)

1. Kanai L Mukherjee and Anuradha Chakravarthy Medical Laboratory Technology IVth edition, Vol I, 2022
2. Ramnik Sood, Text Book of Medical Laboratory Technology, Jaypee Publishers, 2006
3. Tietz, N. (2018) Fundamentals of Clinical Chemistry and Molecular Diagnostics 8th edition, W.B. Saunders Company

REFERENCE BOOK(S)

1. Bergey's manual of determinative bacteriology by Edited by John G. Holt
REF Desk QR81.A5 1994 ISBN: 0683006037.
2. Laboratory test handbook : concise, with disease index by David S. Jacobs, REF RB38.2
L327 2004 ISBN: 9781591950806.

E-RESOURCES:

- 1 <https://www.youtube.com/watch?v=QNYIX5Ne9IQ>
- 2 <https://www.slideshare.net/doctorrao/agglutination-tests-and-immunoassays>
- 3 <https://microbenotes.com/introduction-to-precipitation-reaction/>



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SUNDARAKKOTTAI, MANNARGUDI- 614016
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DEPARTMENT OF BIOCHEMISTRY
M.Sc., BIOCHEMISTRY

Semester: IV- VAC-II: Biochemistry of common Disorders

Course Credit: 2 *

Course Code: 23PBCVA42

UNIT- I: Disorders of carbohydrate metabolism

Maintenance of blood glucose by hormone with special reference to insulin and glucagon. Abnormalities in glucose metabolism: Diabetes mellitus; types, causes, biochemical manifestations, diagnosis and treatment, glycated hemoglobin. Inborn errors of carbohydrate metabolism, glycosuria, Fructosuria, Pentosuria, Galactosemia and Glycogen storage diseases.

UNIT- II: Disorders of Lipid Metabolism

Lipid Profile, Atherosclerosis, Fatty liver and hyper lipidemia. Hypercholesterolemia, Lipidosis and Xanthomatosis, Tay-Sach's disease, Niemann-Pick disease, lipotropic agents. Obesity: Definition, classification and biochemical basis; Genetic and environmental factors leading to obesity; Obesity related diseases and management of obesity.

UNIT- III: Liver Function Tests

Bilirubin metabolism and jaundice, Estimation of conjugated and total bilirubin in serum (Diazomethod). Detection of bilirubin and bile salts in urine (Fouchet's test and Hay's Sulphur test). serum enzymes in liver disease serum transaminases (SGPT & SGOT) and lactate dehydrogenase (LDH). **Kidney Function Tests:** Measurement of urine pH, volume, specific gravity, osmolality, sediments in urine, inulin, urea and creatinine clearance tests. Phenol red test. Proteinuria.

UNIT- IV: Gastric Function test

Composition of gastric juice, collection of gastric contents, examination of gastric residuum, fractional test meal (FTM), stimulation test-alcohol and histamine stimulation, Tubeless gastric analysis.

UNIT- V: Clinical enzymology

Enzymes of diagnostic importance-LDH, creatine kinase, transaminases, phosphatases, Isoenzymes of lactate dehydrogenase.

COURSE OUTCOME

The students are able to,

1. Explain the concepts of hormones and their importance to maintain glucose and types of Diabetes, diagnosis and treatment.
2. Analyze the lipid profile and different deficiency state.
3. Describe the liver and kidney functions and specific diagnostic methods used for biological sample.

4. Detail about the composition of gastric juice and special test for diagnosis.
5. Elaborate the enzyme markers used for diagnostic studies.

TEXT BOOK(S)

1. MN Chatterjee and RanaShinde, Text Book of Medical Biochemistry, Jaypee Brothers Medical Publishers (P) LTD, New Delhi, 8th Edition, 2012
2. Ambika Shanmugam's Biochemistry for medical students, 8th edition, Published by Wolters Kluwer India Pvt. Ltd.

REFERENCE BOOK(S)

1. Philip.D.Mayne, Clinical Chemistry in diagnosis and treatment. ELBS Publication, 6th edition, 1994.
2. Thomas M. Devlin (2014) Text book of Biochemistry with clinical correlations (7th ed). John Wiley and sons.
3. Tietz Fundamentals of clinical chemistry and molecular Diagnostics (2014) (7th ed) Saunders.

E-RESOURCES

1. <https://www.britannica.com/science/metabolic-disease/Disorders-of-carbohydrate-etabolism>
2. <https://www.slideshare.net/MohitAdhikary/gastric-and-pancreatic-function-tests>
3. https://onlinecourses.nptel.ac.in/noc20_ge13/preview
