

**B.SC.,
BIOCHEMISTRY**

MANONMANIAM SUNDARANAR UNIVERSITY

SYLLABUS

**FROM THE ACADEMIC YEAR
2023 – 2024**

As per
**TAMILNADU STATE COUNCIL FOR HIGHER
EDUCATION, CHENNAI – 600 005**

THE REGULATIONS ON LEARNING OUTCOMES BASED CURRICULUM FRAME WORK FOR UNDERGRADUATE EDUCATION

1. Preamble

Biochemistry is the cross over scientific discipline that integrates the living world and chemistry. It involves the study of the structure of biomolecules and explores the biological processes at molecular level in the living organisms. It is the laboratory science that has several domains like cell biology, molecular biology, clinical biology, enzymology, immunology, physiology, pharmacology etc., It has enlightened many aspects of health and diseases and paved the way for many interdisciplinary technological innovations like metabolomics, genomics and proteomics. There is a continuous demand for biochemists in public and private health care sectors, agriculture, medical and forensic departments. Almost all food, pharmaceuticals, health and beauty care etc required quality control and safety checks for which experts in the field of Biochemistry are always in need. The syllabi for the three year B.Sc., degree programme in Biochemistry was framed in such a way that at the end of the course they could apply the knowledge and expertise in industries, diagnostic laboratories and various research fields

The programme endeavours to provide students a broad based training in biochemistry with a solid background of basic concepts as well as exposing them to the exciting advancements in the field. In addition to theoretical knowledge, significant emphasis has been given to provide hands on experience to the students in the forefront areas of experimental biochemistry. A multidisciplinary approach has been employed to provide the best leverage to students to enable them to move into frontier areas of biological research in the future.

The course defines clearly the objectives and the learning outcomes, enabling students to choose the elective subjects for broadening their skills. The course also offers skills to pursue research in the field of Biological Chemistry and thus would produce best minds to meet the demands of society.

Biochemistry, today is considered as an application oriented integrated basic science. It's an interdisciplinary science that has emerged by the confluence of principles of Chemistry, Physics and Mathematics to Biology. Advances in Biochemistry have immense positive implications on the understanding of biochemical interactions, cellular communications, hormonal mechanisms and the cross talks between them. The research in Biochemistry has been translational and there is a shift from hypothesis driven research to data dependent

research that promises translational, product oriented research. Much of the advancement in Biochemistry is in the advancement of Biotechnology, as a basic science discipline Biochemistry lead to Biotechnological advancement. Considering its pivotal role in biological sciences, it is imperative to strengthen the fundamental concepts of Biochemistry.

TANSICHE REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR UNDERGRADUATE EDUCATION	
Programme:	B.Sc Biochemistry
Programme Code:	
Duration:	3 years [UG]
Programme Outcomes:	<p>PO1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study</p> <p>PO2: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one’s views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.</p> <p>PO3: Critical thinking: Capability to 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.</p> <p>PO4: Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one’s learning to real life situations.</p> <p>PO5: Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.</p> <p>PO6: Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to 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; ability to plan, execute and report the results of an experiment or investigation</p> <p>PO7: Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated</p>

	<p>effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team</p> <p>PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.</p> <p>PO9: Reflective thinking: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.</p> <p>PO10 Information/digital literacy: Capability to 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.</p> <p>PO 11 Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.</p> <p>PO 12 Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.</p> <p>PO 13: Moral and ethical awareness/reasoning: Ability to 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. Capable of demonstrating 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 adopting objective, unbiased and truthful actions in all aspects of work.</p> <p>PO 14: Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.</p> <p>PO 15: Lifelong learning: Ability to acquire knowledge and skills, including „learning how to learn“, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.</p>
<p>Programme Specific Outcomes:</p>	<p>PSO1 – Placement: To prepare the students who will demonstrate respectful engagement with others’ ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.</p> <p>PSO 2 - Entrepreneur: To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations</p>

	<p>PSO3 – Research and Development: Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.</p> <p>PSO4 – Contribution to Business World: To produce employable, ethical and innovative professionals to sustain in the dynamic business world.</p> <p>PSO 5 – Contribution to the Society: To contribute to the development of the society by collaborating with stakeholders for mutual benefit</p>
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PROGRAM OUTCOMES

PO1	Acquire knowledge in Biochemistry and apply the knowledge in their day to day life for betterment of self and society
PO2	Develop critical ,analytical thinking and problem solving skills
PO3	Develop research related skills in defining the problem, formulate and test the hypothesis, analyse, interpret and draw conclusion from data
PO4	Address and develop solutions for societal and environmental needs of local, regional and national development
PO5	Work independently and engage in lifelong learning and enduring proficient progress
PO6	Provoke employability and entrepreneurship among students along with ethics and communication skills

PROGRAM SPECIFIC OUTCOMES

PSO1	Comprehend the knowledge in the biochemical, analytical, biostatistical and computational areas
PSO2	Ability to understand the technical aspects of existing technologies that help in addressing the biological and medical challenges faced by human kind
PSO3	Acquiring analytical and hands on skills to perform research in multidisciplinary environments
PSO4	Use library search tools and online databases and sources to locate and retrieve scientific information about a topic and techniques related to biochemistry

ELIGIBILITY FOR ADMISSION

Candidate for admission to the first year of B.Sc. Degree Course in Bio-Chemistry shall be required to have passed the Higher Secondary Examination with Chemistry and Biology or Chemistry, Botany and Zoology or Biochemistry and Chemistry or any other Science subject that may be considered as equivalent by the M.S. University.

LIST OF ALLIED COURSES TO BE OFFERED TO B.ScBIOCHEMISTRY APPROVED BY OTHER BOARD (SEMESTER I ,II,III and IV)

Chemistry

Microbiology

Biostatistics

Zoology

Botany

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

B.Sc. Biochemistry
(Choice Based Credit System)
(Effective from the academic year 2023-2024 onwards)

Programme Structure

FIRST YEAR: SEMESTER I

Part I/II/III/ IV/V	Course Category	Course	Credit Distribution				Overall Credits	Total Contact hours	Marks		
			L	T	P	S			CIA	ESE	Total
Part I		Language –I	2	1	0	0	3	6	25	75	100
Part II		English –I	2	1	0	0	3	6	25	75	100
Part III	Core Course 1	Nutritional Biochemistry	3	1	0	0	4	5	25	75	100
	Core Course 2	Core Practical I - Nutritional Biochemistry	0	0	3	0	3	3	40	60	100
	Allied Course 1	Allied – I (Choose any one from the list of approved allied courses)	3	1	0	0	4	4	25	75	100
	Allied Practical 1	Allied Practical - I	0	0	2	0	2	2	40	60	100
Part IV	Skill Enhancement Course (SEC-1)	(Choose any one) a. Health and Nutrition b. Lifestyle Diseases	1	1	0	0	2	2	25	75	100
	Foundation Course	Bridge course – Fundamentals of Biochemistry	1	1	0	0	2	2	25	75	100
Total							23	30			

FIRST YEAR: SEMESTER II

Part I/II/III/ IV/V	Course Category	Course	Credit Distribution				Overall Credits	Total Contact hours	Marks		
			L	T	P	S			CIA	ESE	Total
Part I		Language –II	2	1	0	0	3	6	25	75	100
Part II		English –II	2	1	0	0	3	6	25	75	100
Part III	Core Course 3	Cell Biology	3	1	0	0	4	5	25	75	100
	Core Course 4	Core Practical II - Cell Biology	0	0	3	0	3	3	40	60	100
	Allied Course 2	Allied – II (Choose any one from the list of approved allied courses)	3	1	0	0	4	4	25	75	100
	Allied Practical 2	Allied Practical - II	0	0	2	0	2	2	40	60	100
Part IV	Skill Enhancement Course (SEC-2)	(Choose any one) a. Medicinal Diet b. Hormones in Health and Disease	1	1	0	0	2	2	25	75	100
	Skill Enhancement Course – (SEC-3) Discipline/ Subject specific	First Aid	1	1	0	0	2	2	25	75	100
Total							23	30			

IYEAR : SEMESTER I
NUTRITIONAL BIOCHEMISTRY

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Core Paper1- Nutritional Biochemistry	Core	3	1	0	0	4	5	25	75	100

Learning Objectives

The objectives of this course are to

- Create awareness about the role of nutrients in maintaining proper health
- Understand the nutritional significance of carbohydrates, lipids and proteins.
- Understand the importance of a balanced diet.
- Study the effect of additives, emulsifiers, flavour enhancing substances in food.
- Study the significance of nutraceuticals.

Module I : Concepts of food and nutrition. Basic food groups-energy yielding, body building and functional foods. Units of energy. Calorific and nutritive value of foods. Measurement of Calories by bomb calorimeter. Basal metabolic rate (BMR)- definition, determination of BMR and factors affecting BMR. 12 Hrs

Module II: Physiological role and nutritional significance of carbohydrates, lipids and protein. Evaluation of proteins by nitrogen balance method- Biological value of proteins- Digestibility coefficient, , Protein Energy Ratio and Net Protein Utilization. Protein energy malnutrition – Kwashiorkar and Marasmus, Obesity-Types and preventive measures.12 Hrs

Module III : Balanced diet, example of low and high cost balanced diet- for infants, children, adolescents, adults and elderly people. ICMR classification of five food groups and its significance food pyramid. Junk foods- definition and its adverse effects .12 Hrs

Module IV : Food additives: Structure, chemistry, function and application of preservatives, emulsifying agents, buffering agents, stabilizing agents, natural and artificial sweeteners, bleaching, starch modifiers, antimicrobials, food emulsions, fat replacers, viscosity agents, gelling agents and maturing agents. Food colors, flavors, anti-caking agent, antioxidants. Safety assessment of food additives. 12 Hrs

Module V : Nutraceuticals and Functional Foods: Definition, properties and function of Nutraceuticals, food Supplements, dietary supplements prebiotics and probiotics, and functional Foods. Food as medicine. International quality standards like ISO and food codex, BRC. Food safety and Standards act,2006. 12 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Cognizance of basic food groups viz. Carbohydrates, proteins and lipids and their nutritional aspects as well as calorific value	PO1,PO5
CO2	Identify and explain nutrients in foods and the specific functions in maintaining health.	PO1
CO3	Classify the food groups and its significance	PO1,PO2
CO4	Understand the effect of food additives	PO1,PO2
CO5	Describe the importance of nutraceuticals and pigments	PO1,PO5,PO6

Text books

- 1.Gaile Moe, Danita Kelley, Jacqueline Berning and Carol Byrd-Bredbenner. 2013. Wardlaw's Perspectives in Nutrition: A Functional Approach. McGraw-Hill, Inc., NY, USA.
- 2.M.Swaminadhan (1995) Principles of Nutrition and Dietics. Bappco.
- 3.Tom Brody(1998). Nutritional Biochemistry (2nded), Academic press, USA
- 4.Garrow, JS,James WPT and Ralph A (2000). Human nutrition and dietetics(10thed) Churchill Livingstone.
- 5.Andreas M.Papas(1998). Antioxidant Status, Diet, Nutrition, and Health (1sted) CRC

Reference Books

- 1.Branen, A.L., Davidson PM &Salminen S. 2001. Food Additives. 2nd Ed. Marcel Dekker.
2. Gerorge, A.B. 1996. Encyclopedia of Food and Color Additives. Vol. III. CRC Press.
- 3.Advances in food biochemistry, FatihYildiz (Editor), CRC Press, Boca Raton, USA, 2010
- 4.Food biochemistry & food processing, Y.H. Hui (Editor), Blackwell Publishing, Oxford, UK, 2006.
- 5.Geoffrey Campbell-Platt. 2009. Food Science and Technology. Wiley-Blackwell ,UK.

Web resources

- <http://old.noise.ac.in/SecHmscicour/english/LESSON O3.pdf>
- <https://study.com/academy/lesson/energy-yielding-nutrients-carbohydratesfat-protein.html>.
- <https://www.nhsinform.scot/healthy-living/food-and-nutrition/eatingwell/vitamins-and-minerals>

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3				2		3	3	3	3
CO 2	3						3	3		3
CO 3	3	2					3	1		3
CO 4	3	2					3	3		3
CO5	3				2	2	3	3		3

S-Strong(3) M-Medium (2) L-Low (1)

I YEAR : SEMESTER I

PRACTICAL – I: NUTRITIONAL BIOCHEMISTRY

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Core paper 2 : Practical 1- Nutritional Biochemistry	Core	0	0	3	0	3	3	25	75	100

Learning objectives

The objectives of this course are to

- Impart hands-on training in the estimation of various constituents by titrimetric method
- Prepare Biochemical preparations
- Determine the ash content and extraction of lipid

TITRIMETRY 20hrs

1. Estimation of ascorbic acid in a citrus fruit.
2. Estimation of calcium in milk .
3. Estimation of glucose by Benedict's method in honey.
4. Estimation of phosphorous (Plant source)

BIOCHEMICAL PREPARATIONS 15 Hrs

Preparation of the following substances and its qualitative tests

5. Lecithin from egg yolk.
6. Starch from potato.
7. Casein and Lactalbumin from milk.

GROUP EXPERIMENT 10Hrs

8. Determination of ash content and moisture content in food sample
9. Extraction of lipid by Soxhlet's method.

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Estimate the important biochemical constituents in the food samples.	PO1,PO3
CO2	Prepare the macronutrients from the rich sources.	PO1,PO3
CO3	Determine the ash and moisture content of the food samples	PO1,PO3
CO4	Extract oil from its sources	PO1,PO3,PO6

Text books

1. Laboratory manual in Biochemistry, J. Jayaraman, 2nd edition, NewAge International Publishers, 2011,
2. An Introduction to Practical Biochemistry, David T. Plummer, 3rd edition, Tata McGraw-Hill Publishing Company Limited, 2001.

Reference books

1. Biochemical Methods, Sadasivam S and Manickam A, 4th edition, NewAge International Publishers, 2016
2. Essentials of Food and Nutrition, Vol. I & II, M.S. Swaminathan.
- 3 Bowman and Robert M. 2006. Present Knowledge in Nutrition. 9th edition, International Life Sciences Publishers.
4. Indrani TK. 2003. Nursing Manual of Nutrition and Therapeutic Diet, 1st edition Jaypee Brothers medical publishers.
5. Martha H. and Marie A. 2012. Biochemical, Physiological, and Molecular Aspects of Human Nutrition. 3rd edition. Chand Publishers.

Web resources

1. <https://www.elsevier.com/journals/clinical-biochemistry/0009-9120/guide-for-authors>
2. <http://rajswasthya.nic.in/RHSDP%20Training%20Modules/Lab.%20Tech/Biochemistry/Dr.%20Jagarti%20Jha/Techniques%20In%20Biochemistry%20Lab.pdf>

3. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistrypdf.pdf?sequence=1&isAllowed=y

4. https://dspace.cuni.cz/bitstream/handle/20.500.11956/111493/Clinical_biochemistrypdf.pdf?sequence=1&isAllowed=y

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3		3				3	3	3	3
CO 2	3		3				3	3	3	3
CO 3	3		3				3	3	3	3
CO 4	3		3			3	3	3	3	3

S-Strong(3) M-Medium (2) L-Low (1)

IYEAR : SEMESTER I

Foundation Course - Bridge Course

FUNDAMENTALS OF BIOCHEMISTRY

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. hours	Marks		
									CIA	External	Total
	Bridge Course – Fundamentals of Biochemistry	Foundation Course	1	1	0	0	2	2	25	75	100

Learning Objectives

The objectives of this course are to

- To give students the basic concepts of biochemistry and its nature of interdisciplinary importance.
- To acquaint with basic laboratory instruments safely and precisely to obtain reproducible results from biochemical experiments.
- To let students, understand the basic concepts of biomolecules, their occurrence in biological system.
- To recognize the scope of biochemistry in various thrust areas.
- To familiarize the role of computers in the biochemical laboratories.

Module I : Molecules of life – Carbohydrates, Lipids, Amino acids, Proteins and Nucleic acids (General classification and examples). Different types of chemical bonds – ionic bond, covalent bond, coordinate bond, hydrogen bond and Vander Waals force. Formation of glycosidic, peptide and phosphodiester linkage. 6 hrs

Module II : Basic concepts of acids, bases, buffers and pH. Methods of expressing concentration – Molarity, Molality, Mass percentage and Parts per million(ppm). Preparation of Molar, Molal, percentage, ppm, Mass percentage solutions (calculation using an example). 6 hrs

Module III : Bioinstruments – Working principles, and major applications – pH meter, Colorimeter, Centrifuges, Incubator, Hot air oven, Microscope, Laminar air flow Chromatography & Electrophoretic units. Safe handling of chemicals and reagents in Biochemistry lab – Prevention, Precaution and First aid of lab hazards. 6 hrs

Module IV : Thrust areas in Biochemistry – Scope and role of a Biochemist in Agriculture, Medical diagnosis, Pharmaceuticals, Dairy Science, Food industry, Environmental sector (Water and soil quality management), Forensic science, Development of Natural product, Medical coding and Biological Research. 6 hrs.

Module V : Computational Biology – Basic usage of computers - Bioinformatics, Biostatistics, Diagnostic imaging techniques, Cyberbiosecurity. Structural characterisation of biological compounds. Automation in Forensic lab, Medical diagnostic labs and Biochemical research laboratories. 6hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Understand and relate the role of biochemistry and its importance in biology and interdisciplinary field.	PO1,PO5
CO2	Identify and explain the use of basic laboratory instruments for analytical purposes.	PO1
CO3	Classify biomolecules, their occurrence in biological system.	PO1,PO2
CO4	recognize the application and need of biochemistry in various thrust areas	PO1,PO2
CO5	Describe the importance of computers in the biochemical laboratories.	PO1,PO5,PO6

S-Strong(3) M-Medium (2) L-Low (1)

Text books

1. Biochemistry, U. Sathyanarayana & U. Chakrapani, 2013, 5th edition Elsevier India Pvt. Ltd., Books & Allied Pvt. Ltd.
2. Textbook of Medical Biochemistry, M. N. Chatterjea, Rana Shinde, 2002, 8th edition, Jaypee Brothers.
3. L. Veerakumari, 2009, Bioinstrumentation, 1st edition, MJ Publishers.
4. Avinash Upadhyay, Kakoli Upadhyay & Nirmalendu Nath, 2002, Biophysical Chemistry, Principles and Techniques, 3rd edition, Himalaya Publishing House.

Reference books

1. David L. Nelson, Michael M. Cox, 2005, Principles of Biochemistry, 4th edition W. H. Freeman and Company.
2. Terrance G. Cooper The tools of Biochemistry, 1977, John Wiley & Sons, Singapore.
3. Saroj Dua, Neera Garg, Biochemical Methods of Analysis, 2010, 1st edition, Narosa Publishing House.
4. B. Godkar. 2020. Textbook of Medical Laboratory Technology Vol 1 & 2 Paperback, 3rd edition, Bhalani Publishers.

Web resources

<https://www.britannica.com/science/biomolecule> <https://en.wikipedia.org/wiki/Biomolecule> <https://www.khanacademy.org/science/biology/macromolecules>

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3	2	2			2	3	2	2	3
CO 2	2	2	3			2	3	3	3	3
CO 3	2	2	3				3	3	3	3
CO 4	3	2	3			2	3	3	3	3
CO 5	3	2	3			2	3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)

FIRST YEAR : SEMESTER II

CELL BIOLOGY

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Core paper 3: Cell Biology	Core	3	1	-	-	4	5	25	75	100

Learning Objectives

The main objectives of this course are to

- Provide basic understanding of architecture of cells and its organelles.
- Understand the organization of prokaryotic and eukaryotic genome.
- Educate on the structural organization of bio membrane and transport mechanism
- Impart knowledge on cell cycle, cell division and basics of cells
- Familiarize the concept of mechanism of cell-cell interactions.

Module I: Architecture of cells- Structural organization of prokaryotic and eukaryotic cells microbial, plant and animal cells. The ultrastructure of nucleus, mitochondria, RER, SER, golgi apparatus, lysosome, peroxisome and their functions 12 Hrs

Module II: Cytoskeleton- microfilament, microtubules and intermediary filament- structure, composition and functions. Organization of Genome -prokaryotic, and eukaryotic genome. Organization of chromatin – histones, nucleosome concept, formation of chromatin structure. Special types of chromosomes – lamp brush chromosomes, polytene chromosomes. 12 Hrs

Module III: Biomembranes- Structural organization of bilipid layer model and basic functions- transport across cell membranes- uniport, symport and antiport. Passive and active transport. 12Hrs

Module IV: Cell cycle- Definition and Phases of Cell cycle- Cell division- Mitosis and Meiosis and its significance, Cancer cells- definition, types and characteristics of cancer cells. 12 Hrs

Module V: Extracellular matrix – Collagen, laminin, fibronectin and proteoglycans- structure and biological role. Structure and role of cadherin, selectins, integrins, Cell -cell interactions- Types-gap junctions, tight junctions and Desmosomes 12 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Explain the structure and function of basic components of prokaryotic and eukaryotic cells, especially the organelles.	PO1
CO2	Familiarize the cytoskeleton and chromatin	PO1, PO2
CO3	Illustrate the structure, composition and function of cell membrane related to membrane transport	PO1, PO2
CO4	Elaborate the phases of cell cycle and cell division - mitosis and meiosis and characteristics of cancer cells.	PO1, PO2
CO5	Relate the structure and biological role of extracellular matrix in cellular interactions	PO1, PO2

Text books

1. Arumugam, N., Cell biology. Saras publication (10ed, paperback), 2019
2. Devasena, T. Cell Biology. Oxford University Press India - ISBN: 9780198075516, 0198075510, 2012
3. Bruce Alberts and Dennis Bray. 2013, Essential Cell Biology. (4thed). Garland Science.

Reference books

1. S.C, R. Cell Biology. New Age Publishers - ISBN-10: 8122416888 / ISBN-13: 978-8122416886, 2008
2. Cooper, G.A. The Cell: A Molecular Approach. Sinauer Associates, Inc - ISBN10: 0878931066 / ISBN 13: 9780878931064, 2013
3. ...E.M.F., D.R, Cell and Molecular Biology. Lippincott Williams & Wilkins Philadelphia - ISBN: 0781734932 9780781734936, 2006
4. Lodish H.A, Berk C.A, Kaiser M, Krieger M.P, Scott A, Bretscher H, Ploegh and Matsudaira. 2007. Molecular Cell Biology, 6th Edition, WH. Freeman Publishers, New York, USA.

Web resources

<https://nicholls.edu/biol-ds/bio1155/Lectures/Cell%20Biology.pdf>

<https://www.medicalnewstoday.com/article/320878.php>

<https://biologydictionary.net/cell>

Mapping with Program Outcome

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3						3			3
CO 2	3	3					3			3
CO 3	3	3					3			3
CO 4	3	3					3	3		3
CO5	3	3					3			3

S-Strong(3) M-Medium (2) L-Low (1)

FIRST YEAR : SEMESTER II PRACTICAL - II :CELL BIOLOGY

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Core paper 4 practical II: Cell Biology	Core practical	-	-	3	-	3	3	40	60	100

Learning Objectives

The main objectives of this course are to

- Learn the parts of microscope
- Investigate the cells under microscope.
- Image the cells using different stains
- Identify the cells, organelles and stages of cell division
- Identify the spotters

I MICROSCOPY AND STAINING TECHNIQUES

1. Study the parts of light and compound microscope
2. Preparation of Slides and Micrometry
3. Examination of prokaryotic and eukaryotic cell

4. Visualization of animal and plant cell by methylene blue
5. Visualization of nuclear fraction by acetocarmine stain
6. Staining and visualization of mitochondria by Janus green stain

II GROUP EXPERIMENT

7. Identification of different stages of mitosis in onion root tip
8. Identification of different stages of meiosis in onion bulb

III SPOTTERS

9. a) **Cells:** Nerve, plant and Animal cell
- b) **Organelles:** Mitochondria, Chloroplast, Endoplasmic reticulum,
- c) **Mitosis stages** – Prophase, Anaphase, Metaphase, Telophase

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Identify the parts of microscope.	PO1, PO2
CO2	Preparation of Slides	PO1, PO2
CO3	Identify the stages of mitosis & meiosis	PO1, PO2
CO4	Visualize nucleus and mitochondria by staining methods	PO1, PO2
CO5	Identify the spotters of cells, organelles and stages of cell division	PO1, PO2

Text books

1. Rickwood, D and J.R. Harris cell Biology: Essential Techniques, John Wiley 1996.
2. Davis, J.M. Basic Cell culture: A practical approach, IRL 1994.
3. Ganesh M.K. and Shivashankara A.R. 2012. Laboratory Manual for Practical Biochemistry Jaypee publications, 2nd Edn.

Reference books

- 1) Essential practical handbook of Cell biology, Genetics and Microbiology - A Practical manual- Debarati Das Academic publishers, ISBN, 9789383420599, 1st Edition 2017
- 2) Cell biology Practical, Dr. Venugupta ISBN 8193651219, Prestige publisher, 1st Jan 2018.
- 3) Cell and Molecular biology, De Robertis, 8th edition, 1st June, 1987

Web resources

1. <http://amrita.olabs.edu.in/?sub=79&brch=18&sim=237&cnt=1>
2. <https://www.microscopemaster.com/organelles.html>
3. <https://www.pdfdrive.com/biochemistry-books.htm>
4. http://medcell.med.yale.edu/histology/cell_lab.php#:~:text=The%20electron%20microscope%20is%20necessary,and%20small%20granules%20and%20vesicles.
5. <http://amrita.olabs.edu.in/?sub=79&brch=18&sim=237&cnt=1>
6. <https://www.khanacademy.org/science/ap-biology/heredity/meiosis-and-geneticdiversity/a/phases-of-meiosis>
7. <https://www.microscopemaster.com/organelles.html>
8. <https://www.pdfdrive.com/biochemistry-books.html>

Mapping with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	2	3					3	3	3	3
CO 2	2	3					3	3	3	3
CO 3	2	3					3	3	3	3
CO 4	2	3					3	3	3	3

S-Strong(3) M-Medium (2) L-Low (1)

SKILL ENHANCEMENT COURSE -SEC

FIRST YEAR: SEMESTER I

HEALTH AND NUTRITION

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Health and Nutrition	SEC	1	1	-	-	2	2	25	75	100

Learning Objectives

The main objectives of this course are to

- Gain basic knowledge about health.
- Understand about vitamins.
- Learn about functions of fat on health.

- Understand the types of minerals and its functions
- Know about the importance of carbohydrates and proteins on health

Module I: Health – definition, Factors affecting human health. Importance of health care of children, adults and elderly people. Balanced diet and calorific value. 6Hrs

Module II: Vitamins-definition, classification, sources, properties, functions and deficiency symptoms. Recommended daily allowances. 6Hrs

Module III: Sources and functions of dietary fats, role of fats in health and diseases. 6Hrs

Module IV: Minerals- Role of minerals on human health, sources, biological functions, deficiency disorders with special reference to Calcium, Phosphorus, Potassium, Copper, Iron, Zinc and Selenium. Minerals in biological systems and their importance –Iron, Calcium, Phosphorus, Iodine, Copper, Zinc. 6Hrs

Module V: Role of proteins and carbohydrates in health. Functions of protein and carbohydrate and their calorific value. Dietary sources and deficiency disorders – Kwashiorkor and Marasmus – supplementation programs in India and their implications.6Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Programoutcomes
CO1	Understand about the importance of health and diet	PO1
CO2	Discuss about the classification properties and deficiencies of vitamins	PO1
CO3	Understand about sources and functions of fats and lipids on health	PO1.PO4
CO4	Detail about the different typed of minerals and its role in health	PO1,PO4
CO5	Relatetherole of proteins and carbohydrates on health	PO1,PO4

Text books

- 1 S.Davidson and J.R.Passmore (1986) Human Nutrition and Dietetics, (8th ed), Churchill Livingstone
2. J. S. Garrow, W. Philip T. James, A. Ralph (2000), Human Nutrition and Dietetics (10th ed), Churchill Livingstone
3. M.Swaminathan (1995) Principles of Nutrition and Dietetics, Bappco

Reference Books

1. Margaret Mc Williams (2012). Food Fundamentals (10th ed), Prentice Hall

Web Resources

1. <https://www.universalclass.com/articles/health/nutrition/nutritional-needs-for-differentages>.

2. nhp.gov.in/healthyliving/healthydiet
3. www.anme.com.mx/libros/PrinciplesofNutrition.pdf

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3						3	3		3
CO 2	3						3	3		3
CO 3	3			2			3	3		3
CO 4	3			2			3	3		3
CO5	3			2			3	3		3

S-Strong (3) M-Medium (2) L-Low (1)

FIRST YEAR : SEMESTER I LIFE STYLE DISEASES

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Lifestyle Diseases	SEC	2		-	-	2	2	25	75	100

Learning Objectives

The objectives of this course are to

- Create awareness on lifestyle diseases among adolescents.
- List out the lifestyle diseases.
- Explain the common lifestyle diseases and their prevention.
- Acquaint the disorders associated with women's health.
- Impart life skills so as to prevent lifestyle diseases.

Module I: Lifestyle diseases: Definition, Factors contributing to lifestyle diseases - Physical inactivity, Poor food habits, disturbed biological clock, sleep deprivation.
6Hrs

Module II: Top lifestyle diseases, Impact of Lifestyle diseases on family, society and economy of country. 6 Hrs

Module III : Causes, symptoms, types, preventive measures and treatment of Obesity, cardiovascular diseases, diabetes and cancer. 6 hrs

Module IV: Women's lifestyle diseases : Polycystic Ovarian Disease, Infertility, Breast and cervical cancer and Osteoporosis. 6 hrs

Module V: Prevention of lifestyle diseases: Balanced diet, sufficient intake of water, physical activity, sleep-wake cycle, stress management and meditation. 6Hrs

Course outcomes

CO	On completion of the course the students will be able to	Program Outcomes
CO1	DefineLifestylediseasesanddescribethecontributingfactors	PO1
CO2	Enumeratethetoplifestylediseasesand its impact on life.	PO1,PO4,PO5
CO3	Elaboratethetreatmentandpreventionmeasures of common lifestyle diseases.	PO1,PO4,PO5
CO4	Highlight thelifestylediseasesthataffectsthewomen'shealth	PO1,PO4,PO5
CO5	Illustratethevariousmeasuresforpreventionoflifestylediseases	PO1,PO4,PO5

Textbooks

1. JamesM R,LifestyleMedicine,2ndEdition,CRCPress,2013
2. AkiraMiyazaki,NewFrontiersinLifestyle-RelatedDisease,Springer,2008

Referencebooks

1. Steyn K, Lifestyleandrelatedriskfactorsforchronicdiseases
2. Willett WC,Preventionofchronicdiseasebymeansofdietandlifestyle.
3. Kumar M & R. Kumar,.Guidetopreventionoflifestylediseases.Deep& Deep publications

Web resources

1. <https://youtu.be/jDdL2bMQXfE>
2. <https://youtu.be/7WnpSB14nDM>
3. <https://youtu.be/ollz9MqtW-U>

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	2						3	3		3
CO 2	2			2	3		3	3		3
CO 3	2			2	3		3	3		3
CO 4	2			2	3		3	3		3
CO 5	2			2	3		3	3		3

S-Strong(3) M-Medium (2) L-Low (1)

FIRST YEAR : SEMESTER II

MEDICINAL DIET

Course Code	Course Name	Category		L	T	P	S	Credits	Inst. Hours	Marks		
										CIA	External	Total
	Medicinal Diet	SEC		1	1	-	-	2	2	25	75	100

Learning Objectives

The main objectives of this course are to

- Provide basic knowledge about diet
- Understand of diet modification for GI diseases
- Plan a diet for liver diseases
- Prepare diet chart for Infectious diseases
- Plan a diet for Diabetes ,Renal and Cardio-vascular diseases

Module-I :Principles of Therapeutic Diet: Definitions of Normal diet, Therapeutic diet, soft Diet and Liquid diet. Objectives of Diet Therapy. Advantages of using normal diet as the basis for Therapeutic diet. Normal Diet-therapeutic modification of normal diet. 6 Hrs

Module II:Diet modification in Gastrointestinal diseases: Peptic ulcer, Diarrhea, Lactose intolerance, Constipation and Malabsorption syndrome 6 Hrs

Module III:Diet Modification in liver and gall bladder in diseases: Etiology, symptoms and dietary treatment in jaundice, hepatitis, cirrhosis of liver and hepatic coma. 6 Hrs

Module IV:Diet Modification in Infectious Diseases: Fevers, Typhoid, Tuberculosis and Viral Hepatitis. Dietary modifications in Tuberculosis.6 Hrs

Module V:Diet Modification in Diabetes , Renal and Cardio-vascular diseases-Diabetes, acute & chronic glomerulonephritis, nephrosis, renal failure, kidney stone and Hypertension.6 Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO 1	Possess basic knowledge about diet	PO1
CO2	Sketch diet plan for GI diseases	PO1,PO4,PO5,PO6
CO3	Sketch diet plan for liver diseases	PO1,PO4,PO5,PO6
CO4	Sketch a diet plan for Infectious diseases	PO1,PO4,PO5,PO6
CO5	Prepare diet chart for Diabetes Renaland Cardio-vascular diseases	PO1,PO4,PO5,PO6

Text Books

- 1.M.RaheenaBegum ,AText Book of Foods, Nutrition and Dietetics, Sterling Publishers Pvt.Ltd.
- 2.M.V.RajaGopal ,Sumati.R.,Mudambi, Fundamentals of foods and Nutrition, Wiley Eastern Limited, Year-1990.
- 3.William S.R Nutrition and Diet Therapy, 1985, 5thedition, MoslyCo.St.Louis.

Reference books

- 1.Rodwell Williams Nutrition and Diet Therapy, 1985,the C.V MoslySt.Louis.
- 2.M.V.Krause&M.A.Mohan ,Food Nutrition and Diet Therapy, 1992 by W.B Saunders Company, Philadelphia, London.
- 3.Davidson and Passmore ,Human Methods and Diabetics, 1976 the English Language Book Society and Churchill.

Web sources

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	2						3	3		3
CO 2	2			2	3	2	3	3		3
CO 3	2			2	3	2	3	3		3
CO 4	2			2	3	2	3	3		3
CO 5	2			2	3	2	3	3		3

S-Strong(3) M-Medium (2) L-Low (1)

FIRST YEAR: SEMESTER II
HORMONES IN HEALTH AND DISEASE

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Hormones in Health and Disease	SEC	1	1	-	-	2	2	25	75	100

Learning Objectives

The main objectives of this course are to

- Provide basic knowledge about endocrine glands and hormones
- Understand the importance of hormonal effects
- Interpret about the biological effects of each hormone
- Explain the prevention and management of endocrine disorders

Unit I: The Endocrine glands, Hormones - Definition, Classification, Mechanism of hormone action - Class I and Class II hormones. 6 Hrs

Unit II: Hypothalamic & Pituitary hormones. Biological effects of Vasopressin and Oxytocin, Growth hormone, FSH, LH, TSH, ACTH and Prolactin. Hyper and Hypopituitarism. 6 Hrs

Unit III: Biosynthesis, transport, normal levels and biological effects of Thyroid hormones. Hypo and hyperthyroidism. Role of parathyroid hormone, calcitonin and calcitriol in maintaining calcium and phosphorus homeostasis. Hypo and Hyper parathyroidism. 6 Hrs

Unit IV: Hormones of the Pancreas, Synthesis, secretion, structure and Biological action of Insulin and Glucagon. Diabetes mellitus. 6 Hrs

Unit V: Chemical nature, circulating levels and biological effects Glucocorticoids, Mineralocorticoids and Adrenal medullary hormones. Pathophysiology of adrenal gland secretions. Biological effects of gonadal hormones. 6 Hrs

Course Outcomes

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

CO. No.	Hormones in Health and disease	Program outcomes
CO1	recall the structural organization of endocrine systems	PO1
CO2	relate the of the pituitary gland and hypothalamus in clinical domain	PO1,PO2
CO3	interpret the role of thyroid function and understand the thyroid related disorders	PO1,PO4,PO5,PO6
CO4	assess the importance of pancreatic hormones and evaluate	PO1,PO4,PO5,PO6

	its effect on carbohydrates, lipids and protein metabolism	
CO5	explain the organization of adrenals and gonads	PO1,PO4,PO5,PO6

Reference Books

1. ShlomoMelmed et al., Williams Text Book of Endocrinology, 13th edition, Saunders, 2015.
2. Robert K Murray et. al., Harper's Illustrated Biochemistry, 31st edition-McGraw Hill, 2018.
3. Nelson and Cox. Lehninger Principles of Biochemistry. Freeman, 7th ed., 2017.
4. Andrew Day, Philip Mayne, Clinical Chemistry in diagnosis and treatment, 6th edition, Hodder Arnold Publication, 1994.
5. W.J. Marshall, S. K. Bengert, M. Lapsley, Clinical Chemistry, 8th edition, Elsevier, 2016.

Web Resources

1. <https://www.slideshare.net/shibu989/hypopituitarism-96746917>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6761896/>
3. <https://www.webmd.com/diabetes/endocrine-system-facts>

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	2	3	3	3	3	3
CO2	2	3	3	3	2	3	2	3	3	3
CO3	3	3	3	3	2	2	3	3	3	3
CO4	2	3	3	3	2	3	2	3	3	3
CO5	2	3	3	3	2	3	2	3	3	3

Strongly Correlated (3); Moderately Correlated (2); Weakly Correlated (1); No Correlation (0)

FIRST YEAR: SEMESTER II

FIRST AID

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	First Aid	SEC (Discipline)	1	1	-	-	2	2	25	75	100

Learning Objectives

The main objectives of this course are to:

- Provide knowledge on the basics of first aid.
- Perform first aid during various respiratory issues.

- Demonstrate the first aid to treat injuries.
- Learn the first aid techniques to be given during emergency.
- Familiarize the first aid during poisoning.

Module I: Aims and important rules of first aid, dealing with emergency, types and content of a first aid kit. First aid technique – Dressing and Bandages, fast evacuation technique, transport techniques. 6 Hrs

Module II: Basics of Respiration – CPR, first aid during difficult breathing, drowning, choking, strangulation and hanging, swelling within the throat, suffocation by smoke or gases and asthma. 6 Hrs

Module III: Common medical aid- first aid for wounds, cuts, head, chest, abdominal injuries, shocks, burns, amputations, fractures, dislocation of bones. 6Hrs

Module IV: First aid related to unconsciousness, stroke, fits, convulsions- seizures, epilepsy 6Hrs

Module V: First aid in poisonous bites (Insects and snakes), honey bee stings, animal bites, disinfectant, acid and alkali poisoning .6Hrs

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Discuss on the rules of first aid, dealing during emergency and first aid techniques	PO1.PO4,PO5
CO2	Understand the first aid techniques to be given during different types of respiratory problems	PO1.PO4,PO5
CO3	Provide first aid for injuries, shocks and bone injury	PO1.PO4,PO5
CO4	Detail on the first aid to be given for unconsciousness, stroke, fits and convulsions	PO1.PO4,PO5
CO5	Gain expertise in giving first aid for insect bites and chemical poisoning	PO1.PO4,PO5

Text books

- 1) First aid and health Dr. Gauri Goel, Dr. Kumkum Rajput, Dr. ManjulMungali
ISBN-978-93-92208-19-5
- 2) Indian First Aid Manual-<https://www.indianredcross.org/publications/FA-manual.pdf>
- 3) Red Cross First Aid/CPR/AED Instructor Manual

Reference books

Web resources

1) <https://www.redcross.org/take-a-class/first-aid/first-aid-training/first-aid-online> •

2) <https://www.firstaidforfree.com/>

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	2						3	3	3	3
CO 2	2			3	3		3	3	3	3
CO 3	2			3	3		3	3	3	3
CO 4	2			3	3		3	3	3	3
CO5	2			3	3		3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)

ALLIED COURSE OFFERED BY BIOCHEMISTRY

FIRST YEAR : FIRST SEMESTER

ALLIED BIOCHEMISTRY I

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Allied Biochemistry I	(Theory)Allied I	3	1	-	-	4	4	25	75	100

Learning objectives

The objectives of this course are to

- Introduce the structure and classification of carbohydrates
- Comprehend the metabolism of carbohydrates
- Study the classification and properties of amino acids
- Elucidate the various levels of organization of Proteins
- Study functions and deficiency diseases of vitamins

Module I: Definition and classification of carbohydrates, linear and cyclic forms (Haworth projection) for glucose, fructose and mannose and disaccharides (maltose, lactose, sucrose). General properties of monosaccharides and disaccharides. Occurrence and significance of polysaccharides. 12Hrs

Module II:Metabolism- Catabolism and Anabolism.Carbohydrate metabolism- Glycolysis, TCA cycle, HMP shunt and glycogen metabolism and energetics 12Hrs

Module III:Amino acids -Classifications, physical properties -amphoteric nature, isoelectric point and chemical reactions of carboxyl ,amino and both groups. Amino acid metabolism- transamination, deamination and decarboxylation. 12Hrs

Module IV :Proteins- classification - biological functions ,physical properties- ampholytes, iso electric point, salting in and salting out, denaturation, nature of peptide bond. Secondary structure, α -helix and β -pleated sheet, tertiary structure, various forces involved- quaternary structure. 12Hrs

Module V: Vitamins- Fat(A,D,E and K) and water soluble vitamins(B complex and C)- sources, RDA, biological functions and deficiency diseases12 Hrs

Course Outcome

CO	On completion of this course, students will be able to	Programme Outcome
CO1	Classify the structure of carbohydrates and its properties	PO1
CO2	Explain the metabolism of carbohydrates and its significance	PO1
CO3	Classify amino acids and its properties	PO1
CO4	Explain the classification and elucidate the different levels of structural organization of proteins	PO1
CO5	Identify the disease caused by the deficiency of vitamins	PO1

Text Books

- 1 Satyanarayan,U (2014) Biochemistry (4th ed), Arunabha Sen Books & Allied (P) Ltd, Kolkata.
- 2.Jain J.L.(2007) Fundamentals of Biochemistry,S.Chand publishers 311

Reference books

1. David L.Nelson and Michael M.Cox (2012) Lehninger Principles of Biochemistry (6th ed) W.H. Freeman.
2. Voet.D&Voet. J.G (2010) Biochemistry , (4th ed), John Wiley & Sons, Inc.
3. LubertStryer (2010) Biochemistry,(7th ed), W.H.Freeman
4. Satyanarayan,U (2014) Biochemistry (4th ed), Arunabha Sen Books & Allied (P) Ltd, Kolkata.
- 5.Jain J.L.(2007) Fundamentals of Biochemistry,S.Chand publishers 31

Web sources

- 1.onlinecourses.swayam2.ac.in/cec20_bt12

Mapping with Program Outcome

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3						3			3
CO 2	3						3			3
CO 3	3						3			3
CO 4	3						3			3
CO5	3						3	3		3

S - Strong (3) M - Medium (2) L -Low(1)

FIRST YEAR : SEMESTER I

ALLIED BIOCHEMISTRY PRACTICAL -I

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	AlliedBiochemistry Practical I	Allied Practical I	-	-	2	-	2	2	25	75	100

Learning objectives

- Identify carbohydrates by qualitative test
- Estimate biomolecules volumetrically
- Estimate protein quantitatively

I Qualitative analysis of carbohydrates- 25Hrs

- Monosaccharides-Glucose, Fructose
- Disaccharides- Lactose, Maltose, Sucrose
- Polysaccharides-Starch

II Volumetric analysis 15 Hrs

- Estimation of ascorbic acid using 2,6dichlorophenolindophenol as link solution
- Estimation of Glucose by Benedicts method
- Estimation of Glycine by Sorenson Formal titration

III Quantitative analysis(Demonstration Expt)5 hrs

- Colorimetric estimation of protein by Biuret method

Course Outcome

CO	On completion of this course, students will be able to	Program Outcomes
CO1	Qualitatively analyze and report the type of carbohydrate based on specific tests	PO1,PO2,PO3
CO2	Quantitatively estimate the carbohydrates, amino acids and ascorbic acid	PO1,PO2,PO3
CO3	Estimate protein by colorimetric method	PO1,PO2,PO3

Text books

- 1.Laboratory manual in Biochemistry, J. Jayaraman, 2nd edition, New Age International Publishers, 2011,
2. An Introduction to Practical Biochemistry, David T. Plummer, 3 rd edition, Tata McGraw-Hill Publishing Company Limited, 2001.
3. Biochemical Methods, Sadasivam S and Manickam A, 4h edition, New Age International Publishers, 2016

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	2	3	3				3	3	3	3
CO 2	2	3	3				3	3	3	3
S - CO 3	2	3	3				3	3	3	3

Strong (3) M - Medi) L -Low(1)

FIRST YEAR ; SEMESTER II

ALLIED BIOCHEMISTRY II

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Allied Biochemistry II	Allied II	3	1	-	-	4	4	25	75	100

Learning objectives

The objectives of this course are to

- Impart knowledge on the classification, properties and characterization of lipids.
- Comprehend the metabolism of Lipids
- Acquaint with the structure, properties and functions of nucleic acids
- Learn about the enzyme kinetics and inhibition
- Study the importance of Hormones

Module I : Lipids–Bloor’s classification of lipids- simple lipids, fatty acids (saturated and unsaturated), compound lipids, derived lipids. Properties of lipids- reduction, oxidation, halogenation, saponification and rancidity .Classification and functions of phospholipids, Cholesterol – structure and biological importance. 12 Hrs

Module II : Lipid metabolism- Oxidation of fatty acids(Palmitic acid) – Beta oxidation-Role of carnitine, energetics , alpha oxidation and omega oxidation. Biosynthesis of saturated fatty acids. 12 Hrs

Module III : Purine and pyrimidine bases, nucleosides, nucleotides, polynucleotides, DNA structure, various types, properties- absorbance, effect of temperature. Different types of RNA, structure and function, Genetic code. 12 Hrs

Module III : Enzymes - Nomenclature, IUB system of enzyme classification, active site, specificity, isoenzymes, units of enzyme activity factors affecting enzyme activity- substrate concentration, pH, temperature. Enzyme Kinetics- Michaelis and Menten equation. Lineweaver- Burk plot. Enzyme inhibition, competitive, uncompetitive and non competitive inhibition 12 Hrs

Module V: Hormones -classification, Biological functions of Insulin, Thyroid and Reproductive hormones . 12Hr

Course Outcome

CO	On completion of this course, students will be able to	Program Outcomes
CO1	Elaborate on classification, structure, properties, functions and characterization of lipids	PO1
CO2	Discuss the metabolism of lipids and its importance	PO1
CO3	Explain about structure, properties and functions of nucleic acids	PO1
CO4	Derive Michaelis Menten equation and concepts of enzyme inhibition	PO1, PO3
CO5	Classify the Hormones and its biological functions	PO1, PO4

Text books

1.Satyanarayan,U (2014) Biochemistry (4th ed), Arunabha Sen Books & Allied (P) Ltd, Kolkata.

2.Jain J.L.(2007) Fundamentals of Biochemistry,S.Chand publishers

Reference books

1. David L.Nelson and Michael M.Cox (2012) Lehninger Principles of Biochemistry (6th ed) W.H. Freeman.

2. Voet.D&Voet. J.G (2010) Biochemistry , (4th ed), John Wiley & Sons, Inc.

3. LubertStryer (2010) Biochemistry,(7th ed), W.H.Freeman

Web sources

1.onlinecourses.swayam2.ac.in/cec20_bt12

2 onlinecourses.swayam2.ac.in/cec20_bt19

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	3						3			3
CO 2	3						3			3
CO 3	3		3				3			3
CO 4	3			3			3			3
CO5	3						3	3		3

S - Strong (3) M - Medium (2) L -Low(1)

FIRST YEAR: SEMESTER II ALLIED BIOCHEMISTRY : PRACTICAL II

Course Code	Course Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	AlliedBiochemistry Practical II	Allied Practical II	-	-	2	-	2	2	25	75	100

Learning objectives

The objectives of this course are to

- Identify amino acids by qualitative test
- Prepare biomolecules from its sources
- Estimate phosphorus quantitatively

I. Qualitative analysis of amino acids

a) Arginine b)Cysteine c) Tryptophan d)Tyrosine e) Histidine

II. Biochemical preparations

a) Preparation of casein from milk.

b)Preparation of starch from potato.

c)Preparation of albumin from egg.

III Group Experiment

Determination of Iodine/ Saponification number of an edible oil(Demonstration) .

Course Outcome

CO	On completion of this course, students will be able to	Programme Outcome
CO1	Qualitatively analyze the amino acids and report the type of amino acids based on specific tests	PO1,PO2,PO3
CO2	Prepare the macronutrients from the rich sources.	PO1,PO2,PO3
CO3	Check the quality of edible oil	PO1,PO2,PO3

Text books

- 1.Laboratory manual in Biochemistry, J. Jayaraman, 2nd edition, NewAge International Publishers, 2011,
2. An Introduction to Practical Biochemistry, David T. Plummer, 3 rd edition, Tata McGraw-Hill Publishing Company Limited, 2001.

Reference books

1. Biochemical Methods, Sadasivam S and Manickam A, 4h edition, NewAge International Publishers, 2016
2. Essentials of Food and Nutrition, Vol. I & II, M.S. Swaminathan.

Mapping with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO1	PSO2	PSO3	PSO4
CO 1	2	3	3				3	3	3	3
CO 2	2	3	3				3	3	3	3
CO 3	2	3	3				3	3	3	3

S - Strong (3)

M - Medium (2)

L -Low