Ist B. Sc (2023-2024)

Biochemistry

SEMESTER I

Title of the Course	**: BIOMOLECULES**		
Category of the Course	**: CORE COURSE**	**Semester**	**I**
Course Code	**: U1R3BCCC1**	**Nature of the Skill**	**: EMPLOYABILITY**
Marks	**: CIA:25+ Ext: 75 = 100**	**Hrs/Week**	**5**
Credits	**: 5**	**Total Inst. Hrs**	**75**

Course objectives:

The objectives of this course are to

1. Introduce the structure, properties and biological significance of carbohydrates
2. Comprehend the classification, functions and acid base properties of amino acids
3. Elucidate the various levels of organization of Proteins.
4. Impart knowledge on the classification, properties and characterization of lipids.
5. Acquaint with the classification, structure, properties and functions of nucleic acids

Unit I **14 Hours**

Molecules in Life:

Definition, scope and significance of Biochemistry. Important discoveries in Biochemistry. Basic principles of organic chemistry, role of carbon, types of functional groups, chemical nature of water, pH and biological buffers. An overview of biomolecules, trace elements, minerals & vitamins.

Unit II **17 Hours**

Carbohydrates:

Definition, empirical formulae, classification, biological importance. Monosaccharides: Stereochemistry of monosaccharides, (+) and (-), D and L, epimers, anomers, and diastereo isomers (ICT). Disaccharides: Establishment of structures of sucrose and lactose, biological importance and structure of isomaltose, trehalose and maltose. Polysaccharides: Partial structure, occurrence and importance of starch, glycogen, inulin, cellulose, chitin, pectin and heparin, hyaluronic acid, teichoic acid and chondroitin sulphate (ASSIGNMENT). Bacterial cell wall polysaccharide, peptidoglycans.

Unit III **15 Hours**

Amino acids and Proteins:

Structure and classification of amino acids. Peptides: Peptide bond, structure and biological importance(ASSIGNMENT) Primary Structure of proteins, methods of determining N- and C- terminal

amino acids, amino acid composition. Sequencing by Edman's degradation method. Secondary Structure – α Helix. β-sheet, β-bend (ICT). Tertiary structure of myoglobin and quaternary structure of hemoglobin, denaturation and renaturation of proteins.

Unit IV **17 Hours**

Lipids:

Classification and biological role. Fatty acids – Nomenclature of saturated and unsaturated fatty acids. Physiological properties of fatty acids. Acylglycerols: Mono, di and triglycerols. Saponification value, iodine value, acid value(Assignment) and their significance. Phosphoglycerides: Structure of lecithin, cephalins, phosphotidylinosital, plasmalogens, and cardiolipin. Biological role of phosphoglycerides. Sphingolipids: Structure and importance of sphingomyelin. Glycosphingolipids: Structure and importance of gangliosides and cerebrosides. Eicosanoids: Structure of PGE2, and PGF2α importance of prostaglandins (ICT).

Unit V **12 Hours**

Nucleic acids:

Composition of DNA. Nucleosides and nucleotides. Chargaff's rule. Watson and Crick model of DNA. Melting of DNA (Tm) (ICT). RNA: Composition, types (mRNA, tRNA and rRNA), secondary structures of tRNA – clover leaf model.

Course Outcomes:

Course Name – BIOMOLECULES		**Course Code - U1R3BCCC1**	**Knowledge Level**
After completion of this course, students would be able to			
CO1	Classify, illustrate the structure and explain the physical and chemical properties of carbohydrates.		K1
CO2	Indicate the classification, structure, properties and biological functions of amino acids.		K1
CO3	Explain the classification and elucidate the different levels of structural organization of proteins.		K1
CO4	Elaborate on classification, structure, properties, functions and characterization of lipids		K1, K4

CO5	Describe the structure, properties and functions of different types of nucleic acids	K1

Text Books:

1. Textbook of Medical Biochemistry – MN Chatterjee & Rana Shindee, 7th Edition, Jaypee Publishers, 2007.
2. Introduction to Biochemistry – Mary K. Campbell & Shawn O. Farrell, 1st Edition, Cengage Learning, 2009.

Reference Books:

1. Lehninger Principles of Biochemistry- `David L. Nelson & Michael M. Cox, 4th Edition, W. H. Freeman Publication, 2004.
2. Biochemistry-Donald Voet & Judith G. Voet ,3rd Edition, John Wiley and Sons Publication, 2004
3. Biochemistry- Jeremy M Berg, John L Tymoczko, and LubertStryer,6th Edition, Freeman Publications, 2006.

e-Learning Resources:

1. https://youtu.be/iuW3nk5EADg
2. https://youtu.be/Fp1wKo72b2A
3. https://youtu.be/6AfRX6oh9-E

Relationship Matrix for CO, PO & PSO

Title of the Course: BIOMOLECULES							**Course Code: U1R3BCCC1**			
Course Outcomes (COs)	**PO**						**PSO**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	-	-	-	-	-	3	-	-	3
CO2	3	-	-	-	-	-	3	-	-	3
CO3	3	-	-	-	-	-	3	-	-	3
CO4	3	-	-	2	-	-	3	2	-	3
CO5	3	-	-	-	-	-	3	-	-	3

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

Title of the Course	**: Practical - I Biomolecules**		
Category of the Course	**: Core Course**	**Semester**	**I**
Course Code	**: UIR3BCCC2P**	**Nature of the Skill**	**: EMPLOYABILITY**
Marks	**: CIA:40+ Ext: 60 = 100**	**Hrs/Week**	**4**
Credits	**: 5**	**Total Inst. Hrs**	**60**

Course objectives:

The main objectives of this course is to

1. Identify the biomolecules carbohydrates by qualitative test.
2. Identify the biomolecules and amino acids by qualitative test.
3. Determine the quality of Lipids by titrimetric methods.
4. Isolate nucleic acids from plant source.
5. Isolate nucleic acids from animal source.

I Qualitative test for

1) Carbohydrates

a) Glucose b) Fructose c) Arabinose d) Maltose e) Sucrose f) Lactose g) Starch

2) Amino acids

a) Arginine b) Cysteine c) Histidine d) Proline e) Tryptophan f) Tyrosine g) Methionine

II Titrimetric methods

1) Determination of Saponification value of an edible oil

2) Determination of Iodine number of an edible oil

3) Determination of Acid number of an edible oil

III Group Experiments

1) Isolation of DNA from plant/animal source.

2) Isolation of RNA from rich source.

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Qualitatively analyze the carbohydrates and report the type of carbohydrate based on specific tests	K1, K2, K3
CO2	Qualitatively analyze amino acids and report the type of amino acids based on specific tests	K1, K2, K3
CO3	Determine the Saponification, Iodine and acid number of edible oil	K1, K3, K4
CO4	Isolate the nucleic acid from biological sources	K1, K3
CO5	Qualitatively Analyze the Proteins.	K1, K2, K3

Text books

1. David T Plummer, An Introduction to Practical Biochemistry, 3rd edition, Tata McGraw-Hill Edition
2. J. Jayaraman Laboratory Manual in Biochemistry New Age International (P) Limited Fifth edition 2015
3. S. Sadasivam A. Manickam Biochemical Methods New Age International Pvt Ltd publisher's third edition 2018

Reference books

1. Rageeb, Kiran Patil, M. Bakshi Rahman, Sufiyan Ahmad Raees a Practical book on BiochemistryEverest publishing house1st Edition, 2019
2. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd ed, 2005.
3. Biochemical Tests – Principles and Protocols. Anil Kumar, SarikaGarg and NehaGarg. Vinod Vasishtha Viva Books Pvt Ltd, 2012.
4. Harold Varley, Practical Clinical Biochemistry, CBS. 6 editions, 2006.
5. Keith Wilson and John Walker. Principles and Techniques of Practical Biochemistry, 4thedition, Cambridge University press, Britain.1995.

Web resources

1. https://www.pdfdrive.com/instant-notes-analytical-chemistry-e912659.html 14
2. https://www.pdfdrive.com/analytical-biochemistry-e46164604.html
3. https://www.pdfdrive.com/biochemistry-books.html

Relationship Matrix for CO, PO & PSO

Title of the Course: Major Practical – I							**Course Code: U1R2BCCC2P**			
Course Outcomes (COs)	**PO**						**PSO**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	3	3	-	-	-	3	3	3	3
CO2	2	3	3	-	-	-	3	3	3	3
CO3	2	-	3	2	-	-	3	3	3	3
CO4	2	-	3	-	-	-	3	3	3	3
CO5	2	-	3	-	-	-	3	3	3	3

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

Title of the Course : MEDICINAL DIET

Category of the Course : Non Major Elective

Nature of the Skill : Entrepreneurship

Marks : CIA:25+ Ext: 75 = 100 Hrs/Week : 2

Credits : 2 Total Inst. Hrs : 30

Course objectives:

The main objectives of this course are to

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

Unit I **06 Hours**

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.

Unit II **06 Hours**

Diet modification in Gastrointestinal diseases: Peptic ulcer, Diarrhea, Lactose intolerance, Constipation and Malabsorption syndrome.

Unit III **06 Hours**

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

Unit IV **06 Hours**

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

Unit V **06 Hours**

Diet Modification in Diabetes, Renal and Cardio-vascular Diseases-Diabetes, acute & chronic glomerulonephritis, nephrosis, renal failure, kidney stone and Hypertension.

Course Outcomes

CO	On completion of this course, students will be able to	Program outcomes
CO1	Possess basic knowledge about diet	K1
CO2	Sketch diet plan for GI diseases	K1, K4, K5, K6
CO3	Sketch diet plan for liver diseases	K1, K4, K5, K6
CO4	Sketch a diet plan for Infectious diseases	K1, K4, K5, K6
CO5	Prepare diet chart for Diabetes Renal and Cardio-vascular diseases	K1, K4, K5, K6

Text Books

1. M. Raheena Begum, A Text Book of Foods, Nutrition and Dietetics, Sterling Publishers Pvt. Ltd.
2. M.V. Raja Gopal, Sumati.R., Mudambi, Fundamentals of foods and Nutrition, Wiley Eastern Limited, Year-1990.
3. William S.R Nutrition and Diet Therapy, 1985, 5thedition, Mosly Co. St. Louis.

Reference books

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

Relationship Matrix for CO, PO & PSO

Title of the Course: MEDICINAL DIET										
Course Outcomes (COs)	**PO**						**PSO**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	-	-	-	-	-	3	3	-	3
CO2	2	-	-	2	3	2	3	3	-	3
CO3	2	-	-	2	3	2	3	3	-	3
CO4	2	-	-	2	3	2	3	3	-	3
CO5	2	-	-	2	3	2	3	3	-	3

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

Title of the Course : LIFE STYLE DISEASES

Category of the Course : Non Major Elective

Nature of the Skill : Entrepreneurship

Marks : CIA:25+ Ext: 75 = 100 Hrs/Week : 2

Credits : 2 Total Inst. Hrs : 30

Course objectives:

The main objectives of this course are to

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

Unit I **06 Hours**

Lifestyle diseases: Definition, Factors contributing to lifestyle diseases – Physical inactivity, Poor food habits, disturbed biological clock, sleep deprivation.

Unit II **06 Hours**

Top lifestyle diseases, Impact of Lifestyle diseases on family, society and economy of country.

Unit III **06 Hours**

Causes, symptoms, types, preventive measures and treatment of Obesity, cardiovascular diseases, diabetes and cancer.

Unit IV **06 Hours**

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

Unit V **06 Hours**

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

Course outcomes

CO	On completion of the course the students will be able to	Program Outcomes
CO1	Define Life style diseases and describe the contributing factors	K1
CO2	Enumerate the top life style diseases and its impact on life.	K1, K4, K5
CO3	Elaborate the treatment and prevention measures of common lifestyle diseases.	K1, K4, K5
CO4	Highlight the life style diseases that affects the women's health	K1, K4, K5
CO5	Illustrate the various measures for prevention of life style diseases	K1, K4, K5

Text books

1. James M R, Life style Medicine, 2nd Edition, CRC Press, 2013
2. Akira Miyazaki, New Frontiers in Life style -Related Disease, Springer,2008

Reference books

1. Steyn K, Life style and related risk factors for chronic diseases
2. Willett WC, Prevention of chronic disease by means of diet and lifestyle.
3. Kumar M & R. Kumar, Guide to prevention of life style diseases. Deep & Deep publications

Web resources

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

Relationship Matrix for CO, PO & PSO

Title of the Course: Life Style Diseases										
Course Outcomes (COs)	PO						PSO			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	-	-	-	3	3	-	3
CO2	2	-	-	2	3	-	3	3	-	3
CO3	2	-	-	2	3	-	3	3	-	3
CO4	2	-	-	2	3	-	3	3	-	3
CO5	2	-	-	-	-	-	3	3	-	3

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

Title of the Course	**: Foundation Course**		
Category of the Course	**: Foundation Course**	**Semester**	**I**
Course Code	**: U1R3BCFC**	**Nature of the Skill**	**: Entrepreneurship**
Marks	**: CIA:25+ Ext: 75 = 100**	**Hrs/Week**	**2**
Credits	**: 2**	**Total Inst. Hrs**	**30**

Course objectives:

The objectives of this course are to

1. Understand the basic concepts in chemistry.
2. Understand the fundamental concepts in organic chemistry.
3. Explain the theories of origin of life on earth.
4. Illustrate the structure, composition and functions of cell and its organelles.
5. Familiarize with genetics.

Unit I **06 Hours**

Some Basic Concepts of Chemistry

General Introduction- Importance and scope of Chemistry. Nature of matter, laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules. Atomic and molecular masses, mole concept and molar mass, percentage composition, empirical and molecular formula.

UNIT II **08 Hours**

Cell biology

Cell as basic unit of life, prokaryotic and eukaryotic cells and their similarities and differences. Structure and functions of cell wall, plasma membrane, endoplasmic reticulum (rough endoplasmic reticulum and smooth endoplasmic reticulum), golgi apparatus, lysosomes, micro bodies (peroxysomes and glyoxysomes), vacuoles, ribosomes, centriole and basal bodies, Mitochondria, chloroplasts, nucleus, nucleolus, nuclear membrane and organization of chromosomes

UNIT III **05 Hours**

Genetics

Chromosomes – structure and types – genes and genomes – linkage and crossing over – gene mapping – recombination of chromosomes – mutation – chromosomal aberrations – DNA as genetic material – structure of DNA – replication of DNA – structure of RNA and its types

UNIT IV **05 Hours**

Biotechnology

Recombinant DNA technology – transgenic plants and microbes – plant tissue culture and its application – protoplasmic fusion – single cell protein.

UNIT V **06 Hours**

Plant physiology

Photosynthesis – significance – site of photosynthesis – photochemical and biosynthetic phases – electron transport system – cyclic and non - cyclic

and C photophosphorylation – C pathways – photorespiration – factors – saprophytic –parasitic and insectivorous plants – chemosynthesis – respiration.

Course Outcomes

Course Name - Foundation Course		**Course Code – U1R3BCFC**	**Knowledge Level**
After completion of this course, students would be able to			
CO1	Understand the basic concepts in chemistry		K2
CO2	Understand the fundamental concepts in organic chemistry		K3
CO3	Explain the theories of origin of life on earth		K3
CO4	Illustrate the structure, composition and functions of cell and its organelles		K4
CO5	Familiarize with genetics		K1

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3. 3. Biochemical Tests – Principles and Protocols. Anil Kumar, SarikaGarg and NehaGarg. Vinod Vasishtha Viva Books Pvt Ltd, 2012.

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3. https://youtu.be/6AfRX6oh9-E

Relationship Matrix for CO, PO & PSO

Title of the Course: Foundation Course							**Course Code: U1R3BCFC**			
Course Outcomes (COs)	**PO**						**PSO**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	-	3	-	-	2	3	3	3	3
CO2	3	-	3	-	-	-	3	-	-	3
CO3	2	-	-	-	-	-	-	3	3	3
CO4	2	-	-	-	-	3	3	3	3	3
CO5	2	-	-	-	-	-	-	3	3	3

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