

**SHRI GOVIND GURU UNIVERSITY**  
**Programme: B.Sc. (Biochemistry) Semester: V**  
**Syllabus with effect from: June-2018**

**Paper Code: C – 1**

**Title of Paper: Molecular Biology - II**

**Unit – I**

**Regulation of Gene Expression**

Principle of gene regulation

Definition : constitutive enzyme, induced enzyme, constitutive gene expression, inducible and induction, repressible and repression activators, repressors, operon

Lac operon hypothesis, Tryptophan operon hypothesis

Regulation of gene expression in eukaryotes

**Unit – II**

**Gene Mutation & Repair**

Definition: mutation, hotspots, mutagens, Base analogues

Agents modifying purines and pyrimidine, Agents producing distortion in DNA

Thymine dimer, X-rays

Mismatch repair, Base excision repair, Nucleotide excision repair, Direct repair : UV repair system in e-coli

**Unit – III**

Protein trafficking; Signal transduction. G protein mediated signal transduction, Protein kinases mediated signal transduction, MAPK cascade.

**Unit – IV**

Retroviruses and retroposons; DNA rearrangement Genomics – Comparative and functional genomics; SNPs.

**Reference Books:**

- Principle of Biochemistry-Lehninger
- Gene-Levin-8
- Molecular Biology of the Gene-Watson et al
- Gene Cloning by T.A. Brown
- Elements of Biotechnology by R. K. Gupta.

**Programme: B. Sc.(Biochemistry) Semester:V**  
**Syllabus with effect from: June-2018**

**Paper Code: C – 2**

**Title of Paper: Plant Biochemistry**

**Unit – I**

Plant cell Structure,  
Biochemistry of Specialized Plant cell Organelles, Primary and Secondary cell wall, Plasmodesmata (structure and Function),  
Water relations of plants: Role of water, Absorption, Adsorption, Conduction and Transpiration, Guttation, Water Balance and Stress.

**Unit – II**

Secondary Metabolites-Phenols, Tannins, Lignin, Flavonoids, Waxes, Cutin and Suberin-structures and functions.

**Unit – III**

Photosynthesis:  
Hill's Reaction, Light Reaction, Dark Reaction C<sub>3</sub> and C<sub>4</sub> cycles, Photo Respiration, Factors affecting rate of Photosynthesis.

**Unit – IV**

Plant Hormones:  
Auxins, Cytokinins, Gibberalic acids, Absisic acid, Brassinosteroids, Salicylic acid, Jasmonic acid.

**ReferenceBooks:**

- Plant Physiology by Salis burry and Ross
- Plant Biochemistry by Hans - Walter Heldt

## Syllabus with effect from: June-2018

**Paper Code: C – 3**

**Title of Paper: Regulation of Metabolic Pathway**

### **Unit – I**

Significance and importance of studying the regulation of metabolism. General mechanisms of regulations (Feedback, Allosteric, Covalent modification of enzymes, hormonal and gene expression level).

### **Unit – II**

Signal Transduction. Molecular mechanism of signal transduction, Gated ion channels, Receptor enzyme, G protein coupled receptor and secondary messenger, Regulation of transcription by steroid hormone, Regulation of the cell cycle by protein kinases.

### **Unit – III**

Regulation of carbohydrate metabolism. Overall pathway and regulation of Glycolysis, tricarboxylic acid cycle, Pentose phosphate pathway, glyoxylate pathway). Regulation of Gluconeogenesis, glycolysis, starch, cellulose synthesis.

### **Unit – IV**

Regulation of Lipid metabolism: Overall pathways and regulation of fatty acid synthesis and breakdown. Regulation of complex lipid.

Regulation of Purine and pyrimidine synthesis and catabolism

Regulation of amino acid metabolism. Overall anabolic and catabolic pathways of pyruvate family, aspartate family, aromatic family.

### **Reference Books:**

1. [www.expasy.ch/tools/pathways](http://www.expasy.ch/tools/pathways)
2. Biochemistry of Signal Transduction and Regulation. ,Gerhard Krauss (Laboratorium fur Biochemie, Universitat Bayreuth, D-95440 Bayreuth, Germany); Translator: Bonnie L. Cooper; Translator: Nancy Schönbrunner , Edition: 2nd ,ISBN: 3527600051, 2003 Wiley VCH, Darmstadt, FRG
3. Biochemistry, By Matthews, van Holde and Ahern. 3rd ed. Prentice Hall; 3 edition (9 Dec 1999), ISBN-10: 0805330666
4. Biochemistry by Lubert Stryer, W. H. Freeman and Company. 4th /6<sup>th</sup> edition, 2000/2004 Hardback, ISBN 0716720094
5. Fundamental of biochemistry by D Voet, J.G Voet and C.W Pratt, John Wiley & Sons, Inc., New York, 2<sup>nd</sup> edition, 2005
6. Principles of Biochemistry by Albert Lehninger, W.H. Freeman & Company; 3rd edition (February 2000), ISBN-10: 1572591536
7. Harper's Biochemistry : Harper, 27<sup>th</sup> Edition, McGraw-Hill Publishing Co; Robert K. Murray, Daryl K. Granner, Victor W. Rodwell, 2006 ISBN-10: 0071461973
8. Biochemistry (with BiochemistryNOW) by Mary K. Campbell , Shawn O. Farrell, Brooks Cole; 5 edition (January 14, 2005), ISBN-10: 0534405215.
9. The Absolute, Ultimate Guide to Lehninger Principles of Biochemistry, Third Edition, Study Guide and Solutions Manual (Paperback), W. H. Freeman; 3rd edition (February 29, 2000), ISBN-10: 1572591676

**SHRI GOVIND GURU UNIVERSITY**  
**Programme: B. Sc. (Biochemistry) Semester: V**  
**Syllabus with effect from: June-2018**

**Paper Code: C – 4**

**Title of Paper: Clinical Biochemistry**

**Unit – I**

Clinical biochemistry- definition, major causes of disease  
Correlation of biochemical pathways with diseases development with appropriate example.

Blood: general composition- physical characteristics, functions,  
Functions of RBC, WBC, platelets, blood fluid- composition and functions of C.S.F and lymph.

Composition of urine - normal and abnormal.

**Unit – II**

Plasma Proteins- Biochemical Importance.

General Characteristics of Plasma Proteins Function of Plasma Proteins.

Chemistry, clinical significance and importance of -- Albumin, HaptoGlobin,  $\alpha$  AT<sub>1</sub>, Transferrin, Ceruloplasmin.

Lipoproteins (different types, their role, factor affecting LDL and HDL concentration in blood.).

Lipid profile.

**Unit – III**

Organs Functions Tests:

Liver Functions Tests (Serum Bilirubin, V.D. Bergh, Urine bilirubin, Total plasma protein Total albumin A: G ratio, Serum Cholesterol), Jaundice-(types, causes and symptoms).

Kidney Functions Tests, (Tests based on Glomerular filtration – Urea clearance Test Endogenous Creatinine clearance test, Inulin clearance test. Tests based on tubular function- Concentration test, Dilution test.) , Nephritis-(types, causes and symptoms).

**Unit – IV**

Haemostasis - vascular system, platelets plugs, formation of blood clotting,  
Role of Blood Platelets, biochemical reaction in the clotting process.

Fibrinolytic systems.

Haemoglobin- chemistry and structure of haemoglobin.

Definition and types of anemia.

Normal types and properties of haemoglobin.

Life cycle of RBCs.

**ReferenceBooks:**

- Harper's illustrated Biochemistry - Robrert. K. Murray.
- Human Biochemistry -James. M. Orten&Otto.W.Neuhaus.
- Biochemistry by clinical correlation by Devlin.

**SHRI GOVIND GURU UNIVERSITY**  
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**Syllabus with effect from: June-2018**

**Paper Code: E – 1**

**Title of Paper: Omics**

**Unit – I**

Introduction to the proteome and the genome, codon bias, gene expression, Genome size-C value paradox, DNA sequencing: Maxam-Gilbert, Sanger, Pyrosequencing, automated DNA sequencing. other features of nucleic acid sequencing.

Analysis and Annotation-ORF, Exon-intron boundaries, Protein motif and domains.

**DNAMicroarray technology** The generation of cDNA expression libraries, their robotic arraying, Complex hybridization on DNA chips.

**Unit – II**

Human genome project- Strategies for large-scale sequencing projects; landmarks on chromosomes generated by various mapping methods; BAC libraries and shotgun libraries preparation;

Physical map-cytogenetic map, contig map, restriction map.

Model organisms and other genome projects (*Arabidopsis*, *Caenorhabditis elegans*);

Comparative genomics of relevant organisms such as pathogens and non-pathogens

**UNIT –**

**III**

Relationship between protein structure and function, Identification and analysis of proteins by 2D analysis; Spot visualization and picking; Tryptic digestion of protein and peptide fingerprinting; Mass spectrometry: ion source (MALDI, spray sources); analyzer (ToF, quadrupole, quadrupole ion trap) and detector.

**Protein-protein interactions:** Solid phase ELISA, pull-down assays (using GST-tagged protein), far western analysis, surface plasmon resonance technique, Yeast two hybrid system, Phage display; Protein interaction maps.

**Protein arrays**-definition, applications-diagnostics, expression profiling. Uses of automated technologies to generate protein arrays and chips

**Unit – IV**

**Transcriptomics:** Comparative transcriptomics, Differential gene expression; Genotyping/SNP detection; Detection technology; Computational analysis of microarray data.

**Metabolomics:** Human Metabolome Project, Clinically diagnostics metabolites Analytical Tools, Applications, Metabolite databases, Data Analysis Tools.

**Reference Books:**

- Discovering Genomics, Proteomics and Bioinfo, A.M, Campbell, C,S,H, Press, (2003).
- Essential of Genomics and Bioinformatics C,W, Sensen, Wiley (2003),
- Hand book of Comparative Genomics: Principle and Methodology by Cecilia Saccone, Graziano Pesole, Wiley-LISS publication (2003),
- Proteomics : From protein sequencing to function by S.R. Pennington and M.J. Dunn, Viva Books, Private Ltd (2001)
- Introduction to Proteomics by Daniel C, Liebler, Humana Press

**SHRI GOVIND GURU UNIVERSITY**  
**Programme: B. Sc.(Biochemistry) Semester: V**  
**Syllabus with effect from: June-2018**

**Paper Code: E – 2**

**Title of Paper: r-DNA Technology**

**Unit – I**

**Introduction to rDNA technology**

Steps involved in rDNA technology, isolation of DNA from different sources, concept of restriction and modification, restriction endonucleases, manipulative enzymes used in cloning. Introduction of vector and host. Introduction to generation of genomic and cDNA libraries.

**UNIT 2**

**Gene amplification through PCR**

Polymerase Chain Reaction: Principle, methodology, primer designing, types of polymerase and factors affecting PCR, advantages, limitations and application PCR.

Variants of PCR: Reverse Transcriptase PCR, Real Time PCR, Inverse PCR, anchored PCR, nested PCR, overlap extension PCR, hot start PCR, multiplex PCR, touchdown PCR, ARMS (amplification refractive mutation system) PCR.

**UNIT 3**

**Characterization of DNA**

Methodology and application of DNA fingerprinting methods (RFLP with probe introduction, RAPD, AFLP, SSR, SCAR, DGGE)

Principle methodology and types of DNA sequencing (Sanger-Coulson method, Maxam-Gilbert method, Pyrosequencing)

**UNIT 4**

**Application of rDNA technology**

Improvement of plant, animals and microbes. Gene therapy, pharmaceutical products and molecular diagnostics, Molecular pharming. Metagenomics, Metabolic engineering.

**Reference Books:**

1. Recombinant DNA: Watson *et. al.*
2. Principle of gene manipulation: Old and Primerose
3. Gene cloning: T.A. Brown

4. Genetic engineering: SandyaMitra.
5. Molecular Biotechnology – Glick
6. Applied Molecular Genetics – Roger Miesfeld
7. Biotechnology – H. K. Das
8. Genetic Engineering- SmitaRastogi and Neelam Pathak
9. Animal Biotechnology- P. Ramadaas