DEPARTMENT OF BIOCHEMISTRY

GOVT. NAGARJUNA PG COLLEGE of SCIENCE, RAIPUR

B. Sc. BIOCHEMISTRY

(Semester System with CBCS)

Scheme and Syllabi of Examination

For

Session 2025-26

The syllabus for B.Sc. V & VI Semester (Semester System with CBCS and) Bio-Chemistry is hereby approved for the session2025-26. In case any change or modification is prescribed by Central Board of Studies or Higher Education Department, Govt. of Chhattisgarh with respect to content or distribution of marks for undergraduate syllabi, it will be implemented accordingly.

B. Sc. BIOCHEMISTRY
(Semester System with CBCS)
The syllabus with the paper combinations is as under

S. NO	COURSE TYPE	COURSE CODE	TITLE OF PAPER	MAX MARKS			MIN MARKS	CREDIT
				ESE	INT	TOTAL		
SEMESTER- V								
10	**DSE2A or DSE2B**	S5- BCH -5T (Elective)	Gene replication, expression and regulation **Or** Biotechnology	40	10	50	20	4
		S5- BCH -5P	LAB 5: Elective Gene replication, expression and regulation **Or** LAB5: Biotechnology	50	--- -	50	20	2
SEMESTER- VI								
11	**DSE2C or DSE2D**	S6- BCH -6T (Elective)	Biochemistry and Function of Hormones **Or** Plant Biochemistry	40	10	50	20	4
		S6- BCH -6P	LAB6: Biochemistry and Function of Hormones **Or** LAB6: Plant Biochemistry	50	--- -	50	20	2
12	**SEC-2**	S6 SEC-2P	Clinical biochemistry (Skill Enhancement Course)	50	--- -	50	20	2
Exit after successful completion of I to VI Semester student will be able to earn a Degree								

Programme Educational Objectives:

PEO 1: The graduating student shall become a professional assistant in the area of biochemistry.

PEO 2: The graduating student shall become a researcher in the field of biochemistry.

PEO 3: The graduating student will become an entrepreneur or a consultant or a freelancer in the area of biochemistry.

Program Outcome:

On Successful completion of this program the graduates shall have:

PO 1: Ability to apply the fundamental knowledge of Biomolecules, protein, biochemical techniques in the area of biochemistry.

PO 2: Ability to conduct experiment, analyze and interpreted the results.

PO 3: An ability to learn a system with its component, or process to meet desired need within realistic constraints.

PO 4: Ability to function in a multidisciplinary team.

PO 5: Ability to identify, formulate and solve the problems in the area of biochemistry.

PO 6: An understanding of professional and ethical responsibilities

PO 7: Ability to communicate effectively.

PO 8: The broad education necessary to understand the impact of Business solutions in a global, economic, environmental and societal context.

PO 9: Recognition of the need for and an ability to engage in lifelong learning in the area of biochemistry.

PO 10: Knowledge of contemporary issues in the area of biochemistry.

PO 11: An ability to use the techniques, skills and modern professional tools necessary for professional practice and for research.

PO 12: An ability to apply the relevant knowledge and managerial skills to manage the project of multidisciplinary nature.

Program Specific Objectives:

PSO 1- Students shall be able to identify, formulate and solve the problems of general metabolic disorders and able to establish correlation among social, health, food and environmental problems and way to find out its solutions with the knowledge of biochemistry.

PSO 2- Students shall be able to conduct the clinical biochemistry, Diagnostic biochemistry experiments as well as to analyze and interpret the results.

PSO 3- Students shall be able to use the biochemical techniques, Genetic Engineering & Biotechnology skills and modern pathological tools necessary for professional practice and for research.

Examination Scheme for theory Paper and Laboratory Course

Each theory paper and laboratory course of Biochemistry in all the Semester of graduation will carry maximum allotted marks of 50 for annual examinations. The examination pattern for theory and Laboratory course will be as follows.

Pattern of Question Paper

Each theory paper will have questions divided into four sections, A, B, & C. Section A will have 5 MCQ, (1 from each unit) of 1 mark each covering whole syllabus. Section B will have 5 short answer questions, one from each unit with internal choice, of 3 marks each to be answered about 75 words. Section C will have 5 questions, one from each unit with internal choice, of 05 marks each. The question has to be answered in about 150 words.

Internal marks will be given on the basis of internal exams.

Section	Type of Question	Word Limit	No. of Questions	Marks in each question	Marks in Question
Section A	Objective Type / MCQ	-	05 (1From Each Unit)	1	05
Section B	Short Answer Type	75-100 words	5 (From Each Unit with internal Choice)	2	10
Section C	Long Answer Type	150 - 250 Words	5 (From Each Unit with internal Choice)	05	25
			Total Marks		**40**

Examination Scheme for Practical Max. Marks 50

	Exercises	Max. Marks
1.	Major exercise -1	20
2.	Major exercise- 2	20
3.	Viva-voce	10
	Total	**50**

Multiple Entry Exit System (MEES) – Students may allow to multiple exits in this three year UG program depending on the completion years within this period, one will be able to earn a certificate after successful completion of I and II semester, diploma after successful completion of I to IV semester or degree after successful completion of I to VI semester.

Part A- Introduction

Program: B.Sc. Course	**Semester: V**	**Year: (Jul-Dec) 2025**	**Session: 2025-26**

1.	**Course Code**	S5- BCH 5T	
2.	**Course Title**	Gene Replication, Expression and Regulation	
3.	**Course Type**	DSE 2A	
4.	**Pre-requisite (if any)**	To study this course, a student must have completed I to IV Semester in biochemistry	
5.	**Course learning Outcome (CLO)**	*On successful completion of the course, the student shall be able to:* CO.1 – Distinguish the process of replication in prokaryotes as well as eukaryotes. CO.2 – Distinguish the process of transcription in prokaryotes as well as eukaryotes. CO.3 – Distinguish the process of translation in prokaryotes as well as eukaryotes. CO.4 – Discuss the process of transcriptional regulation in prokaryotes as well as eukaryotes. CO.5 – Explain the process of DNA damage and various DNA repair mechanisms.	
6.	**Credit Value**	4	
7.	**Marks**	Max. Marks-10+40	Min. Marks-20

Part B- Content of the Course

Total numbers of Lectures (in hours):60		
Unit	**Topics**	**Numbers of Lectures**
I	**Basic Concepts of Genetic Information** Salient features of Eukaryotic, prokaryotic and viral genomes; highly repetitive, moderately repetitive and unique DNA sequences. Tm and buoyant density and their relationship with G-C content in DNA. **C**hirality of DNA, tertiary Structure of DNA. Structure and properties of RNA: secondary and tertiary structures. Nucleic acid hybridization: Cot value and satellite DNA.	12
II	**DNA replication:** Features of replication, enzymes and proteins in DNA replication, E coli DNA polymerases, stages of replicationinitiation, elongation and termination. **Replication In Eukaryotes:** end replication problem, telomerase, various modes of replication. Comparison of replication in prokaryotes and eukaryotes. Inhibitors of DNA replication.	12
III	**Transcriptionin prokaryotes**: RNA polymerases, transcription cycle in bacteria, sigma factor, bacterial promoters, identification of DNA binding sites by DNA footprinting, various stages of RNA synthesis, initiation, elongation and termination, rho-dependent and rho-independent termination. Inhibitors of transcription and applications as antimicrobial drugs. **Transcriptionin eukaryotes**: Comparison between prokaryotic and eukaryotic transcription. The three classes of eukaryotic RNA polymerases, transcription by RNA polymerase II, RNA polymerase II core promoters, general transcription factors, transcription by RNA polymerase I and III. Inhibitors of eukaryotic transcription and their applications **RNA Processing**: Types of RNA processing- polyadenylation and capping, the spliceosome machinery, splicing pathways, group I and group II introns, alternative splicing, exon shuffling and RNA editing.	12
IV	**Translation:** Genetic code and its characteristics, triplet nature, degenerate, deciphering the genetic code, Wobble hypothesis. Suppressor tRNAs. Exceptions to the nearly universal genetic code. Messenger RNA, transfer RNA, charging of tRNA. The structure of ribosome. Three stages of translation-initiation, elongation and termination. Translation	12

	in eukaryotes. Regulation of translation. Comparison of prokaryotic and eukaryotic protein synthesis. Inhibitors of translation and their clinical importance.	
V	**Regulation of gene expressionin prokaryotes**: Principles of gene regulation, negative and positive regulation, concept of operons, regulatory proteins, activators, repressors, DNA binding domains, regulation of lac operon and trp operon. Regulatory RNAs in bacteria, small RNA and riboswitches. **Regulation of gene expression in eukaryotes**: Gene regulation by chromatin remodeling, regulation of galactose metabolism in yeast, action of enhancers and insulators, working of activators and repressors, concept of combinatorial control. Regulatory RNAs in eukaryotes: synthesis and mechanism of siRNA and miRNA.	12

Key Words: Chirality, DNA Replication, Transcription, Translation, Gene Expression, Operon.

Part C- Learning resources

Text Books, Reference Books, Other resources

1.Molecular Cell Biology (2013) 7th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M.,Bretscher, A.,Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (NewYork), ISBN:13:978-1-4641-0981-2.
2.Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., JohnWiley&Sons,Inc. (New York), ISBN:13: 978-0470-23396-2
3.Molecular Biology of the Gene (2008) 6th ed., Watson, J.D., Baker, T.A., Bell, S.P.,Gann, A., Levine, M. and Losick, R., Cold Spring Harbor Laboratory Press, Cold springHarbor (New York), ISBN:0-321-50781 / ISBN:978-0-321-50781-5.
4. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W. H. Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6 / ISBN:10-14641-0962- 1.
5. Principles of Genetics (2010) 5th ed., Snustad, D.P. and Simmons, M.J., John Wiley &Sons Asia, ISBN:978-0-470-39842-5.

E-learning Resources

https://www.genome.gov/genetics-glossary/DNA-Replication
https://www.nature.com/scitable/topicpage/gene-expression-14121669/
https://www.genome.gov/genetics-glossary/Mutation
https://www.frontiersin.org/articles/10.3389/fmicb.2020.624830/full

Part D- Assessment and Evaluation (As per University and Autonomous Guideline)

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)

Assessment	Mode	Max. Marks	Min. Marks	Pattern
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**	**20**	

Part A- Introduction

Program: B.Sc. Course	**Semester: V**	**Year: (Jul-Dec) 2025**	**Session: 2025-26**
1.	**Course Code**	S5BCH 5P	
2.	**Course Title**	LAB5: Gene Replication, Expression and Regulation	
3.	**Course Type**	DSE 2A Practical	
4.	**Pre-requisite (if any)**	To study this course, a student must have completed I to IV Semester in biochemistry	
5.	**Course learning Outcome (CLO)**	**Course Outcomes (COs)** On successful completion of the course, the student shall be able to: CO1- Demonstrate assay for nucleic acid by various methods. CO2- Demonstrate isolation process of DNA from different samples. CO3- Apply electrophoresis technique for different isolated compounds. CO4- Illustrate PCR techniques. CO5- Illustrate SDS-PAGE techniques by biomolecules.	
6.	**Credit Value**	2	
7.	**Marks**	Max. Marks-50	Min. Marks-20

Part B- Content of the Course

Total numbers of Lectures (in hours):30	
Tentative Practical List	1. Estimation of DNA by diphenylamine method. 2. Effect of temperature on the viscosity of DNA using Oswald's viscometer. 3. Extraction of RNA and its estimation by Orcinol method. 4. Isolation and estimation of RNA from yeast. 5. Agarose Gel Electrophoresis and separation of DNA 6. Isolation of DNA from bacteria/eukaryotic cells and check its purity **Note:** This is tentative list; the teachers concern can add more program as per requirement.

Part C- Learning resources

Text Books, Reference Books, Other resources

Recommended Books

1.Molecular Cell Biology (2013) 7th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M.,Bretscher, A.,Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (NewYork), ISBN:13:978-1-4641-0981-2.
2.Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., JohnWiley&Sons,Inc. (New York), ISBN:13: 978-0470-23396-2
3.Molecular Biology of the Gene (2008) 6th ed., Watson, J.D., Baker, T.A., Bell, S.P.,Gann, A., Levine, M. and Losick, R., Cold Spring Harbor Laboratory Press, Cold springHarbor (New York), ISBN:0-321-50781 / ISBN:978-0-321-50781-5.
4. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W. H. Freeman & Company (New York), ISBN:13: 978-1-4292-3414-6 / ISBN:10-14641-0962- 1.
5. Principles of Genetics (2010) 5th ed., Snustad, D.P. and Simmons, M.J., John Wiley &Sons Asia, ISBN:978-0-470-39842-5.
6. The World of the Cell, Wayne M. Becker, Lewis J. Kleinsmith, Jeff Hardin, Gregory Paul Bertoni, 7th Edition.
7.Gene Machine, VenkiRamakrishnan

E-learning Resources

https://link.springer.com/article/10.1007/s11368-019-02427-y
https://biocyclopedia.com/index/biotechnology_methods/biochemistry/estimation_of_rna_by_the_orcinol_method.php
https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/dna-binding
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2874567/
https://pubmed.ncbi.nlm.nih.gov/22546956/

Part D- Assessment and Evaluation (As per University and Autonomous Guideline)

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**	**Min. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**	**20**	

Part A- Introduction

Program: B.Sc Course		**Semester: V**	**Year: (Jul-Dec) 2025**	**Session: 2025-26**
1.	**Course Code**	**S5 BCH 5T**		
2.	**Course Title**	**Biotechnology**		
3.	**Course Type**	**DSE 2B Theory**		
4.	**Pre-requisite (if any)**	To study this course, a student must have completed I to IV Semester in biochemistry		
5.	**Course learning Outcome (CLO)**	On successful completion of the course, the student shall be able to: 1. The students will acquire basic knowledge of recombinant DNA technology, DNA manipulation in prokaryotes and eukaryotes, engineering of DNA molecules using restriction and modification enzymes. 2. They will get acquainted with the use of cloning and expression vectors, creation of genomic and cDNA libraries and their applications. 3. Students will also understand the methods for production of proteins using recombinant DNA technology and their application in industrial systems.		
6.	**Credit Value**	04		
7.	**Marks**	Max. Marks-10+40	Min. Marks-20	

Part B- Content of the Course

Total numbers of Lectures (in hours):60		
Unit	**Topics**	**Numbers of Lectures**
I	Principles of gene cloning: Restriction and modification systems, restriction endonucleases and other enzymes used in manipulating DNA molecules. Ligation of DNA molecules, DNA ligase, sticky ends, blunt ends, linkers and adapters, homopolymer tailing, Synthetic oligonucleotides.	12
II	Plasmids and bacteriophages as vectors for gene cloning. Cloning vectors based on E. coli plasmids, pBR322, pUC8, pGEM3Z. Viruses as vectors, cloning vectors based on M13 and λ bacteriophage.	12
III	**Uptake of DNA by cells**, Selection and identification for transformed cells, Transfection. Chemical and physical methods of DNA introduction into cells. Direct selection, marker rescue. cDNA and Genomic libraries, Southern and Northern hybridization.	12
IV	**Plant genetic engineering**: gene isolation, gene transfer systems, Ti plasmid, plant virus vectors, electroporation, microinjection, microprojectile technology, Transgenic plants and animals. **Production of recombinant proteins** by eukaryotic cells. Fusion tags such as, polyhistidine, glutathione, maltose binding proteins and their role in purification of recombinant proteins.	12

V	**Fermentation technology** – Fermentors, general design of fermentor, fermentation processes, production of alcohols, antibiotics, steroids and enzymes. **Enzyme Technology** - Large scale production of enzymes, enzyme reactors. Enzyme electrodes, biosensors.	12

Key Words: Recombinant DNA, Transfection, Recombinant Protein, Transgenics

Part C- Learning resources

Text Books, Reference Books, Other resources
Suggested readings : 1. Principles of Gene Manipulation and Genomics (2006) 7th ed., Primrose, S.B., and Twyman, R. M., Blackwell publishing (Oxford, UK) 2. Gene Cloning and DNA Analysis (2010) 6th ed., Brown, T.A., Wiley-Blackwell publishing (Oxford, UK) 3. Molecular Biotechnology: Principles and Applications of Recombinant DNA (2010) 4th ed., Glick B.R., Pasternak, J.J. and Patten, C.L., ASM Press (Washington DC) 4. Molecular Cloning: A laboratory manual (2014), 4nded., Michael R Green and J. Sambrook Cold spring Harbor laboratory press (3vol.) https://www.klimud.org/public/atlas/idrar/web/www.irvingcrowley.com/cls/fund.htm https://www.mayoclinic.org/tests-procedures/prothrombin-time/about/pac-20384661 https://www.ncbi.nlm.nih.gov/books/NBK482339/ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6709845/

Part D- Assessment and Evaluation (As per University and Autonomous Guideline)

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**	**Min. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**	**20**	

Part A- Introduction

Program: B.Sc		**Semester: V**	**Year: (Jul – Dec) 2025**	**Session: 2025-26**
1.	**Course Code**	**S5 BCH 5P**		
2.	**Course Title**	**Lab - Biotecnology**		
3.	**Course Type**	**DSE-2B Practical**		
4.	**Pre-requisite (if any)**	To study this course, a student must have completed I to IV Semester in biochemistry		
5.	**Course learning Outcome (CLO)**	On successful completion of the course, the student shall be able to: Students will learn the experimental techniques of recombinant DNA technology and their biotechnological applications, such as separation of DNA fragments by Agarose gel electrophoresis, isolation of plasmid DNA from *E. coli*, transformation of *E. coli* cells, digestion of plasmid DNA, amplification of a DNA fragment by PCR, etc.		
6.	**Credit Value**	02		
7.	**Marks**	Max. Marks-10+40	Min. Marks-20	

Part B- Content of the Course

Total numbers of Lectures (in hours): 30	
	Topics
	Practical content 1. Agarose gel electrophoresis for separation of DNA fragments. 2. Isolation of plasmid DNA from *E. coli.* 3. Transformation of *E. coli* cells with plasmid DNA. 4. Digestion of plasmid DNA with restriction enzymes. 5. Amplification of a DNA fragment by PCR. 6. Complementation of β−galactosidase for Blue and White selection.

Key Words: SDS, DNA isolation, Restriction digestion, PCR

Part C- Learning resources

Text Books, Reference Books, Other resources

Suggested readings :

1. Principles of Gene Manipulation and Genomics (2006) 7th ed., Primrose, S.B., and Twyman, R. M., Blackwell publishing (Oxford, UK)
2. Gene Cloning and DNA Analysis (2010) 6th ed., Brown, T.A., Wiley-Blackwell publishing (Oxford, UK)
3. Molecular Biotechnology: Principles and Applications of Recombinant DNA (2010) 4th ed., Glick B.R., Pasternak, J.J. and Patten, C.L., ASM Press (Washington DC)
4. Molecular Cloning: A laboratory manual (2014), 4nded., Michael R Green and J. Sambrook Cold spring Harbor laboratory press (3vol.)
https://www.klimud.org/public/atlas/idrar/web/www.irvingcrowley.com/cls/fund.htm
https://www.mayoclinic.org/tests-procedures/prothrombin-time/about/pac-20384661
https://www.ncbi.nlm.nih.gov/books/NBK482339/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6709845/

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**	**Min. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**	**20**	

Part A- Introduction

Program: B.Sc. Course	**Semester: VI**	**Year: (Jan- Jun) 2026**	**Session: 2025-26**

1.	**Course Code**	**S6 BCH-6T**	
2.	**Course Title**	**Biochemistry and Function of Hormones**	
3.	**Course Type**	**DSE-2C Theory**	
4.	**Pre-requisite (if any)**	To study this course, a student must have completed I to V semester study in Biochemistry	
5.	**Course learning Outcome (CLO)**	**Course Outcomes (COs)** The students will understand the different modes of communication between cells including signal reception, transduction, amplification and response. They will understand the role of endocrine system in maintaining ionic and glucose homeostasis and the communications that regulate growth appetite, metabolism and reproduction in humans. The students will be able to decipher molecular and biochemical mechanisms of all hormones and will be in a position to interpret hormonal levels in individuals with health and disease conditions. Besides,students will also understand the role of various plant hormones in growth and development of plants.	
6.	**Credit Value**	4	
7.	**Marks**	Max. Marks-10+40	Min. Marks-20

Part B- Content of the Course

Total numbers of Lectures (in hours):60		
Unit	**Topics**	**Numbers of Lectures**
I	Hormones: Chemical classification of hormones, Functions of hormones and their regulation. Chemical signaling - endocrine, paracrine, autocrine, intracrine and neuroendocrine mechanisms. General introduction to Endocrinology. Hormone receptors - extracellular and intracellular. Receptor - hormone binding, G protein coupled receptors, second messengers - cAMP, cGMP, IP3, DAG, Ca2+, Effector systems - adenylcyclase, guanylcyclase, PDE, PLC. Protein kinases (PKA, PKB, PKC, PKG). Receptor tyrosine kinases - EGF, insulin and Ras - MAP kinase cascade. Non receptor tyrosine kinase-erythropoietin receptor JAK - STAT pathway. Steroid hormone Receptor. Receptor regulation and crosstalk.	12
II	Hypothalamic-Hypophysialsystem, Pituitary: anatomy, histology, vasculature and secretions. Physiological and biochemical actions of hypothalamic hormones and anterior pituitary hormones; Feed- back regulation. Posterior pituitary hormones – structure, physiology and biochemical actions of AVP and Oxytocin.	12
III	Thyroid gland - Histology; Biosynthesis of thyroid hormone and its regulation: Role of TRH and TSH in T4 synthesis and response. Physiological and biochemical action of Thyroxine. Pathophysiology of thyroxine secretion: Hyper and hypothyroidism, Goiter, Graves' disease, Cretinism, Myxoedema. **Regulation of calcium homeostasis:** PTH, Vitamin D and calcitonin. Mechanism of Ca2+ regulation.Regulation of Growth: growth hormone and somatomedin, Endocrine disorders - gigantism, acromegaly, dwarfism, pygmies. Physiology and biochemical actions of Growth factors- EGF, PDGF andErythropoietin.	12
IV	**Hormones of adrenal gland:** Physiology and action of Aldosterone; the Renin Angiotensin System. Physiology and Biochemical actions of Cortisol. Adrenal medullary Hormones: Epinephrine and Norepinephrine. General adaptation syndrome: acute and chronic stress response. Pathophysiology – Addison's disease, Conn's syndrome.	12

V	**Cells involved in the release of gastrointestinal hormones**; the gastrin family of hormones and CCK: the secretin family of hormones; Incretins; Ghrelin; Summary of hormone metabolite control of GI function. Hormones of the Pancreas: Structure, synthesis, physiology and biochemical actions of insulin and glucagon. Adipocyte hormones: Adiponectin and leptin; Appetite and satiety control. **Male and female sex hormones.** Hormones during ovarian and uterine phases of menstrual cycle; Placental hormones; role of hormones during parturition and lactation.	12

Key Words: Cell Organelles, Cell Biology, Circulatory System, Respiratory System, Digestive System, Endocrine system, Excretory System

Part C- Learning resources

Text Books, Reference Books, Other resources

Recommended Books:

1. Lehninger:PrinciplesofBiochemistry(2017)7thed.,Nelson,D.L.andCox,M.M. W.H. Freeman & Company (New York
2. Vander'sHumanPhysiology(2019)15thed.,Widmaier,E.P.,Raff,H.andStrang, K.T. McGraw Hill International Publications (USA)
3. Endocrinology (2007) 6thed., Hadley, M.C. and Levine, J.E. Pearson Education (New Delhi), Inc.
4. The Cell: A Molecular Approach (2009) 5th Ed. Cooper, G.M. and Hausman, R.E. ASM Press & Sunderland, (Washington DC), Sinauer Associates. (MA).

E-learning Resources

https://www.nature.com/scitable/topic/cell-biology-13906536/
https://www.sciencedirect.com/topics/medicine-and-dentistry/endocrinology
https://www.webmd.com/lung/how-we-breathe
https://www.britannica.com/science/circulatory-system
https://www.niddk.nih.gov/health-information/digestive-diseases/digestive-system-how-it-works

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)

Assessment	Mode	Max. Marks	Min. Marks	Pattern
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**	**20**	

Part A- Introduction

Program: B.Sc. Course		**Semester: VI**	**Year: (Jan-Jun) 2026**	**Session: 2025-26**
1.	**Course Code**	**S6 BCH -6P**		
2.	**Course Title**	**LAB6: Biochemistry and Function of Hormones**		
3.	**Course Type**	**DSE-2C Practical**		
4.	**Pre-requisite (if any)**	To study this course, a student must have completed I to V semester study in Biochemistry		
5.	**Course learning Outcome (CLO)**	On successful completion of the course, the student shall be able to: Students will acquire practical training to undertake clinical tests like Glucose Tolerance test, estimation of serum Ca2+, serumT4, serumelectrolytes and HCG based pregnancy test. They will be in a position to interpret hormonal level with clinical conditions of the individuals.		
6.	**Credit Value**	2		
7.	**Marks**	Max. Marks-50	Min. Marks-20	

Part B- Content of the Course

Total numbers of Lectures (in hours):30	
Tentative Practical List	1. Estimation of serum Ca2+. 2. Estimation of serum T4 3. HCG based pregnancy test. 4. Estimation of serum electrolytes. **5.** Case studies

Part C- Learning resources

Text Books, Reference Books, Other resources

Recommended Books:

1. Vander's Human Physiology (2008) 11th ed., Widmaier, E.P., Raff, H. and Strang, K.T.,McGrawHillInternational Publications (New York), ISBN: 978-0-07-128366-3.
2. Textbook of Medical Physiology (2011) 10th ed., Guyton, A.C. and Hall, J.E., ReedElsevier's India Pvt. Ltd. (New Delhi). ISBN: 978-1-4160-4574-8.
3. Endocrinology (2007) 6th ed., Hadley, M.C. and Levine, J.E. Pearson Education (NewDelhi), Inc. ISBN: 978-81-317-2610-5.
4. Fundamental of Anatomy and Physiology (2009), 8th ed., Martini, F.H. and Nath, J.L.,Pearson Publications (San Francisco), ISBN: 10:0-321-53910-9 / ISBN: 13: 978-0321-53910-6.

E-learning Resources

https://www.klimud.org/public/atlas/idrar/web/www.irvingcrowley.com/cls/fund.htm
https://www.mayoclinic.org/tests-procedures/prothrombin-time/about/pac-20384661
https://www.ncbi.nlm.nih.gov/books/NBK482339/
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6709845/

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**	**Min. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**	**20**	

Part A- Introduction

Program: B.Sc (Hons) Course		**Semester: VI**	**Year: Jan-jun2026**	**Session: 2025-26**
1.	**Course Code**	**S6 BCH 6T**		
2.	**Course Title**	**Plant Biochemistry**		
3.	**Course Type**	**DSE-2D Theory**		
4.	**Pre-requisite (if any)**	To study this course, a student must have completed I to V semester study in Biochemistry		
5.	**Course learning Outcome (CLO)**	Learning outcomes for this course include detailed understanding of metabolic processes specific for plants such as nitrate assimilation, photosynthesis, respiration, nitrogen fixation and the role of different metabolic pathways in plant growth and development. Students will also gain insight to various stressful conditions of the environment that affect plant growth and productivity as well as the defense mechanisms in plants due to which plants survive under stresses.		
6.	**Credit Value**	04		
7.	**Marks**	Max. Marks-10+40	Min. Marks-20	

Part B- Content of the Course

Total numbers of Lectures (in hours):60		
Unit	**Topics**	**Numbers of Lectures**
I	**Electron transport system in plants:** oxidative phosphorylation, mitochondrial respiratory complexes, order and organization of electron carriers, electrochemical gradient, chemiosmotic theory, ATP synthase and mechanism of ATP synthesis.	12
II	**Nitrogen metabolism:** assimilation of nitrate,structural features of nitrate reductase and nitrite reductase, incorporation of ammonia into organic compounds, regulation of nitrate assimilation. Biological nitrogen fixation by free living and in symbiotic association; structure and function of the enzyme nitrogenase.	10
III	**Photosynthesis –** Photosynthetic apparatus, pigments of photosynthesis, role of carotenoids, photosystems I and II, their location; Hill reaction, photosynthetic electron transport and generation of NADPH & ATP, cyclic and non-cyclic photophosphorylations, complexes associated with thylakoid membranes; light harvesting complexes, path of carbon in photosynthesis – C3 and C4 pathway of carbon reduction and its regulation, Photorespiration.	12
IV	**Special features of secondary plant metabolism,** terpenes (classification, biosynthesis), lignin, tannins, pigments, phytochrome, waxes, alkaloids, biosynthesis of nicotine, functions of alkaloids, cell wall components. **Toxins of plant origin –** mycotoxins, phytohemagglutinins, lathyrogens, nitriles, protease inhibitors, protein toxins. **Stress metabolism in plants –** Environmental stresses, salinity, water stress, heat, chilling, anaerobiosis, pathogenesis, heavy metals, radiations and their impact on plant growth and metabolism, criteria of stress tolerance.	16
V	**Antioxidative defense system in plants –** reactive oxygen species and their generation, enzymic and non-enzymic components of antioxidativedefense mechanism.	10

Key Words: Electron transport, Nitrogen assimilation, secondary metabolites, Reactive oxygen species.

Part C- Learning resources

Text Books, Reference Books, Other resources
Suggested readings: 1. Buchann (2015), Biochemistry and Molecular Biology of Plants, 2nded. Publisher: I KInternational. ISBN-10: 8188237116, ISBN- 978047 0714218 2. Taiz and Zeiger, Plant Physiology, 5thedition, Sinauer Associates Inc.ISBN-13:978- 0878938667, ISBN-10:0878938664 3. Caroline Bowsher, Martin steer, Alyson Tobin (2008), Plant Biochemistry, Garland science ISBN978-0-8153-4121-5. 4. P.M Dey and J.B. Harborne (Editors) (1997), Plant Biochemistry, Publisher:Academic Press ISBN-10:0122146743,ISBN-13:978-0122146749

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**	**Min. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**	**20**	

Part A- Introduction

Program: B.Sc		**Semester: VI**	**Year: JAN-JUN 2026**	**Session: 2025-26**
1.	**Course Code**	**S6 BCH-6P**		
2.	**Course Title**	**Lab- Plant Biochemistry**		
3.	**Course Type**	**DSE - 2D Practical**		
4.	**Pre-requisite (if any)**			
5.	**Course learning Outcome (CLO)**	Students will gain expertise to determine the contents of photosynthetic pigments, ascorbic acid, phenols, tannins, hydrogen peroxide in plant samples. They will understand the spectral patterns of photosynthetic pigments and will get training to extract and assay enzymes like urease from Jack bean.		
6.	**Credit Value**	02		
7.	**Marks**	Max. Marks-10+40	Min. Marks-20	

Part B- Content of the Course

Total numbers of Lectures (in hours): 30	
	Topics
	Practical content: 1. Estimation of chlorophylls and carotenoids from grass/spinach leaves 2. Estimation of ascorbic acid, phenols, tannins in fruits and vegetables 3. Determination of radical scavenging activity of plant extracts 4. Estimation of hydrogen peroxide in tissue extracts 5. Extraction and assay of urease from Jackbean 6. Separation of photosynthetic pigments by TLC and determination of absorption Spectra.

Part C- Learning resources

Text Books, Reference Books, Other resources
Suggested readings: 1. Buchann (2015), Biochemistry and Molecular Biology of Plants, 2nded. Publisher: I KInternational. ISBN-10: 8188237116, ISBN- 978047 0714218 2. Taiz and Zeiger, Plant Physiology, 5thedition, Sinauer Associates Inc.ISBN-13: 978- 0878938667, ISBN-10:0878938664 3. Caroline Bowsher, Martin steer, Alyson Tobin (2008), Plant Biochemistry, Garland science ISBN978-0-8153-4121-5. 4. P.M Dey and J.B. Harborne (Editors) (1997), Plant Biochemistry, Publisher: Academic Press ISBN-10:0122146743,ISBN-13:978-0122146749

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods: Internal (CCE) + External Assessment (ESE)				
Assessment	**Mode**	**Max. Marks**	**Min. Marks**	**Pattern**
CCE	Class Test/ Assignment/Presentation	10		
ESE	University Exam	40		
	Total Marks	**50**	**20**	