DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM & MARKING SCHEME

B.Sc. III, IV, V, VI Semester

BIOCHEMISTRY

(Based on Choice Based Credit System)

SESSION : 2024-25

ESTD : 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A+, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

Phone : 0788-2212030

Website - www.govtsciencecollegedurg.ac.in, Email – autonomousdurg2013@gmail.com

DEPARTMENT OF CHEMISTRY

GOVT.V.Y.T.PG.AUTONOMOUS COLLEGE, DURG. (C.G.)

Four Year Undergraduate Program

BIOCHEMISTRY

Semester III

Session 2024-25

For DSC/GEC

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISRTY

COURSE CURRICULUM 2024-25

BIOCHEMISTRY

PART A: INTRODUCTION				
Program: U.G.		Class: B.Sc.	Semester - III	Session:2024-2025
1	Course Code	BBC 301		
2	Course Title	Enzymology		
3	Course Type	DSC/GEC		
4	Course Learning Outcome (CLO)	**This Course will enable the students to:** 1. To acquire fundamental knowledge on enzymes and their importance in biological reactions. 2. To understand ability to difference between a chemical catalyst and biocatalyst. 3. To understand the concept of activation energy and its importance in biological reactions. 4. To understand the nature of non-protein enzymes such as ribozymes. 5. To understand the role of enzymesin clinical diagnosis and industries. Biochemistry Core .		
5	Credit Value	3Credits	1 credit =15 Hours – Learning and Observation	
6	Total Marks	Maximum Marks :100		Minimum Passing Marks:40

PART B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (COURSE CONTENTS)	No. of Periods
I	**INTRODUCTION** History general characteristics, nomenclature, IUB enzyme classification (rational, overview and specific examples), significance of numbering system. Definitions with examples of holoenzyme, apoeonzyme, coenzymes, cofactors, activators, inhibitors, active site (identification of groups excluded), metallo-enzymes, units of enzyme activity, specific enzymes, isoenzymes, monomeric, enzymes, oligomeric enzymes and multi-enzyme complexes. Enzyme specificity. Historical perspective, nature of non-enzymatic and enzymatic catalysis. Measurement and expression of enzyme activity-enzyme assays. Definition of IU, Katal enzyme turn over number and specific activity. Role of non-protein organic molecules and inorganic ions-coenzyme, prosthetic groups. Role of Vitamins as coenzymes precursors (general treatment).	09
II	**Enzyme Catalysis** Role of cofactors in enzyme catalysis : NAD/NADP+, FMN/FAD, coenzyme A, biocytin, cobamide, lipoamide, TPP, pyridoxal phosphate, tetrahydrofolate and metal ions with special emphasis on coenzyme functions. Acid-base catalysis, covalent catalysis, proximity and orientation effects, strain and distortion theory. Mechanism of action of chymotrypsin, carboxypeptidase, ribonuclease and lysozyme.	09

III	**Enzyme Purification** Method for isolation, purification and characterization of enzymes.	09
IV	**ENZYME KINETICS** Factors affecting enzyme activity, enzyme concentration, substrate concentration, pH and temperature. Derivation of Michaelis- Menten equation for uni-subatrate reactions. Km and its significance. Line Weaver - Burk plot and its limitations. Importance of Kcat/Km. Bi-substrate reactions - brief introduction to sequential and ping-pong mechanisms with examples. Kinetics of zero and first order reactions. Significance and evaluation of energy of activation and free energy. Reversible and irreversible inhibition, competitive, non competitive and uncompetitive inhibitions.. Determination of Km & Vmax in presence and absence of inhibitor. Allosteric enzymes.	09
V	**INDUSTRIAL AND CLINICAL APPLICATION OF ENZYMES** Immobilization of enzyme and their industrial applications. Production of glucose from starch, cellulose and dextran, use of lactose in dairy industry, production of glucose fructose syrup from sucrose, use of proteases in food. Detergent and leather industry, medical application of enzymes use of glucose oxidase in enzyme electrodes.	09

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

Reference Books

1. Fundamental of Enzymology Nicholas C Price and Lewis Stevens , Oxford university Press.
2. Principles of Enzymology for food Science by JR Whitkar , M Dekker Publishers.
3. Biochemistry by Lubert Stryer , WH Freeman and Co., San Francisco .
4. Enzyme Dixon Mand Webb , EC, Longmans, London .
5. The chemical kinetics of enzymes action by KJ Laidler and PS Buntinf , Oxford Univercity Press, London.
6. Enzyme stucture and function by S Blackburn , Marcel Dekker , Inc., NY.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

https://www.sciencedirect.com/topics/medicine-and-dentistry/enzymology
https://www.jbc.org/Enzymology
https://www.biologyonline.com/dictionary/coenzyme
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3770912/
https://www.eposters.net/redirect/?ID=16026&UID=0&Type=poster
https://link.springer.com/chapter/10.1007/978-0-387-35141-4_34
https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/enzyme- immobilization

PART D: ASSESSMENT AND EVALUATION		
Suggested Continuous Evaluation Methods: **Maximum Marks:** 100 Marks **Continuous Comprehensive Evaluation (CCE):** 20 Marks **Semester End Exam (SEE):** 80 Marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)		Internal Test of 20 Marks each and Assignment of 20 Marks
Semester End Exam (SEE)	**Pattern - FOUR Questions (A, B, C, D) from each Unit** Question - A & B: (Compulsory) Very short answer type (02 each) Question - C: Short answer type question Question -D: Long answer type question	04 x 5 = 20 Marks 05 x 5 = 25 Marks 07 x 5 = 35 Marks **Total = 80 Marks**

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM 2024-25

Lab Course

PART A: INTRODUCTION				
Program:		Class: B.Sc. Semester - III		Session:2024-2025
1	Course Code	**BBCL - 03**		
2	Course Title	LAB COURSE BIOCHEMISTRY - III		
3	Course Type	DSC/GEC		
4	Course Learning Outcome (CLO)	**This Course will enable the students to:** 1. To have practical knowledge of estimation of SGPT and SGOT in serum. 2. To learn about preparation of starch from potato and its hydrolysis by salivary amylase. 3. To learn about effect of enzyme concentration on enzyme activity. 4. To learn about separation and identification of amino acid by (a) paper chromatography and (b) thin layer chromatography 5. To learn about determination of achromatic point in salivary amylase.		
5	Credit Value	1Credit	1 credit =30 Hours – Learning and Observation	

6	Total Marks	Maximum Marks: 50	Minimum Passing Marks:20

PART B: CONTENT OF THE COURSE	
S.No.	List of Experiments
1.	Separation and identification of amino acid by (a) paper chromatography and (b) thin layer chromatography
2.	Separation of polar and non polar lipids by thin layer chromatography.
3.	a) Assay of serum alkaline phosphatase activity. b) Inhibition of alkaline phosphatase activity by EDTA. c) Effect of substrate concentration on alkaline phosphatase activity and determination of its Km value.
4.	a) Effect of temperature on enzyme activity and determination of activation energy. b) Effect of pH on enzyme activity and determination of optimum pH. c) Effect of enzyme concentration on enzyme activity.
5.	a) Preparation of starch from potato and its hydrolysis by salivary amylase. b) Determination of achromatic point in salivary amylase. c) Effect of sodium chloride on amylases.

PART C - LEARNING RESOURCES	
Text Books, Reference Books, Other Resources	
1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292- 3414-8. 2. Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley & Sons Asia Pvt. Ltd. (New Jersey), ISBN:978-1180-25024. 3. Fundamentals of Enzymology (1999) 3rd ed., Nicholas C.P. and Lewis S., Oxford University Press Inc. (New York), ISBN:0 19 850229 X. E-learning Resources https://www.thermofisher.com/in/en/home/references/protocols/cell-and-tissue-analysis/elisa-protocol/elisa-sample-preparation-protocols/plasma-and-serum-preparation.html https://labmonk.com/determination-of-sgot-and-sgpt https://www.labcorp.com/help/patient-test-info/total-protein-and-albuminglobulin-ag-ratio https://link.springer.com/article/10.1007/s101570200005 https://jcp.bmj.com/content/jclinpath/6/3/173.full.pdf	
PART D: ASSESSMENT AND EVALUATION	
Examination Scheme for Practical Max. Marks 50 Major exercise -1 - 20 Marks Major exercise- 2 – 20 Marks Viva-voce - 10 Marks **Total - 50 Marks**	
Semester End Exam (SEE)	**Laboratory performance: As per Dept. (LOCF)**

Name & Signature of Members of Board of Studies

05/07/2024
Subject Expert
Dr. Mrigendra Diwedi

05/7/24
(Dr. A K Mishra)

05/07/2024
(Dr. Hemlata Mahobey)

3/7/24
(Dr. S. D. Deshmukh)

05/07/24
(Dr. Anju Jha)

Dr. V.S. Geete

5/7/24
(Dr. P. Kathane)

(Dr. S.D. Deshmukh)

(Dr. Sunitha Mathew)

Dr. A. L. Pillai

Dr. A. Kadyap

Dr. Bhawna

DEPARTMENT OF CHEMISTRY

GOVT.V.Y.T.PG AUTONOMOUS COLLEGE, DURG. (C.G.)

Four Year Undergraduate Program

BIOCHEMISTRY

Semester IV

Session 2024-25

For DSC /GEC

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM 2024-25

PART A: INTRODUCTION				
Program: U.G.		**Class: B.Sc.**	**Semester - IV**	**Session:2024-2025**
1	**Course Code**	**BBC 401**		
2	**Course Title**	INTERMEDIARY METABOLISM		
3	**Course Type**	DSC/GEC		
4	**Course Learning Outcome (CLO)**	On successful completion of the course, the student shall be able to: CO1 – Describe the fundamentals of thermodynamics in biochemical processes. CO2 – Acquire the knowledge of energy production in living systems by the degradation of fatty acids. CO3 – Explain the various pathways of fatty acid synthesis in living systems. CO4 – Explain the mechanism of the machinery system involved in carbohydrate metabolism. CO5– Describe breakdown and synthesis of Amino acids and nucleotides in humans and recognize its relevance with respect to nutrition and human diseases.		
5	**Credit Value**	**3Credits**	**1 credit =15 Hours – Learning and Observation**	
6	**Total Marks**	**Maximum Marks :100**		**Minimum Passing Marks:40**

PART B: CONTENT OF THE COURSE		
Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)		
Unit	**Topics (COURSE CONTENTS)**	**No. of Periods**
I	**INTRODUCTION TO METABOLISM** General features of metabolism, experimental approaches to study metabolism: use of intact organism. Bacterial mutants, tissue slices, stable and radioactive isotopes. **CARBOHYDRATE METABOLISM** Reactions and energetics of glycolysis. Alcoholic and lactic acid fermentations. Entry of fructose, galactose, mannose etc. Reactions and energetics of TCA cycle. Gluconeogenesis, glycogenesis and glycogenolysis. Reactions and physiological significance of pentose phosphate pathway. Regulation of glycolysis and TCA cycle. Photosynthesis. A brief review.	**09**
II	**Electron Transport Chain and Oxidative Phosphorylation** Structure of mitochondria, sequence of electron carriers, sites of ATP production, inhibitors of electron transport chain, Hypothesis of mitochondrial oxidative phosphorylation (basic concepts). Inhibitors and uncouplers of oxidative phosphorylation. Transport of reducing potentials into mitochondria.	**09**

III	**LIPID METABOLISM** Introdcution, hydrolysis of triacylglycerols, transport of fatty acids into mitochondria β oxidation of saturated fatty acids. ATP yield from fatty acid oxidation, Biosynthesis of saturated and unsaturated fatty acids, Metabolism of ketone bodies, oxidation of unsaturated and odd chain fatty acids, Biosynthesis of triglycerides and important phospholipids, glycolipids, sphingolipids and cholesterol. Regulation of cholesterol metabolism.	**09**
IV	**AMINO ACID METABOLISM** General reactions of amino acid metabolism: Transamination, oxidative deamination and decarboxylation. Urea cycle. Degradation and biosynthesis of aminoacids. Glycogenic and ketogenic amino acids.	**09**
V	**NUCLEOTIDE METABOLISM** Sources of the atoms in the purine and pyrimidine molecules. Biosynthesis and degradation of purines and pyrimidines. Regulation of purine and pyrimidine biosynthesis. **PORPHYRIN METABOLISM** Biosynthesis and degradation of porphyrins production of bile pigments.	**09**

PART C - LEARNING RESOURCES
Text Books, Reference Books, Other Resources
Recommended Books: 1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1. 2. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., JohnWiley & Sons, Inc. (New Jersey), ISBN:978-0-470-28173-4. 3. Biochemistry (2012) 7th ed., Berg, J.M., Tymoczko, J.L. and Stryer L., W.H. Freemanand Company (New York), ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936-4. E-learning Resources https://www.britannica.com/science/metabolism https://www.sciencedirect.com/science/article/pii/S0009912013001677 https://pubmed.ncbi.nlm.nih.gov/23720291/ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3243375/

PART D: ASSESSMENT AND EVALUATION		
Suggested Continuous Evaluation Methods:		
Maximum Marks:	**100 Marks**	
Continuous Comprehensive Evaluation (CCE):	**20 Marks**	
Semester End Exam (SEE):	**80 Marks**	
Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 20 Marks each and Assignment of 20 Marks	
Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D)from each Unit**	
	Question - A & B: (Compulsory) Very short answer type (02 each)	04 x 5 = 20 Marks
	Question - C: Short answer type question	05 x 5 = 25 Marks
	Question -D: Long answer type question	07 x 5 = 35 Marks
		Total = 80 Marks

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM 2024-25

Lab Course

PART A: INTRODUCTION				
Program: U.G.		Class: B.Sc. Semester - IV		Session:2024-2025
1	Course Code	BBCL - 04		
2	Course Title	LAB COURSE BIOCHEMISTRY - IV		
3	Course Type	DSC/GEC		
4	Course Learning Outcome (CLO)	**This Course will enable the students :** CO1-To understand the importance of lipids as storage molecules and as structuralcomponent of biomembranes. CO2-Understanding the importance of high energy compounds,electron transport chain,synthesis of ATP under aerobic and anaerobic conditions. CO3-To acquire knowledge related to the role of TCA cycle in central carbon metabolism,importance of anaplerotic reactions and redoxbalance. CO4-Students will be exposed with the fact that perturbations in the carbon metabolism canlead to various disorders such as diabetes and cancer.		
5	Credit Value	1Credit	1 credit =30 Hours – Learning and Observation	
6	Total Marks	Maximum Marks: 50		Minimum Passing Marks:20

PART B: CONTENT OF THE COURSE	
S.No.	List of Experiments
1.	Separation of Blood Plasma and Serum. a. Estimation of protein from serum by biuret and Lowry methods. b. Determination of albumin and A/G ratio in serum.
2.	Estimation of bilirubin (conjugated and unconjugated) in serum.
3.	a. Estimation of total lipids in serum by vanillin method. b. Estimation of cholesterol in serum.
4.	Estimation of lipoprotein in plasma.
5.	Estimation of lactic acid in blood before and after exercise.
6.	Estimation of blood urea nitrogen from plasma.

PART C - LEARNING RESOURCES	
Text Books, Reference Books, Other Resources	
Recommended Books: 1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New(York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1. 2. Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., John Wiley & Sons, Inc. (New Jersey),ISBN:978-0-470-28173-4. 3. Biochemistry (2012) 7th ed., Berg, J.M., Tymoczko, J.L. and Stryer L., W.H. Freemanand Company (New York),ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936-4. E-learning Resources https://link.springer.com/article/10.1007/s00217-008-0998-4 https://www.cdc.gov/nchs/data/nhanes/nhanes_03_04/l13_c_met_lipids.pdf	
PART D: ASSESSMENT AND EVALUATION	
Examination Scheme for Practical Max. Marks 50 **Major exercise -1 - 20 Marks** **Major exercise- 2 – 20 Marks** **Viva-voce - 10 Marks** **Total - 50 Marks**	
Semester End Exam (SEE)	**Laboratory performance: As per Dept. (LOCF)**

Name & Signature of Members of Board of Studies

05/07/2024
Dr. Mrigendra Diwedi
Subj Expert

05/7/24
(Dr. Arun Mishra)

05/07/2024
(Dr. Hem Lata Mahobey)

5/7/24
(Dr. S.D. Deshmukh)

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Dr. V.S. Geete

5.7.24
(Dr. S.C. Tiwari)

Dr. A.K.P. Illai

05.07.24
(Dr. Sunitha Mathew)

05/7/24
(Dr. Prerna Kaltheune)

Dr. A. Kashyap

Dr. Bhawana Jain

3

DEPARTMENT OF CHEMISTRY

GOVT.V.Y.T.PG AUTONOMOUS COLLEGE, DURG. (C.G.)

Four Year Undergraduate Program
BIOCHEMISTRY
Semester V

Session 2024-25

For DSC

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM 2024-25

BIOCHEMISTRY

Part A: Introduction				
Program: FYUP		Class: B.Sc.Biochemistry Semester - V		Session:2024-2025
1	Course Code	**BBC 501**		
2	Course Title	MOLECULAR BIOLOGY		
3	Course Type	DSC/GEC		
4	Course Learning Outcome (CLO)	**This Course will enable the students to:** 1. To understand DNA as genetic material, primary, secondary and tertiary structure of DNA and RNA. 2. Replication, Transcription, and Translation and their mechanisms. 3. To understand coding and non-coding regions of eukaryotic genome and their importance. 4. To understand importance of E. coli lac operon, PCR, expression vectors and their importance in Biotechnology. 5. To acquire knowledge about recombinant DNA technology.		
5	Credit Value	**3C**	**1 credit =15 Hours – Learning and Observation**	
6	Total Marks	Maximum Marks :100		Minimum Passing Marks:40

Part B: Content of the Course

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (COURSE CONTENTS)	No. of Periods
I	**BASIC CONCEPTS OF GENETIC INFORMATION** [a.] Nucleic acids as genetic information carriers, experimental evidence e.g. bacterial genetic transformation, Hershey–Chase Experiment, TMV reconstitution experiment. [b.] Central dogma of molecular genetics –current version, reverse transcription and retroviruses. [c.] Primary structure of nucleic acids and their properties, salient features of eukaryotic, prokaryotic and viral genomes; highly repetitive, moderately repetitive and unique DNA sequences. [d.] Basic concepts about the secondary structures of nucleic acids, 5'□3'direction anti-parallel strands, base composition, base equivalence, base pairing and base stacking in DNA molecule. Tm and buoyant density and their relationship with G-C content in DNA.	09

II	**STRUCTURAL LEVELS OF NUCLEIC ACIDS AND SEQUENCING** [a.] Secondary and Tertiary structure of DNA: Watson and Crick model, A, and Z type of DNA major and minor grooves, chirality of DNA, tertiary structure of DNA. [b.] Structures and properties of RNA: Classes of RNA secondary and tertiary structures. [c.] Nucleic acid hybridization: Cot value and satellite DNA. [d.] Sequencing: Restriction and modification system; sequencing of DNA and RNA	**09**
III	**DNA REPLICATION** DNA replication in prokaryotes – conservative, semi conservative and dispersive types, experimental evidence for semi conservative replication. DNA polymerases other enzymes and protein factors involved in replication, Mechanism of replication. Inhibitors of DNA replication. **TRANSCRIPTION** Transcription in prokaryotes RNA polymerase, promoters, initiation, elongation and termination of RNA synthesis, inhibitors of transcription. Reverse transcriptase, post transcriptional processing of RNA in eukaryotes.	**09**
IV	**TRANSLATION AND REGULATION OF GENE EXPRESSION** [a.] Genetic code: Basic features of genetic code, biological significance of degeneracy. Wobble hypothesis, gene within genes and overlapping genes. [b.] Mechanism of translation: Ribosome structure, A and P sites, charged tRNA, f-mat-tRNA initiator codon, Shine Dalgarno consensus sequence (AGGA), formation of 70S initiation complex , role of EF-Tu, EF-Ts, EF-G and GTP, non-sense condons and release factors RF 1 and RF 2 . [c.] Regulation of gene Expression in prokaryotes: Enzyme induction and repression, operon concept, Lac operon, Trp operon.	**09**

V	**MUTATION AND REPAIR** [a.] Mutation: Molecular basis of mutation, type of mutation, e.g transition, transversion frame shift, insertion, deletion, suppresser sensitive, germinal and somatic, backward and forward mutations, true reversion and suppression, dominant and recessive mutations, spontaneous and induced mutations- Lederberg's replica plating experiment. [b.] Mutagenecity testing: Correlation of mutagenecity and carcinogenecity: Ames testing, Random and site - directed mutagenesis. [c.] DNA Repair: UV repair systems in E Coli, Significance of thymine in DNA. [d.] Recombinant DNA Technology Restriction endonucleases, brief discussion of steps in DNA cloning. Applications of recombinant DNA technology.	09

Part C - Learning Resource

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 (NewYork), 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		
Suggested Continuous Evaluation Methods: **Maximum Marks:** **75 Marks** **Continuous Comprehensive Evaluation (CCE):** **15Marks** **Semester End Exam (SEE):** **60 Marks**		
Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test- One of 15 Marks + Assignment/Seminar-One of 15 Marks	Best of test and Assignment shall be considered against 15 marks
Semester End Exam (SEE)	Pattern -FOUR Questions (A, B, C, D)from each Unit Question - A & B: (Compulsory) Very short answer type (01each) 02 x 5 = 10 Marks Question - C: Short answer type question 03 x 5 = 15 Marks Question -D: Long answer type question 07 x 5 = 35 Marks Total = 60 Marks	

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OFCHEMISTRY

COURSE CURRICULUM 2024-25

Lab Course

Part A: Introduction				
Program:		Class: B.Sc. Biochemistry Semester -V		Session:2024-2025
1	Course Code	**BBCL 05**		
2	Course Title	LAB COURSE BIOCHEMISTRY-V		
3	Course Type	DSC/GEC		
4	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.		
5	Credit Value	**1C**	**1 credit =15 Hours – Learning and Observation**	
6	Total Marks	Maximum Marks :25		Minimum Passing Marks:10

S.No.	List of Experiments
1.	Estimation of DNA by diphenylamine method .
2.	Effect of temperature on the viscosity of DNA using Ostwald's viscometer.
3.	Extraction of RNA and its estimation by Orcinol method
4.	Estimation of Hemoglobin by measuring total iron in blood .
5.	Estimation of calcium and phosphorus in serum & urine.

Part C - Learning Resource

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 (NewYork), 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, Venki Ramakrishnan

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	
Suggested Continuous Evaluation Methods: Maximum Marks: 25 Marks (Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)	
Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)

Name & Signature of Members of Board of Studies.

05/07/2024
Dr. Mrigendra Dwivedi
Subject Expert

5/7/24
(Dr. S.D. Deshmukh)

5.7.24
(Dr. S.C. Tiwari)

B. Jain
(Dr. Bhawana Jain)

05/7/24
(Dr. Arun Mishra)

05/07/2024
(Dr. Anju Mishra)

5/7/24
(Dr. Prerna Kathane)

H. Mahabey
05/07/2024
(Dr. Hemlata Mahobey)

Dr. A. K. P. Ma

Dr. V. S. Geete

05.07.24
Dr. Sumitha Mathew

05.7.24
(Dr. A. Kashyap)

DEPARTMENT OF CHEMISTRY

GOVT.V.Y.T.PG AUTONOMOUS COLLEGE, DURG. (C.G.)

Four Year Undergraduate Program

BIOCHEMISTRY

Semester VI

Session 2024-25

For

DSC / GEC

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM 2024-25

BIOCHEMISTRY

Part A: Introduction				
Program: FYUP		Class: B.Sc. Biochemistry Semester - VI		Session:2024-2025
1	Course Code	**BBC 601**		
2	Course Title	NUTRITIONAL, CLINICAL & ENVIRNONMENTAL BIOCHEMISTRY		
3	Course Type	DSC/GEC		
4	Course Learning Outcome (CLO)	**This Course will enable the students to:** 1. To understand normal constituents of urine, blood and their significance in maintaining good health. 2. Understand the mechanisms of causation of diseases of liver and kidney. 3. To understand the current concepts related to mechanism of Cancer. 4. To understand the variations in the levels of trigycerides and lipoproteins and their relationship with various diseases. To get acquainted with the role of enzymes in diagnosis of various diseases.		
5	Credit Value	**3C**	**1 credit =15 Hours – Learning and Observation**	
6	Total Marks	Maximum Marks :100		Minimum Passing Marks:40

Part B: Content of the Course

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (COURSE CONTENTS)	No. of Periods
I	**NUTRITIONAL BIOCHEMISTRY NUTRITION AND DIETARY HABITS** [a.] Introduction and definition of foods and nutrition. Factors determining food acceptance, physiological, energy, body building (growth and development). Regulation of body temperature. Physiology and nutrition of carbohydrates, fats, proteins and water. Vitamins A, D, E, K, Vit B-Complex and Vit C and minerals like Ca, Fe and Iodine and their biological functions. Basic food groups: energy giving foods, body building foods and protective foods. [b.] Composition of balanced diet, recommended dietary allowances (RDA) for average Indian, locally available foods, inexpensive quality foods and food Stuff's rich in more than one nutrients. Balanced vegetarian diets, emphasis on nutritional adequacy.	09

II	**Nutritive and Calorific Value of Foods** [a.] Basic concepts of energy expenditure, units of energy, measurement of energy expenditure by direct or indirect calorimetry, calculation of non protein RQ with respect to carbohydrates and lipids. Determination of heat production of the diet. The basal metabolism and methods of measuring basal metabolic rate (BMR); energy requirements during growth, pregnancy, lactation and various physiological activities. Calculation of energy expenditure of average man and woman. [b.] Specific dynamic action (SDA) of foods, nutritive value of various kinds of foods generally used by Indian population. Planning of dietary regimes for infants, during pregnancy and old age. Malnutrition, its implications and relationship with dietary habits and prevention of malnutrition specially protein-calories malnutrition (Kwashiorkor and Marasmus) by improvement of diets. Human milk and its virtues, breast vs formulated milk feeding. Food preservation standards, food adulterations and precautions, government regulations on preservation and quality of food.	**09**
III	CLINICAL BIOCHEMISTRY BASIC CONCEPT OF CLINICAL BIOCHEMISTRY [a.] Definition and scope of clinical biochemistry in diagnosis, a brief review of units and abbreviations used in expressing concentration and standard solutions. Quality control. Manual vs automation in clinical laboratory. [b.] Collection and preservation of biological fluids (blood, serum, plasma, urine and CSF). Chemical analysis of blood, urine and CSF. Normal values for important constituents (in SI units) in blood (plasma /serum), CSF and urine, clearance test for urea.	**09**
IV	**(I) CLINICAL ENZYMOLOGY** [a.] Definition of functional and non functional plasma enzymes, isoenzyme and diagnostic tests. Enzyme patter in health and diseases with special mention of plasma lipase, amylase, cholinesterase, alkaline and acid phosphate, SGOT, SGPT, LDH and CPK. [b.] Functional test of kidney, liver and gastric fluids. **(II) DISEASE RELATED TO METABOLISM** Hypo and hyper – glycemia, glycogen storage diseases, lipid mal-absorption and steatorrhea, sphingolipidsosis; role of lipoproteins. Inborn errors of amino acid metabolism – alkaptonuria, phenyl – ketonuria, albinism, gout and hyper – uricemia.	**09**

V	**ENVIRONMENTAL BIOCHEMISTRY** [a.] **Air pollution** Particulate matter, compounds of carbon, sulphur, nitrogen and their interactions, methods of their estimation, their effect on atmosphere. [b.] **Water pollution** Types of water bodies and their general characteristics, major pollutants in domestic, agricultural and industrial wastes, methods of their estimation, effects of pollutants on plants and animals, treatment of domestic and industrial wastes, solid wastes and their treatment.	**09**

Part C - Learning Resource
Text Books, Reference Books, Other Resources
TEXT BOOKS Recommended : 1. Text book of biochemistry Thomas M Devin , John Wiley & Sons , NY . **Reference Books :** 1. Modern nutrition in health and diseases by Whol and Goodhart. 2. Human nutrition and Dietetics by S Davidson and Passmore: ELBS Zurich. 3. Tietz fundamental of clinical Chemistry by Cart A Burtis & ER Ashwood Saunders WB Co. 4. Lecture Notes on Clinical Biochemistry – LG Whitby, AF Smith , GJ Beckett, SM Walker, Blackwell Sci Inc.

Part D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: **Maximum Marks:** **75 Marks** **Continuous Comprehensive Evaluation (CCE):** **15Marks** **Semester End Exam (SEE):** **60 Marks**		
Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test- One of 15 Marks + Assignment/Seminar-One of 15 Marks	Best of test and Assignment shall be considered against 15 marks
Semester End Exam (SEE)	Pattern -FOUR Questions (A, B, C, D)from each Unit Question - A & B: (Compulsory) Very short answer type (01each) 02 x 5 = 10 Marks Question - C: Short answer type question 03 x 5 = 15 Marks Question -D: Long answer type question 07 x 5 = 35 Marks Total = 60 Marks	

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OFCHEMISTRY

COURSE CURRICULUM 2024-25

Lab Course

Part A: Introduction				
Program:		Class: B.Sc. Biochemistry Semester -VI		Session:2024-2025
1	Course Code	**BBCL 06**		
2	Course Title	LAB COURSE BIOCHEMISTRY-VI		
3	Course Type	DSCGEC		
4	Course Learning Outcome (CLO)	**Course Outcomes (COs)** **On successful completion of the course, the student shall be able to:** CO1- Demonstrate assay for creatine and creatinine in urine. CO2- Demonstrate immunoglobulins by precipitation with saturated ammonium sulphate. CO3- Apply electrophoresis technique for different isolated compounds. CO4- Illustrate PCR techniques. CO5- Illustrate SDS-PAGE techniques by biomolecules.		
5	Credit Value	**1C**	**1 credit =15 Hours – Learning and Observation**	
6	Total Marks	Maximum Marks :25		Minimum Passing Marks:10

S.No.	List of Experiments
1.	Estimation of creatine and creatinine in urine.
2.	Estimation of immunoglobulins by precipitation with saturated ammonium sulphate.
3.	Denaturation of enzyme, studies on DNA.
4.	Separation of proteins by column chromatography.
5.	Determination of proteins by dye binding assay.
6.	Separation of proteins by SDS- polyacrylamide gel electrophoresis.

Part C - Learning Resource
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 (NewYork), 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.

Part D: Assessment and Evaluation	
Suggested Continuous Evaluation Methods: **Maximum Marks: 25 Marks** **(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)**	
Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)

Name & Signature of Members of Board of Studies

05/07/2024
Dr. Mrigendra Dwivedi
Subject Expert

05/7/24
(Dr. Arun Mishra)

H. Mahabey
05/07/2024
(Dr. Hemlata Mahobey)

5/7/24
(Dr. S.D. Deshmukh)

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(Dr. Sunitha Mathew)

5/7/24
(Dr. Preema Kaithene)

B Jain
(Dr. Bhawna Jain)

Dr. A. Kashyap

DEPARTMENT OF CHEMISTRY

GOVT.V.Y.T.PG AUTONOMOUS COLLEGE, DURG. (C.G.)

Four Year Undergraduate Program

BIOCHEMISTRY

Semester V/VI

Session 2024-25

For DSE

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM 2024-25

BIOCHEMISTRY

Part A: Introduction				
Program: FYUP		Class: B.Sc.Biochemistry Semester – V/VI		Session:2024-2025
1	Course Code	**BBC 801**		
2	Course Title	GENE REPLICATION, EXPRESSION AND REGULATION		
3	Course Type	DSE		
4	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.		
5	Credit Value	**3C**	**1 credit =15 Hours – Learning and Observation**	
6	Total Marks	Maximum Marks :100		Minimum Passing Marks:40

Part B: Content of the Course

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (COURSE CONTENTS)	No. of Periods
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. Chirality of DNA, tertiary Structure of DNA. Structure and properties of RNA: secondary and tertiary structures. Nucleic acid hybridization: Cot value and satellite DNA	09
II	DNA replication: Features of replication, enzymes and proteins in DNA replication, E coli DNA polymerases, stages of replication initiation, 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.	09

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	**09**
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 in eukaryotes. Regulation of translation. Comparison of prokaryotic and eukaryotic protein synthesis. Inhibitors of translation and their clinical importance	**09**
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..	**09**

Part C - Learning Resource
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		
Suggested Continuous Evaluation Methods: **Maximum Marks:** **75 Marks** **Continuous Comprehensive Evaluation (CCE):** **15Marks** **Semester End Exam (SEE):** **60 Marks**		
Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test- One of 15 Marks + Assignment/Seminar-One of 15 Marks	Best of test and Assignment shall be considered against 15 marks
Semester End Exam (SEE)	Pattern -FOUR Questions (A, B, C, D)from each Unit Question - A & B: (Compulsory) Very short answer type (01each) 02 x 5 = 10 Marks Question - C: Short answer type question 03 x 5 = 15 Marks Question -D: Long answer type question 07 x 5 = 35 Marks Total = 60 Marks	

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OFCHEMISTRY

COURSE CURRICULUM 2024-25

Lab Course

Part A: Introduction				
Program:		Class: B.Sc. Biochemistry Semester -V/VI		Session:2024-2025
1	Course Code	**BBCL 07**		
2	Course Title	LAB COURSE BIOCHEMISTRY-V		
3	Course Type	DSE		
4	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.		
5	Credit Value	**1C**	**1 credit =15 Hours – Learning and Observation**	
6	Total Marks	Maximum Marks :25		Minimum Passing Marks:10

Part B: List of Experiments	
S.No.	**List of Experiments**
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 Resource
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.
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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, Venki Ramakrishnan 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		
Suggested Continuous Evaluation Methods: **Maximum Marks:** **75 Marks** **Continuous Comprehensive Evaluation (CCE):** **15Marks** **Semester End Exam (SEE):** **60 Marks**		
Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test- One of 15 Marks + Assignment/Seminar-One of 15 Marks	Best of test and Assignment shall be considered against 15 marks
Semester End Exam (SEE)	Pattern -FOUR Questions (A, B, C, D) from each Unit Question - A & B: (Compulsory) Very short answer type (01each) Question - C: Short answer type question Question -D: Long answer type question	 02 x 5 = 10 Marks 03 x 5 = 15 Marks 07 x 5 = 35 Marks Total = 60 Marks

Name & Signature of Members of Board of Studies.

05/07/2024
Dr. Mrigendra Dwedi
Sab. Exp

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DEPARTMENT OF CHEMISTRY

GOVT.V.Y.T.PG AUTONOMOUS COLLEGE, DURG. (C.G.)

Four Year Undergraduate Program

BIOCHEMISTRY

Semester V/VI

Session 2024-25

For

DSE

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM 2024-25

BIOCHEMISTRY

Part A: Introduction				
Program: FYUP		Class: B.Sc. Biochemistry Semester - V/		Session:2024-2025
1	Course Code	**BBC 802**		
2	Course Title	BIOTECHNOLOGY		
3	Course Type	DSE		
4	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. 2.engineering of DNA molecules using restriction and modification enzymes. 3.They will get acquainted with the use of cloning and expression vectors, creation of genomic and cDNA libraries and their applications. 4.Students will also understand the methods for production of proteins using recombinant DNA technology. 5.application in industrial systems.		
5	Credit Value	**3C**	**1 credit =15 Hours – Learning and Observation**	
6	Total Marks	Maximum Marks :100		Minimum Passing Marks:40

Part B: Content of the Course

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	Topics (COURSE CONTENTS)	No. of Periods
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.	09
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.	09
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.	09
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	09

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.	09

Part C - Learning Resource
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: **Maximum Marks: 75 Marks** **Continuous Comprehensive Evaluation (CCE): 15Marks** **Semester End Exam (SEE): 60 Marks**		
Internal Assessment: Continuous Comprehensive Evaluation(CCE)	Internal Test- One of 15 Marks + Assignment/Seminar-One of 15 Marks	Best of test and Assignment shall be considered against 15 marks
Semester End Exam (SEE)	Pattern -FOUR Questions (A, B, C, D)from each Unit Question - A & B: (Compulsory) Very short answer type (01each) 02 x 5 = 10 Marks Question - C: Short answer type question 03 x 5 = 15 Marks Question -D: Long answer type question 07 x 5 = 35 Marks Total = 60 Marks	

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OFCHEMISTRY

COURSE CURRICULUM 2024-25

Lab Course

Part A: Introduction				
Program:		Class: B.Sc. Biochemistry Semester -VI		Session:2024-2025
1	Course Code	**BBCL 06**		
2	Course Title	LAB COURSE BIOCHEMISTRY-VI		
3	Course Type	DSCGEC		
4	Course Learning Outcome (CLO)	On successful completion of the course, the student shall be able to: 1.Students will learn the experimental techniques of recombinant DNA technology. 2.biotechnological applications. 3.separation of DNA fragments by Agarose gel electrophoresis. 4.isolation of plasmid DNA from E. coli, transformation of E. coli cells, digestion of plasmid DNA, 5.amplification of a DNA fragment by PCR, etc.		
5	Credit Value	**1C**	**1 credit =15 Hours – Learning and Observation**	
6	Total Marks	Maximum Marks :25		Minimum Passing Marks:10

S.No.	List of Experiments
1.	1. Agarose gel electrophoresis for separation of DNA fragments
2.	2. Isolation of plasmid DNA from E. coli.
3.	3. Transformation of E. coli cells with plasmid DNA.
4.	4. Digestion of plasmid DNA with restriction enzymes.
5.	5. Amplification of a DNA fragment by PCR.
6.	6. Complementation of β–galactosidase for Blue and White selection.

Part C - Learning Resource
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: **Maximum Marks:** **25 Marks** **(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)**	
Semester End Exam (SEE)	Laboratory performance: As per Dept. (LOCF)

Name & Signature of Members of Board of Studies

05/07/2024
Dr. Mrigendra Dwivedi
Sub. Expert

05/7/24
(Dr. Arun Mishra)

05/07/2024
(Dr. Hemlata Mahobey)

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5/7/24
(Dr. Prerna Kathane)

Dr. A.K. Allai

Dr. A. Kashyap

B. Jai
(Dr. Bhawana Jai)

DEPARTMENT OF CHEMISTRY

GOVT.V.Y.T.PG.AUTONOMOUS COLLEGE, DURG. (C.G.)

Four Year Undergraduate Program

BIOCHEMISTRY

Session 2024-25

For SEC

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISRTY

COURSE CURRICULUM 2024-25

BIOCHEMISTRY

PART A: INTRODUCTION				
Program: U.G.		Class: B.Sc.		Session:2024-2025
1	Course Code	BBCS01		
2	Course Title	Environmental Biochemistry		
3	Course Type	SEC		
4	Course Learning Outcome (CLO)	**This Course will enable the students to:** CO1: Understand about Sources and Effect of Pollution. CO2: Learn about hazards and risk assessment.		
5	Credit Value	2Credits	1 credit =15 Hours – Learning and Observation	
6	Total Marks	Maximum Marks :50		Minimum Passing Marks:40

PART B: CONTENT OF THE COURSE	
Total no. of Teaching/ Learning Periods = 30Periods (30 Hours)	
Topics (COURSE CONTENTS)	No. of Periods
Environmental Pollution: Major types. Outdoor and indoor air pollution, structure, sources, health effects and control strategies;	05
water pollution, soil contamination, noise pollution and electromagnetic radiations: Sources, health effects and control strategies.	05
Pesticide toxicity: Insecticides, fungicides, herbicides and bio pesticides.	05
Toxicology of food additives; Occupational hazards and risk assessment.	05
Metal toxicity: arsenic, mercury, lead, cadmium and fluoride.	05

PART C - LEARNING RESOURCES
Text Books, Reference Books, Other Resources

Reference Books

Environmental Biochemistry Neelima Rajvaidya, Dilip Kumar Markandey APH Publishing, 2005 –

Environmental biochemistry by U Satyanarayana, M.Sc., Ph.D., F.I.C., F.A.C.B.

Environmental Biochemistry Author Victor Perry ISBN 9781639891801Publication Year (2022)

Textbook of Environmental Biochemistry Harender K. Gaur ISBN: 9788181524478, 8181524470 Edition: First, 2018

Bioremediation for Environmental Pollutants Sustainable Materials Editor(s) : Inamuddin ISBN: 978-981-5123-50-0

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

https://www.sciencedirect.com/topics/medicine-and-dentistry/enzymology
https://www.jbc.org/Enzymology
https://www.biologyonline.com/dictionary/coenzyme
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3770912/
https://www.eposters.net/redirect/?ID=16026&UID=0&Type=poster
https://link.springer.com/chapter/10.1007/978-0-387-35141-4_34
https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/enzyme- immobilization

Assessment and Evaluation

PART D: ASSESSMENT AND EVALUATION			
Evaluation Methods: Internal (CCE) + External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Min. Marks**
Theory	ESE	25	10
Project	On Course Content	25	10
	Total Marks	**50**	20

Name & Signature of Members of Board of Studies.

05/07/2024
Dr. Mrigendra Dwedi
Subject Expert

05/7/24
(Dr. S.D. Deshmukh)

5.7.24
(Dr. S.C. Tiwari)

05/7/24
(Dr. Arun Mishra)

05/07/24
(Dr. Anju Jha)

5/7/24
(Dr. Prerna Kathane)

05/07/2024
(Dr. Hemlata Mahobey)

Dr. V.S. Peele

Dr. A.K.P. Mishra

05.07.24.
Dr. Sunitha Mathew

Dr. A. Kashyap

Dr. Bhawana Jain

DEPARTMENT OF CHEMISTRY

GOVT.V.Y.T.PG.AUTONOMOUS COLLEGE, DURG. (C.G.)

Four Year Undergraduate Program

BIOCHEMISTRY

Session 2024-25

For SEC - II

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF CHEMISRTY

COURSE CURRICULUM 2024-25

BIOCHEMISTRY

PART A: INTRODUCTION				
Program: U.G.		Class: B.Sc.		Session:2024-2025
1	Course Code	INTERPRTATION OF CLINICA BBCS0-II		
2	Course Title	INTERPRATION OF CLINICAL LABORATORY DATA		
3	Course Type	SEC		
4	Course Learning Outcome (CLO)	**This Course will enable the students to:** CO1: Understand about Laboratory factors. CO2: Learn about Clinical factors.		
5	Credit Value	2Credits	1 credit =15 Hours – Learning and Observation	
6	Total Marks	Maximum Marks :50		Minimum Passing Marks:20

PART B: CONTENT OF THE COURSE Total no. of Teaching/ Learning Periods = 30Periods (30 Hours)	
Topics (COURSE CONTENTS)	**No. of Periods**
A student of III semester will have project work. The project has to be carried out in the department. For this course student will have to interpret data given in the pseudo/hypothetical clinical report (at least 01). This Clinical laboratory test reports may be one of any aged group patients /healthy (male/female) subject will be interpret in following criteria. There are many variables that must be considered when interpreting the results of any laboratory or diagnostic test.	**05**
Patient factors: The time of day, fasting, postprandial, supine, upright, age, gender, climate, effects of drugs, and the effects of diet may all affect test results.	**05**
Laboratory factors: Lab situations to consider are: instrumentation (lab equipment used and blood draw equipment used), child or adult, laboratory methodology for performing the tests, laboratory techniques used, the actual lab procedure may yield false-positive or false-negative results, chemicals or reagents used in the lab may be out-dated or contaminated or defective, clerical errors may occur that will give wrong test results, technical errors (problems with the machines that perform some automated tests) may occur that give false results, a variety of human errors in the lab may occur (mixing the wrong chemicals, wrong proportions, etc.).	**05**
Clinical Factors: Special notations should be made on the laboratory test request form when it is particularly germane to a test: time when the blood is drawn , relation to meals (glucose), intravenous infusions (electrolytes), source of specimen (arterial, venous, capillary). Any other aspects which is taken as important by guide/supervisor/teacher.	**05**

Assessment and Evaluation

PART D: ASSESSMENT AND EVALUATION			
Evaluation Methods: Internal (CCE) + External Assessment (ESE)			
Assessment	**Mode**	**Max. Marks**	**Min. Marks**
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	Total Marks	**50**	20

Name & Signature of Members of Board of Studies.

05/07/2024
Dr. Mrigendra Dwedi
Subject-Expert

05/7/24
(Dr. Arun Kishor)

05/07/2024
(Dr. Hemlata Mohabey)

Dr. U.S. Geeta

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(Dr. Sunitha Mathew)

5/7/24
(Dr. Prerna Kathane)

Dr. A. Kanley

(Dr. Bhawana Jain)

Department of Chemistry

Govt. V.Y.T. PG Autonomous

College Durg (C.G.)

Value added Course

2024-25

Govt. V. Y. T. PG Autonomous College, Durg

Department of Chemistry

Value Added Course: *Chemistry of Food, Nutrition and Preservation*

Course Duration: 30hrs.

Course outcome:

Upon successful completion of the course, students are expected to be able:

CO1: To have knowledge about the basics of foodscience and its significance

CO2: To gain insight of nutrition and itsimportance

CO3: To learn about the food preservation and itsutility

CO4: To know about food contaminants, additives, food standards and food laws

CO5: To imbibe the practical skills of food preservation, food processing and quantitative estimation

Module- 1 **(4 lectures/hrs.)**

Basic of Food Science:Basic concept on Food, Nutrition and Nutrients - Nutrition,Malnutrition and Health: Scope of Nutrition; Classification of food;Food group and food pyramids; Classification of nutrients;Balanced Diet.

Module - 2 **(8 lectures/hrs.)**

Nutrition: Dietary fibers (composition, properties), Minerals and trace elements - Calcium, Iron, Iodine, Zinc and Copper(biochemicaland physiological role, bioavailability and requirement), Vitamins (examples, biochemical and physiological requirements, deficiency and excess), Water (requirement, water balance), basic idea about community nutrition (objective and importance of various programmes).

Module - 3 **(6 lectures/hrs.)**

Food preservation: definition, objectives and principles of food preservation. Different methods of food preservation.Preserved Products: Jam, Jelly, Marmalade, Sauces, Pickles,Squashes,Syrups-types, composition and manufacture, selection, cost, storage, uses and nutritional aspects.

Module- 4 **(4 lectures/hrs.)**

Contamination of Food and Food Safety:

Contamination of food- physical and chemical contaminants (Heavy metals and Pesticides). Intentional andunintentional additives, Food additives- Antimicrobial agents, antioxidant, sweeteners and colors.

Food laws and standards, Food safety, Food Hazards of biological origin.

Food Standards: ISI, Agmark, FPO, MPO, PFA, FSSAI.

Module – 5 (Practical) **(8 hrs.)**

Practical based on following heads:

- Food preservation by drying/dehydrating/freezing/pasteurization
- Processing of jams/jellies/sauces/pickles
- Quantitative estimation of carbohydrates/proteins/lipids/trace elements/vitamins in foods
- Food contamination test

Reference/suggested books

1. SrilakshmiB(2017): Nutrition Science,6th Multicolour Ed. New Age International (P)Ltd.
2. RodayS(2012): Food Science and Nutrition, 2nd Ed. Oxford UniversityPress.
3. Mann J and TruswellS(2017): Essentials of Human Nutrition, 5th Ed. Oxford University Press.
4. Wilson K and Walker J(2000): Principles and Techniques of Practical Biochemistry, 5th Ed. Oxford UniversityPress.
5. Sadasivan S and ManikamK(2007): Biochemical Methods, 3rd Ed. New Age International (P) Ltd.
6. Oser B L(1965). Hawk's Physiological Chemistry, 14th Ed. McGraw-HillBook
7. GopalanC, Rama Sastri BV and Balasubramanian SC(2016): Nutritive value of Indian Foods, Indian Council of MedicalResearch.
8. Subalakshmi G and Udipi SA(2006):Food processing and preservation, 1st Ed. New Age International(P)Ltd.
9. SrilakshmiB(2018): Food Science, 7th Colour Ed. New Age International (P) Lt
10. Potter NN and Hotchkiss JH(1999): Food science,5th Ed.,Spinger.

GENERAL INFORMATION

1. Duration of Course: 30 hrs.
3. Eligibility:UG/PG regular students
4. Participants per Batch:30

TEACHING METHODOLOGY

Teaching Mode: Synchronous (Online live)/Asynchronous (Online videos/ PDFs)
Some of the following methods of delivery may be adopted:
A) Lecture
B) Pdf/ Video
C) Demonstration Video/Experimental
D) Group Discussion

ASSESSMENT & CERTIFICATE

Assessment:

Theassessment will be done by the department.Both theory and practical examinations will be conducted online/offline using synchronous and asynchronous modes based on suitable LMS

Pass regulation:

Minimum passing marks for Practical: 60%
Minimum pass marks for Theory: 40%

Certificate:

Successful candidates will be issuedcertificate by the College

ASSESSMENT GUIDELINE:

Assessment will be based on the following:

1. Written exam – Objective/subjective
2. Experiment and Viva-voce
3. Project work and presentation
4. Sessional-Attendance and punctuality

The following marking pattern to be adopted while assessing:

S.No.	Parameters	Assessable outcome	Marks
1.	Writing/Comprehension skill	Remember and Understand	60
2.	Analytical/Applied skill	Apply and Analyse	30
3.	Project work/Presentation skill	Evaluate and Create	20
4.	Sessional- regularity and performance	Aptitude and Attitude	10
	Total		**100**

Name & Signature of Members of Board of Studies:

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05/7/24 (Dr. Arun Mishra)

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(Dr Bhawana ...)