DEPARTMENT OF CHEMISTRY

COURSE CURRICULUM & MARKING SCHEME

B.Sc. I & II 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

FOUR YEAR UNDERGRADUATE PROGRAM (NEP–2020)

Program: Bachelor in Science (2024 -28)

DISCIPLINE – BIOCHEMISTRY

Session – 2024 -25

DSC -01 to 08		DSE -01 to 12	
Code	**Title**	**Code**	**Title**
BCSC -01T	Introductory Biochemistry and Biomolecules	**BCSE -01T**	Clinical Biochemistry
BCSC -01P	Introductory Biochemistry and Biomolecules	**BCSE -01P**	Clinical Biochemistry
BCSC -02T	Bioanalytical Techniques	**BCSE -02T**	Biology of Infectious Diseases
BCSC -02P	Bioanalytical Techniques	**BCSE -02P**	Biology of Infectious Diseases
BCSC -03T	Enzymology	**BCSE -03T**	Biotechnology
BCSC -03P	Enzymology	**BCSE -03P**	Biotechnology
BCSC -04T	Intermediary Metabolism	**BCSE -04T**	Plant Biochemistry
BCSC -04P	Intermediary Metabolism	**BCSE -04P**	Plant Biochemistry
BCSC -05T	Gene replication, expression and regulation	**BCSE -05T**	Human Physiology
BCSC -05P	Gene replication, expression and regulation	**BCSE -05P**	Human Physiology
BCSC -06T	Biochemistry and Function of Hormones	**BCSE -06T**	Cell Biology
BCSC -06P	Biochemistry and Function of Hormones	**BCSE -06P**	Cell Biology
BCSC -07T	Immunology	**BCSE -07T**	Microbial Biochemistry
BCSC -07P	Immunology	**BCSE -07P**	Microbial Biochemistry
BCSC -08T	Nutraceutical Biochemistry and Functional Foods	**BCSE -08T**	Nutritional and Environmental Biochemistry
BCSC -08P	Nutraceutical Biochemistry and Functional Foods	**BCSE -08P**	Nutritional and Environmental Biochemistry
		BCSE -09T	Bioinformatics
		BCSE -09P	Bioinformatics
		BCSE -10T	Industrial Biochemistry
		BCSE -10P	Industrial Biochemistry
		BCSE -11T	Entrepreneurship Development
		BCSE -11P	Entrepreneurship Development
		BCSE -12T	Research Methodology
		BCSE -12P	Research Methodology

GE -01 & 02	
BCGE -01T	Introductory Biochemistry and Biomolecules
BCGE -01P	Introductory Biochemistry and Biomolecules
BCGE -02T	Bioanalytical Techniques
BCGE -02P	Bioanalytical Techniques

VAC	
BCVAC-01	Ethno medicine in Chhattisgarh
SEC	
BCSEC-01	Biostatistics

Name and Signature of Convener & Members of CBoS:

11/06/2024

(Dr. Mrigendra Kumar Dwivedi)

Representative

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:

PO1.	**Knowledge:** A knowledge of contemporary issues related to biochemistry. Ability to demonstrate the fundamental knowledge of molecules of life, molecular techniques, toxicology in the area of biochemistry.
PO2.	**Critical Thinking and Reasoning:** Ability to think critically and apply the same to update scientific knowledge.
PO3.	**Problem Solving:** Ability to identify, formulate and solve professional problems in the area of biochemistry, experimental skill and critical thinking, students will be capable of addressing intricate societal and industrial challenges.
PO4.	**Advanced Analytical and Computational Skills:** Ability to design experiment and interpret the results. An ability to design a system, or process to meet desired need within realistic constraints
PO5.	**Effective Communication:** An ability to communicate effectively in scientific reasoning and data analysis in both written and oral forms.
PO6.	**Social/ Interdisciplinary Interaction:** Ability to function in a multidisciplinary team.
PO7.	**Self-directed and Life-long Learning:** A recognition of the needed for and an ability to engage in lifelong learning in the area of biochemistry.
PO8.	**Effective Citizenship: Leadership and Innovation:** An ability to use the techniques, skills and modern professional tools necessary for professional practice and for research.
PO9.	**Ethics:** An understanding of professional and ethical responsibility in the area of biochemistry.
PO10.	**Further Education or Employment and Global Perspective:** The broad education necessary to understand the impact of solutions in a global, economic, environmental and societal context.

Program Specific Objectives:

PSO1.	Students shall be able to identify, formulate and solve the problems of biological metabolisms, protein biochemistry and molecular biology.
PSO2.	Students shall be able to conduct the experiments in the field of medicine, toxicology and immunology as well as to analyses and interpret the results.
PSO3.	Students shall be able to use the biochemical techniques, bioinformatics tools, biostatistics, skills and modern pathological tools necessary for professional practice and for research.

Name and Signature of Convener & Members of CBoS:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

Department of Biochemistry

Course Curriculum

PART- A: Introduction				
Program: Bachelor in Science *(Certificate / Diploma / Degree/Honors)*		Semester - I		Session: 2024-2025
1	Course Code	BCSC – 01 T		
2	Course Title	Introductory Biochemistry and Biomolecules		
3	Course Type	Discipline Specific Course (Theory)		
4	Pre-requisite (if, any)	As per program		
5	Course Learning. Outcomes (CLO)	*After completion of the course, the students would be able to:* ➢ Understand the history of Biochemistry and key contributions of Indian scientists. ➢ Understand the properties of carbohydrates, proteins, lipids, cholesterol, DNA, RNA and their importance in biological systems. ➢ Understand the methods of determination of amino acid & Proteins. ➢ Understand the structure and function of determination of DNA & RNA.		
6	Credit Value	3 Credits	*Credit = 15 Hours - learning & Observation*	
7	Total Marks	Max. Marks: 100		Min Passing Marks: 40

PART -B: Content of the Course

Total No. of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	**General understanding of Biochemical** Molecular Logic of Life. Definition. Experiments and discoveries of Acharya Nagarjuna. Famous Indian and foreign Biochemists and their inventions/ Discoveries. Importance of Yog, Pranayam, food and healthy lifestyle for balance of biochemical (kaf, vat, pitta) of our body and role in maintaining good mental and physical health. Biochemical basis of Lifestyle disorders.	09
II	**Structure and functions of Carbohydrates and lipids:** Definition, classification, biological importance. Monosaccharides: Stereochemistry of monosaccharides, (+) and (-), D and L, epimers, anomers Disaccharides: Establishment of structures of sucrose and lactose and maltose. Polysaccharides: Partial structure, occurrence and importance of starch, glycogen, inulin, cellulose, chitine. heparin, hyaluronic acid. **Lipids:** Classification and biological role. Fatty acids – Nomenclature of saturated and unsaturated fatty acids. Phosphoglycerides: Structure and function of lecithin, cephalins, phosphotidylinositol, plasmalogens, and cardiolipin Structure and importance of sphingomyelin, gangliosides and cerebrosides.	12
III	**Structure and functions of Amino acids and Proteins:** Structure and classification of amino acids based on polarity. Amino acids D & L notation. **Peptides:** Peptide bond, structure and biological importance. **Proteins:** Peptides, Primary Structure of proteins, N- and C- terminal amino acids, Secondary Structure – α Helix. β-sheet, β-bend. Tertiary and quaternary structure, denaturation and renaturation of proteins.	12
IV	**Structure and functions of Nucleic acids:** Composition of DNA and RNA. Nucleosides and nucleotides. Chargaff's rule. Primary and secondary structure of DNA, Watson and Crick model of DNA. Melting of DNA (Tm).	12
Keywords	Biomolecules, Carbohydrate, Lipids, Fatty acids, Nucleotides, Nucleosides, Nucleic acids,	

Name and Signature of Convener & Members of CBoS:

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Nelson, Cox and Lehninger Principles of Biochemistry, 7th Edition
- Medical Biochemistry By Styanarayan.

Online Resources–

- **e-Resources / e-books and e-learning portals**
- https://www.britannica.com/
- https://en.wikibooks.org/wiki/Biochemistry
- https://www.pdfdrive.com/biomolecules-books.html
- https://byjus.com/biology/biomolecules/
- https://www.vedantu.com/biology/biomolecules

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Internal Assessment (CIA):	**30 Marks**
End Semester Exam (ESE):	**70 Marks**

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **20** +**20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1.** Objective – **10 x1= 10** Mark; **Q2.** Short answer type- **5x4 =20 Marks** Section B: Descriptive answer type qts.,**1out of 2** from each unit-**4x10=40 Marks**	

Name and Signature of Convener & Members of CBoS:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A: Introduction				
Program: Bachelor in Science *(Certificate / Diploma / Degree/Honors)*		**Semester - I**		Session: **2024-2025**
1	Course Code	BCSC – 01 P		
2	Course Title	**Introductory Biochemistry and Biomolecules**		
3	Course Type	Discipline Specific Course (Practical)		
4	Pre-requisite (if, any)	As per the Program		
5	Course Learning. Outcomes (CLO)	*On successful completion of the course, the student shall be able to:* ➢ Describe the basic lab requirements and their uses. ➢ Analyze the characteristics of the compound on the basis of their pH. ➢ Formulate to prepare normal, molar and stock solution. ➢ Estimate Bimolecules in mixture.		
6	Credit Value	**1 Credits**	*Credit =30 Hours Laboratory or Field learning/Training*	
7	Total Marks	**Max. Marks:** 50		**Min Passing Marks:** 20

PART -B: Content of the Course

Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)

Module	Topics (Course contents)	No. of Period
Lab./Field Training/ Experiment Contents of Course	➢ Safety measures in laboratories. ➢ Preparation of normal, molar and stock solution. ➢ Preparation of buffers. ➢ Qualitative tests for carbohydrates, lipids, amino acids, proteins and nucleic acids. ➢ Separation of amino acids/ sugars/ bases by Paper / Thin layer chromatography. ➢ Estimation of vitamin C titremetic method. ➢ Determination of saponification value and iodine number of fats. ➢ Short write-ups on disease privations practices in Indian Knowledge system.	30
Keywords	Laboratory Safety, Estimation, Sugar, Fat, Proteins	

Name and Signature of Convener & Members of CBoS:

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox,
- Experimental Biochemistry by Beedu Shashidhar Rao

Online Resources–

- **e-Resources / e-books and e-learning portals**
- https://en.wikibooks.org/wiki/Biochemistry
- https://www.pdfdrive.com/biomolecules-books.html
- https://ncert.nic.in/textbook.php

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: **50 Marks**
Continuous Internal Assessment (CIA): **15 Marks**
End Semester Exam (ESE): **35 Marks**

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): **10 & 10** Assignment/Seminar +Attendance - **05** Total Marks - **15**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **15** Marks
End Semester Exam (ESE):	**Laboratory / Field Skill Performance: On spot Assessment** **A. Performed the Task based on lab. work - 20 Marks** **B. Spotting based on tools & technology (written) – 10 Marks** **C. Viva-voce (based on principle/technology) - 05 Marks**	**Managed by Course teacher as per lab. status**

Name and Signature of Convener & Members of CBoS:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A: Introduction				
Program: Bachelor in Science *(Certificate / Diploma / Degree / Honors)*		**Semester - II**		Session: **2024-2025**
1	**Course Code**	**BCSC - 02T**		
2	**Course Title**	Bio-analytical Techniques		
3	**Course Type**	Discipline Specific Course (Theory)		
4	**Pre-requisite (if, any)**	As per the Program		
5	**Course Learning. Outcomes (CLO)**	*On successful completion of the course, the student shall be able to:* ➢ Understand basic concepts of Spectroscopy. ➢ Describe amino acids with application of chromatography. ➢ Understand basic concepts of centrifugation. ➢ Understand working principle, instrumentation and applications of various electrophoretic techniques.		
6	**Credit Value**	**3 Credits**	*Credit = 15 Hours - learning & Observation*	
7	**Total Marks**	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

Total No. of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Spectroscopy** - Concepts of spectroscopy, Laws of photometry. Beer-Lambert's law, Principles and applications of colori.metry. Visible and UV spectroscopy. **Electrophoretic techniques** – Principles of electrophoretic separation. Types of electrophoresis including paper and gel. PAGE and SDS-PAGE. Isoelectric focussing.	12
II	**Chromatography** – Principles and applications of paper, thin layer, ion exchange, affinity, gel permeation, adsorption and partition chromatography. HPLC and FPLC.	09
III	**Centrifugation** – Principle of centrifugation, concepts of RCF, different types of instruments and rotors, preparative, differential and density gradient centrifugation, analytical, ultra-centrifugation, determination of molecular weights and other applications.	12
IV	**Microscopy** – Bright field, Dark field, Phase contrast and Fluorescence microscopy Transmission and scanning microscopy, freeze fracture techniques, specific staining of biological materials **Immunological Techniques:** Immuno diffusion, immune electrophoresis, radioimmunoassay, ELISA, Immuno fluorescence.	12
Keywords	Spectroscopy, Chromatography, Centrifugation, Electrophoresis, Microscope, ELISA.	

Name and Signature of Convener & Members of CBoS:

PART–C: **Learning Resources**		
Text Books, Reference Books and Others		
Text Books Recommended – ➢ K Wilson and John Walker Practical Biochemistry: Principles & Techniques ➢ RF Boyer Biochemistry Laboratory: Modern Theory & Techniques ➢ Physical biochemistry by D Friefelder, WH Freeman & Co., USA. ➢ Biophysical Chemistry By Upahyaya & Nath		
Online Resources– ➢ **e-Resources / e-books and e-learning portals** ➢ https://en.wikibooks.org/wiki/Biochemistry ➢ https://www.pdfdrive.com/biomolecules-books.html ➢ https://ncert.nic.in/textbook.php		
PART -D: Assessment and Evaluation		
Suggested Continuous Evaluation Methods: **Maximum Marks:** **100 Marks** **Continuous Internal Assessment (CIA):** **30 Marks** **End Semester Exam (ESE):** **70 Marks**		
Continuous Internal Assessment (CIA): **(By Course Teacher)**	Internal Test / Quiz-(2): **20 +20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A: Introduction				
Program: Bachelor in Science *(Certificate / Diploma / Degree/ Honors)*		Semester -II	Session: 2024-2025	
1	Course Code	BCSC- 02P		
2	Course Title	Bioanalytical Techniques		
3	Course Type	Discipline Specific Course (Practical)		
4	Pre-requisite (if, any)	As Per the Program		
5	Course Learning. Outcomes (CLO)	*On successful completion of the course, the student shall be able to:* ➢ Examine different components present in the extract of radish leaves by using chromatography technique. ➢ Analysis independently of various biomolecules in the laboratory. ➢ Demonstrate the effect of inorganic compound and its percent purities in various types of samples. ➢ Analyze characteristics of UV absorption spectra of by different methods in samples in different biomolecules.		
6	Credit Value	1 Credits	*Credit =30 Hours Laboratory or Field learning/Training*	
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20	

PART -B: Content of the Course

Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)

Module	Topics (Course contents)	No. of Period
Lab./Field Training/ Experiment Contents of Course	➢ Verification of Beer-Lambert's law. ➢ Separation of sugars using paper chromatography. ➢ Separation of amino acids by paper chromatography ➢ Differential centrifugation of cell organelles ➢ SDS-PAGE gel electrophoresis of protein ➢ Separation of plant pigments by Paper chromatography ➢ Estimation of DNA and RNA.	30
Keywords	Spectroscopy, Estimation, Quantitative, Separation, Techniques	

Name and Signature of Convener & Members of CBoS:

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- K Wilson and John Walker Practical Biochemistry: Principles & Techniques
- RF Boyer Biochemistry Laboratory: Modern Theory & Techniques
- Physical biochemistry by D Friefelder, WH Freeman & Co., USA.
- Biophysical Chemistry By Upahyaya & Nath

Online Resources–

- **e-Resources / e-books and e-learning portals**
- https://en.wikibooks.org/wiki/Biochemistry
- https://www.pdfdrive.com/biomolecules-books.html
- https://ncert.nic.in/textbook.php

PART -D: Assessment and Evaluation

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