

शहीद नंदकुमार पटेल विश्वविद्यालय, रायगढ़ (छ.ग.)

(छत्तीसगढ़ विश्वविद्यालय अधिनियम 1973 द्वारा स्थापित राजकीय विश्वविद्यालय)



राष्ट्रीय शिक्षा नीति – 2020

के तहत

नवीन पाठ्यक्रम

(सत्र 2024–25)

बायो-केमेस्ट्री

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		VAC	
BCGE -01T	Introductory Biochemistry and Biomolecules	BCVAC-01	Ethno medicine in Chhattisgarh
BCGE -01P	Introductory Biochemistry and Biomolecules	SEC	
BCGE -02T	Bioanalytical Techniques	BCSEC-01	Biostatistics
BCGE -02P	Bioanalytical Techniques		

Name and Signature of Convener & Members of CBoS:

11/06/2024
(Dr. Mrigendra Kumar Desai)

प्रभासी अधिकारी (अकादमी)
शहीद नंदकुमार पटेल
विश्वविद्यालय, रायगढ़ (छ.ग.)

11/6
Representative
Comm. H.E.

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.

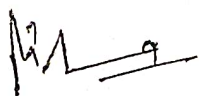
Program Outcome:

On successful completion of this program the graduates shall have:

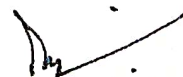
PO1.	Knowledge: A knowledge of contemporary issues related to biochemistry. Ability to demonstrate the fundamental knowledge of molecules of life, molecular techniques, toxicology in the area of biochemistry.
PO2.	Critical Thinking and Reasoning: Ability to think critically and apply the same to update 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)	<i>After completion of the course, the students would be able to:</i> ➤ 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, phosphotidylinosital, 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 (T_m).		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 Styanarayana.

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., 1 out 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)	<i>On successful completion of the course, the student shall be able to:</i> ➤ 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 Biomolecules 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 titrimetric 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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05	
	Total Marks - 15	
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)	<i>On successful completion of the course, the student shall be able to:</i> ➤ 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 colorimetry. 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 –**

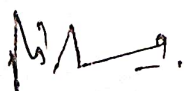
- K Wilson and John Walker Practical Biochemistry: Principles & Techniques
- RF Boyer Biochemistry Laboratory: Modern Theory & Techniques
- Physical biochemistry by D Friefelder, WH Freeman & Co., USA.
- Biophysical Chemistry By Upahyaya & Nath

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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10	
	Total Marks - 30	
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 -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**Suggested Continuous Evaluation Methods:**

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

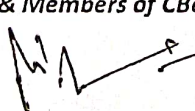
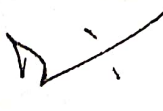
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar +Attendance - 05 Total Marks - 15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory / Field Skill 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 / IV / V/ VI	Session: 2024-2025
1	Course Code	BCSEC- 01	
2	Course Title	Biostatistics	
3	Course Type	Skill Enhancement Course	
4	Pre-requisite (if, any)	As Per the Course.	
5	Course Learning Outcomes (CLO)	<i>On successful completion of the course, the student shall be able to:</i> ➤ Understand the principles of collection of data in biological experiments, proper statistical analysis of the data and its presentation. ➤ Understand the importance of sample size and various variables that affect data. ➤ Know the importance of mean, standard error, standard deviation, significance in presenting the data. ➤ Knowing statistical methods will help students in improving their analytical and interpretation skill.	
6	Credit Value	2 Credits (1C + 1C)	<i>Credit = 15 Hours – Theoretical learning and = 30 Hours Laboratory or Field learning/Training</i>
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of Teaching-learning Periods:			
Theory – 15 Periods (15 Hrs) and Lab. or Field learning/Training 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Theory Contents	Data Collection and Presentation: Biological data management using statistical tools. Concepts of population and sample, advantages of sampling, Basic concepts in sampling and designing experiments, Modes of presenting data: Frequency distributions, Relative frequency Analysis of variance: Mean, median, mode; Co-efficient of variation and standard deviation. Probability: Laws of Probability. Hypothesis testing: General concepts – Null hypothesis, alternative hypothesis, Rejection of hypothesis; Type I and Type II errors; P value and sample size estimation. Chi Square Test – Observed and expected frequencies, Calculating p values, assumptions of a chi square goodness of fit; One-way ANOVA, student's t-test.		15
Lab./Field Training Contents	Estimation of population means and variance in simple random sampling. Collection of data - Random sampling method. Data representation - Frequency and relative frequency distribution table, Plotting of biological data in a representative, graphical format. Data analysis - Calculating Mean, median, mode, variance, standard deviation and standard error for a given data set. S Standard t-test for grouped samples. Analysis of one way variance Chi square goodness of fit test. Learning to analyze data using SPSS/ Prism software		30
Keywords	Sampling, Frequency and relative frequency, variance, standard deviation, Hypothesis testing.		

Name and Signature of Convener & Members of CBOS:

PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- Principles of Biostatistics, M. Pagano and K. Gauvreau (2000); Duxbury Thomas learnings.
- Analysis of Biological Data, M. Whitlock and D. Schluter (2009); Roberts and company publishers.

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 Coordinator)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks	
	Assignment/Seminar +Attendance - 05		
	Total Marks - 15		
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment		Managed by Coordinator as per skilling
	A. Performed the Task based on learned skill - 20 Marks		
	B. Spotting based on tools (written) - 10 Marks		
	C. Viva-voce (based on principle/technology) - 05 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 / III / V	Session: 2024-2025
1	Course Code	BCVAC- 01	
2	Course Title	Ethno Medicine in Chhattisgarh	
3	Course Type	Value added Course	
4	Pre-requisite (if, any)	As Per the Course	
5	Course Learning Outcomes (CLO)	On successful completion of the course, the student shall be able to: ➤ Explain the basic components of Medicinal plant. ➤ Summarize the bioactive compound in herbs. ➤ Recognize the disorder and ethno medicine for it. ➤ Understand the effect of bioactive compound on the disease as well as interpret the effect of toxic chemicals on body parts and their cure.	
6	Credit Value	2 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 30 Periods (30 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Historical perspective, scope and future prospects. Scrutinizing the term 'Ethno medicine'. Common and crucial Medicinal Plants in Chhattisgarh: Ethno medicine in India.		07
II	Properties and functions of photochemical and their medicinal effects - Glucosamine, Octacosanol, Lycopene, Flavonoids, Carnitine, Melatonin and Ornithine alpha, ketoglutarate. Use of proanthocyanidins, grape products, flaxseed oil as Medicine.		08
III	Disease and Ethno medicine; Common Herbal/ House hold/ food used as Medicines in in treatment for cognitive decline. Herbal/ House hold/ food used as Medicines for common disorders like Arthritis, Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers etc.		07
IV	Brief idea about Medicinal effect of some Nutraceutical rich supplements e.g. Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulina etc.		08
Keywords	Phytochemical, Nutraceuticals, Herbal Medicine, Disorders, Disease.		

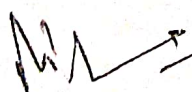
Name and Signature of Convener & Members of CBoS:

PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- 1. Gopalan C., et al Dietary Allowances for Indians, NIH, Hyderabad.
- 2. Anita F.P. Clinical Dietetics and Nutrition, 4th Ed, 1997,
- 3. Devlin, T.M. Text Book of Biochemistry with Clinical Correlation,
- 4. Mahan, L.K. & Ecott- Stump, S. [Ed.] Krause's Food, Nutrition and Diet Therapy .

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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance -	05	
	Total Marks -	15	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 05 x1= 05 Mark; Q2. Short answer type- 5x2 =10 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit- 4x05 =20 Marks		


 Name and Signature of Convener & Members of CBoS:
 

Generic Elective Courses

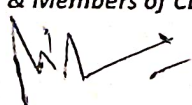
FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

Department of Biochemistry

Course Curriculum

PART- A: Introduction			
Program: Bachelor in Science (Certificate / Diploma / Degree/Honors)		Semester - I	Session: 2024-2025
1	Course Code	BCGE - 01 T	
2	Course Title	Introductory Biochemistry and Biomolecules	
3	Course Type	Generic Elective (Theory)	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	After completion of the course, the students would be able: ➤ Students will be exposed to the history of Biochemistry and key contributions of 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 and nucleotide sequence of proteins and DNA respectively. ➤ They will understand the methods of estimation 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: 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: function of lecithin, cephalins, phosphatidylinositol, plasmalogens, and cardiolipin, importance of sphingomyelin, gangliosides and cerebroside.		12
III	Structure and functions of Amino acids and Proteins: General Structure, classification of amino acids based on R Group. Amino acids D & L notation. 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 (T_m).		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 –**

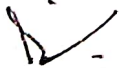
- Nelson, Cox and Lehninger Principles of Biochemistry, 7th Edition
- Medical Biochemistry By Styanarayan.

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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10	
	Total Marks - 30	
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	BCGE – 01 P	
2	Course Title	Biomolecules	
3	Course Type	Generic Elective (Practical)	
4	Pre-requisite (If, any)	As per the Course	
5	Course Learning Outcomes (CLO)	<i>On successful completion of the course, the student shall be able to:</i> ➤ Describe the basic lab requirements and their uses. ➤ Explain various instruments using in separation and isolation of various analytical compounds. ➤ Analyze the characteristics of the compound on the basis of their pH. ➤ Understand to Prepare normal, molar and stock solution. ➤ To estimate Biomolecules 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. ➤ 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>

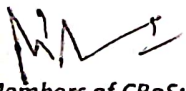
PART -D: Assessment and Evaluation**Suggested Continuous Evaluation Methods:**

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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks - 15	
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	BCGE – 02 T	
2	Course Title	Bioanalytical Techniques	
3	Course Type	Generic Elective (Theory)	
4	Pre-requisite (if, any)	As per the Programm	
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 colorimetry. Visible and UV spectroscopy. Electrophoretic techniques – Principles of electrophoretic separation. Types of electrophoresis including paper and gel.		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, 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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10	
	Total Marks - 30	
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 -II	Session: 2024-2025
1	Course Code	BCGE- 02P	
2	Course Title	Bioanalytical Techniques	
3	Course Type	Generic Elective (Practical)	
4	Pre-requisite (if, any)	As Per the Course	
5	Course Learning Outcomes (CLO)	<i>On successful completion of the course, the student shall be able to:</i> ➤ 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 ➤ Separation of plant pigments by Paper chromatography		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**Suggested Continuous Evaluation Methods:****Maximum Marks:** 50 Marks**Continuous Internal Assessment (CIA):** 15 Marks**End Semester Exam (ESE):** 35 Marks

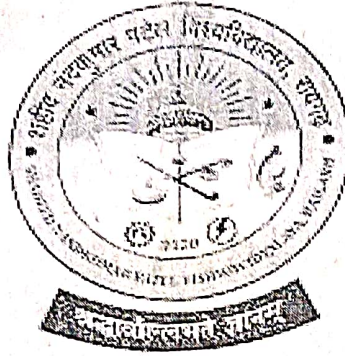
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05	
	Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field 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:

शहीद नंदकुमार पटेल विश्वविद्यालय, रायगढ़ (छ.ग.)

(छत्तीसगढ़ विश्वविद्यालय अधिनियम 1973 द्वारा स्थापित राजकीय विश्वविद्यालय)



राष्ट्रीय शिक्षा नीति – 2020
के तहत तृतीय एवं चतुर्थ सेमेस्टर
नवीन पाठ्यक्रम
(सत्र 2025–26)

बाथो केमिस्ट्री

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		VAC	
BCGE -01T	Introductory Biochemistry and Biomolecules	BCVAC-01	Ethno medicine in Chhattisgarh
BCGE -01P	Introductory Biochemistry and Biomolecules	SEC	
BCGE -02T	Bioanalytical Techniques	BCSEC-01	Biostatistics
BCGE -02P	Bioanalytical Techniques		

Name and Signature of Convener & Members of CBoS:

(Dr. Mrigendra Kumar Dwivedi)

प्रभारी अधिकारी (अकादमी)
शहीद नंदकुमार पटेल
विश्वविद्यालय, रायगढ़ (छ.ग.)

11/6
Representative
Comm. H.F.

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:

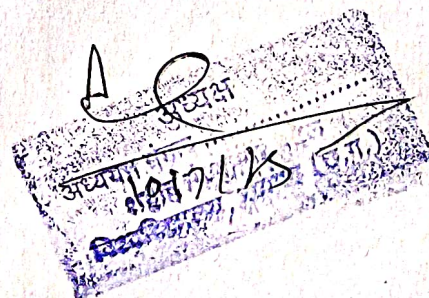
FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

Department of Biochemistry

Course Curriculum

PART- A: Introduction			
Program: Bachelor in Science (Diploma / Degree / Honors)		Semester - III	Session: 2024-2025
1	Course Code	BCSC- 03 T	
2	Course Title	Enzymology	
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: ➤ Describe the enzyme catalysis and regulatory enzymes. ➤ Explain the mechanism of action of enzymes and role of vitamins as coenzyme precursors. ➤ Express the Michaelis-Menten equation, and double reciprocal plots, and graphical representation of various inhibitors. ➤ Describe the principles and methods of Diagnosis by enzymes.	
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	Introduction to enzymes: Nature of enzymes - protein and non-protein (ribozyme). Cofactor and prosthetic group, apoenzyme, holoenzyme. IUBMB classification of enzymes. Coenzymes. Features of enzyme catalysis Catalytic power and specificity of enzymes (concept of active site), Fischer's lock and key hypothesis, Koshland's induced fit hypothesis		09
II	Enzyme kinetics: Relationship between initial velocity and substrate concentration, steady state kinetics, equilibrium constant - Mono substrate reactions. Michaelis-Menten equation, Lineweaver-Burk plot, Km and Vmax, K _{cat} and turnover number. Effect of pH, temperature and metal ions on the activity of enzyme.		12
III	Enzyme inhibition: Reversible inhibition (competitive, uncompetitive, non-competitive, mixed and substrate). Mechanism based inhibitors. Mechanism of action of enzymes - General features - proximity and orientation, strain and distortion, acid base and covalent catalysis (chymotrypsin, lysozyme).		12
IV	Regulation of enzyme activity: Control of activities of single enzymes (end product inhibition) and metabolic pathways, feedback inhibition (aspartate transcarbamoylase), reversible covalent modification phosphorylation (glycogen phosphorylase). Proteolytic cleavage- zymogen. Multienzyme complex as regulatory enzymes, pyruvate dehydrogenase. Isoenzymes - properties and physiological significance (lactate dehydrogenase). Application of enzymes in diagnostics: (SGPT, SGOT, creatine kinase, alkaline and acid phosphatases), Enzyme electrodes, biosensors.		12
Keywords		Coenzyme, Ribozyme, Cofactor, Apoenzyme, Michaelis-Menten equation.	

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, M.M., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292-3414-8.
- Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley & Sons Asia Pvt.Ltd. (New Jersey), ISBN:978-1180-25024.
- Fundamentals of Enzymology (1999) 3rd ed., Nicholas C.P. and Lewis S., Oxford University Press Inc. (New York), ISBN:0 19 850229 X.

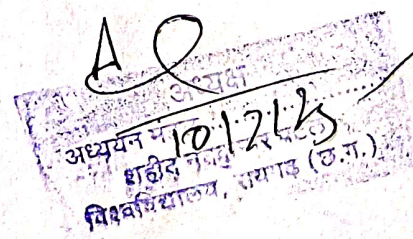
Online Resources–**e-Resources / e-books and e-learning portals**

- <https://www.jbc.org/Enzymology>
- <https://www.sciencedirect.com/topics/medicine-and-dentistry/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

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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar -	10	
	Total Marks -	30	
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., 1 out of 2 from each unit-4x10=40 Marks		

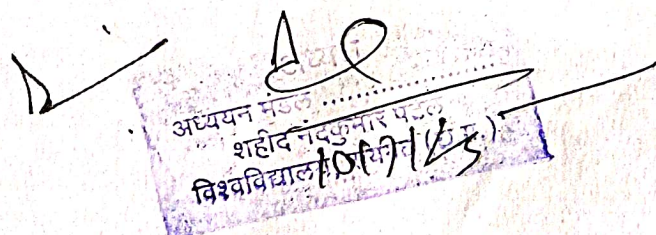
Name and Signature of Convener & Members of CBOS:



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

PART- A: Introduction			
Program: Bachelor in Science (Diploma / Degree/ Honors)		Semester -III	Session: 2024-2025
1	Course Code	BCSC- 03 P	
2	Course Title	Enzymology	
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: ➤ Explain purification of proteins by various methods. ➤ Estimate enzyme activity by different methods. ➤ Explain progress curve of enzyme. ➤ Practice the effect of physical parameters on enzyme activity.	
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	➤ Partial purification of acid/ alkaline phosphatase. ➤ Assay of enzyme activity and specific activity, e.g. acid/ alkaline phosphatase. ➤ Effect of pH on enzyme activity and determination of optimum pH. ➤ Determination of Km and Vmax using Lineweaver-Burk graph. ➤ Isolation and purification of urease. ➤ Inhibition of alkaline/acid phosphatase activity by EDTA ➤ Effect of substrate concentration on alkaline phosphatase activity and determine of its Km value. ➤ Effect of temperature of enzyme activity and determination of activation energy. ➤ Effect of enzyme concentration on enzyme activity.		30
Keywords	Assay, Enzyme, Specific activity, Temperature,		

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, M.M., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292- 3414-8.
- Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley & Sons Asia Pvt. Ltd. (New Jersey), ISBN:978-1180-25024.
- Fundamentals of Enzymology (1999) 3rd ed., Nicholas C.P. and Lewis S., Oxford University Press Inc. (New York), ISBN:0 19 850229 X.

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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks -	

Name and Signature of Convener & Members of CBoS:

अध्ययन मंडल
शहीद निंदक पटेल
विश्वविद्यालय, रायपुर (छ.प्र.)
10/7/25

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

PART- A: Introduction			
Program: Bachelor in Science (Diploma / Degree / Honors)		Semester - III	Session: 2024-2025
1	Course Code	BCSE- 01 T	
2	Course Title	Clinical Biochemistry	
3	Course Type	Discipline Specific Elective (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: ➤ Learn about the normal constituents of urine, blood and their significance in maintaining good health. ➤ Understand the mechanisms of causation of diseases of liver, kidney and of Cancer. ➤ Describe with the variations in the levels of triglycerides and lipoproteins and their relationship with various diseases. ➤ Explain with the role of enzymes in diagnosis of various diseases.	
6	Credit Value	3 Credits	<i>Credit = 15 Hours - learning & Observation</i>
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)			No. of Period
Unit	Topics (Course contents)		
I	Urine: Normal composition of urine – volume, pH, colour, specific gravity. Constituents-urea, uric acid, creatinine, pigment. Abnormal constituents – glucose, albumin, ketone bodies, variations in urea, creatinine, pigments and their clinical significance in brief. Abnormalities in Nitrogen Metabolism – Uremia, hyperuricemia, porphyria and factors affecting nitrogen balance.		09
II	Blood: Normal constituents of blood and their variation in pathological conditions - urea, uric acid, creatinine, glucose, bilirubin, total protein, albumin/globulin ratio. Lipid profile cholesterol, triglycerides, lipoproteins - HDL and LDL. Blood Clotting – Disturbances in blood clotting mechanisms – haemorrhagic disorders – haemophilia, von Willebrand's disease, purpura, Rendu-Osler-Werber disease, thrombotic thrombocytopenic purpura, disseminated intravascular coagulation, acquired prothrombin complex disorders, circulating anticoagulants.		12
III	Diagnostic Enzymes – Enzymes in health and diseases. Biochemical diagnosis of diseases by enzyme assays – SGOT, SGPT, alkaline phosphatase, CPK, cholinesterase, LDH Disorders of liver and kidney – Jaundice, fatty liver, normal and abnormal functions of liver and kidney. Inulin and urea clearance. Electrolytes and acid-base balance – Regulation of electrolyte content of body fluids and maintenance of pH, reabsorption of electrolytes.		12
IV	Biochemistry of Cancer, Cellular differentiation in cancer, carcinogens and cancer therapy Inborn errors of metabolism: Sick cell anaemia, phenyl ketonuria, Neimann – Pick disease and Gaucher's disease.		12
Keywords		Blood, Urine, Cancer, Enzymes, Diseases	

Name and Signature of Convener & Members of CBoS:


 अध्यक्ष महोदय
 शहीद नंदलाल
 विश्वविद्यालय, रायगढ़ (छ.ग.)

PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- Concise Medical Physiology – Choudhary – New Central Book Agency – Calcutta.
- TextBook of Medical Physiology – Guyton – Prism Books Pvt. Ltd. – Bangalore.
- Harper's Biochemistry – Murray, Granner, Mayes, and Rodwell – Prentice Hall International Inc.
- Textbook of medical physiology: A. C. Gyton, and J. E HallSaunders Elsevier Publications, A division of Reed Elsevier India Pvt .Ltd.New Delhi ISBN 81-8147-084-2
- T.M. Delvin (editor), Text book of biochemistry with clinical correlation, (1982), John Wiley & Sons Inc. USA.

Online Resources–**e-Resources / e-books and e-learning portals**

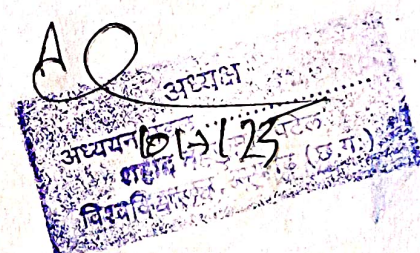
- <https://www.sciencedirect.com/topics/medicine-and-dentistry/enzymology>
- <https://www.jbc.org/Enzymology>
- <https://www.biologyonline.com/dictionary/coenzyme>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3770912/>
- <https://www.eposters.net/redirect/?ID=16026&UID=0&Type=poster>
- https://link.springer.com/chapter/10.1007/978-0-387-35141-4_34

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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10 Total Marks - 30	
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 (Diploma / Degree / Honors)		Semester - III	Session: 2024-2025
1	Course Code	BCSE-01 P	
2	Course Title	Clinical Biochemistry	
3	Course Type	Discipline Specific Elective (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: ➤ Understand Qualitative and quantitative analysis of constituents of biological fluids such as urine, blood and their estimation using standard methods.	
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	➤ Qualitative and quantitative analysis of urine : proteins, Bence-Jones proteins, Cl-, Ca ²⁺ ➤ Qualitative analysis of abnormal constituents in urine - glucose, albumin, bile pigments, bile salts and ketone bodies. ➤ Separation of Blood Plasma and Serum ➤ Determination of A/G ratio in serum ➤ Isolation and estimation of serum cholesterol ➤ Serum enzyme assays: alkaline phosphatase, SGOT, SGPT ➤ Estimation of bilirubin (conjugated and unconjugated) in serum. ➤ Estimation of total lipids in serum by vanillin method. ➤ Estimation of cholesterol in serum. ➤ Estimation of blood urea nitrogen from plasma. ➤ Estimation of SGPT and SGOT in serum. ➤ Preparation of starch from potato and its hydrolysis by salivary amylase. a. Determination of achromatic point in salivary amylase. b. Effect of sodium chloride on amylases		30
Keywords	Blood, Plasma, Liver function test, Serum enzymes		

Name and Signature of Convener & Members of CBoS:

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शहीद नंदकुमार
विश्वविद्यालय, रायचूर
10/7/25

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, M.M., W.H. Freeman and Company (New York), ISBN:13: 978-1-4641-0962-1 / ISBN:10:1-4292- 3414-8.
- Biochemistry (2011) 4th ed., Donald, V. and Judith G.V., John Wiley & Sons Asia Pvt. Ltd. (New Jersey), ISBN:978-1180-25024.
- Fundamentals of Enzymology (1999) 3rd ed., Nicholas C.P. and Lewis S., Oxford University Press Inc. (New York), ISBN:0 19 850229 X.

Online Resources–

- e-Resources / e-books and e-learning portals
<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-albumin/globulin-ag-ratio>
- <https://link.springer.com/article/10.1007/s101570200005>
- <https://icp.bmj.com/content/iclinpath/6/3/173.full.pdf>

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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05	
	Total Marks - 15	
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:

अध्ययन मंडल
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 विश्वविद्यालय, रायचूर (उ.प्र.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

Department of Biochemistry

Course Curriculum

PART- A: Introduction			
Program: Bachelor in Science (Diploma / Degree / Honors)		Semester - IV	Session: 2024-2025
1	Course Code	BCSC-04 T	
2	Course Title	Intermediary Metabolism	
3	Course Type	Discipline Specific Theory	
4	Pre-requisite (if, any)	As Per the Course	
5	Course Learning Outcomes (CLO)	On successful completion of the course, the student shall be able to: ➤ Acquire the knowledge of energy production in living systems by the degradation of fatty acids. ➤ Explain the various pathways of fatty acid synthesis in living systems. ➤ Explain the mechanism of the machinery system involved in carbohydrate metabolism. ➤ Describe breakdown and synthesis of Amino acids and nucleotides in humans and recognize its relevance with respect to nutrition and human diseases.	
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	Carbohydrate Metabolism : Reactions and energetics of glycolysis. Alcoholic and lactic acid fermentations. Reactions and energetic of TCA Cycle. Gluconeogenesis, glycogenesis and glycogenolysis. Reaction and Physiological significance of pentose phosphate pathway. Regulation of Glycolysis and TCA cycle.		12
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. Transport of reducing potentials into mitochondria.		09
III	Lipid Metabolism : Introduction, hydrolysis of triacylglycerols, transport of fatty acids into Mitochondria, β oxidation 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.		12
IV	Amino acid Metabolism: General reactions of amino acid metabolism: transamination, oxidative Deamination and decarboxylation. Urea cycle. Degradation and biosynthesis of Amino acids. Glycogenic and ketogenic amino acids. Nucleotide Metabolism: Sources of the atoms in the purine and pyrimidine molecules. Biosynthesis and Degradation of purines and pyrimidines .		12
Keywords		Glycolysis, Oxidative Phosphorylation, Oxidation, Urea cycle, Nucleotides, Porphyrins.	

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शहीद नंद लाल
विश्वविद्यालय, रायपुर (छ.ग.)

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, M.M., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.
- Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., John Wiley & Sons, Inc. (New Jersey), ISBN:978-0-470-28173-4.
- Biochemistry (2012) 7th ed., Berg, J.M., Tymoczko, J.L. and Stryer L., W.H. Freeman and Company (New York), ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936-4.

Online Resources–**e-Resources / e-books and e-learning portals**

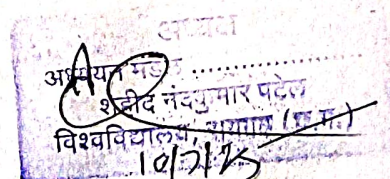
- <https://www.britannica.com/science/metabolism>
- <https://www.sciencedirect.com/science/article/pii/S0009912013001677>
- <https://pubmed.ncbi.nlm.nih.gov/23720291/>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3243375/>

PART -D: Assessment and Evaluation**Suggested Continuous Evaluation Methods:****Maximum Marks:** 100 Marks**Continuous 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:

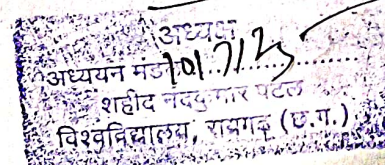




FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A: Introduction			
Program: Bachelor in Science (Diploma / Degree/ Honors)		Semester - IV	Session: 2024-2025
1	Course Code	BCSC- 04 P	
2	Course Title	Intermediary Metabolism	
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 importance of lipids as storage molecules and as structural component of biomembranes. ➤ Explain the importance of high energy compounds , synthesis of ATP under aerobic and anaerobic conditions. ➤ Explain the role of TCA cycle in central carbon metabolism, importance of anaplerotic reactions and redox balance. ➤ Explain perturbations in the carbon metabolism can lead to various disorders such as diabetes and cancer.	
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	➤ To understand the concepts of preparation of buffers. ➤ To estimate biomolecules such as glucose, proteins, cholesterol in clinical samples. ➤ To isolate of lipids from egg. ➤ Estimation of salivary amylase ➤ Separation of Blood Plasma and Serum ➤ Estimation of proteins from serum by biuret and Lowry methods. ➤ Estimation of bilirubin (conjugated and unconjugated) in serum. ➤ Estimation of cholesterol in serum. ➤ Estimation of blood urea nitrogen from plasma. ➤ Preparation of starch from potato and its hydrolysis by salivary amylase. ➤ Determination of achromatic point in salivary amylase. ➤ Effect of sodium chloride on amylases.		30
Keywords	Serum, Plasma, lipids, enzymes estimation, quantitative		

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, M.M., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.
- Textbook of Biochemistry with Clinical Correlations (2011) 7th ed., Devlin, T.M., John Wiley & Sons, Inc. (New Jersey), ISBN:978-0-470-28173-4.
- Biochemistry (2012) 7th ed., Berg, J.M., Tymoczko, J.L. and Stryer L., W.H. Freeman and Company (New York), ISBN:10:1-4292-2936-5, ISBN:13:978-1-4292-2936-4.

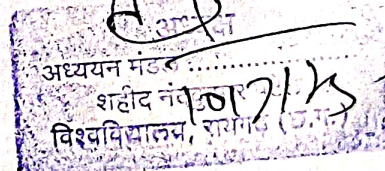
Online Resources–

- e-Resources / e-books and e-learning portals
- <https://link.springer.com/article/10.1007/s00217-008-0998-4>
- https://www.cdc.gov/nchs/data/nhanes/nhanes_03_04/113_c_met_lipids.pdf

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:



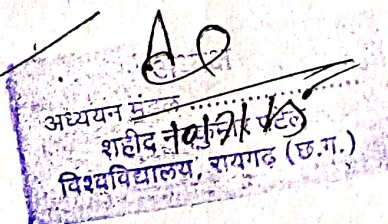
FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

Department of Biochemistry

Course Curriculum

PART- A: Introduction			
Program: Bachelor in Science (Diploma / Degree/Honors)		Semester - IV	Session: 2024-2025
1	Course Code	BCSE-02 T	
2	Course Title	Biology of Infectious Diseases	
3	Course Type	Discipline Specific Elective (Theory)	
4	Pre-requisite (if, any)	As Per Program	
5	Course Learning Outcomes (CLO)	On successful completion of the course, the student shall be able to: ➤ Understand various classes of microbial infectious agents, their mode of action, biology of the diseases, transmission of diseases, the concepts of treatment, and drug resistance for various antimicrobial agents. ➤ Demonstrate molecular basis of diagnosis and treatment of diseases as well as strategies for development of vaccines against these diseases. ➤ Explain the details of important infectious diseases such as tuberculosis, AIDS, malaria, filariasis, etc. ➤ Understand the significance of hygiene, sanitation, vaccination in prevention of infectious diseases.	
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	Infectious diseases: Classification, Nosocomial infections; Past and present emerging and re-emerging infectious diseases and pathogens. Source, reservoir and transmission of pathogens. Safety measures when working with pathogens, biosafety levels, infection and evasion. Fungal diseases: Etiology, characteristics and diagnosis of Candidiasis, Sporotrichosis, Aspergillosis and Ring worm.		09
II	Bacterial diseases: classification of bacterial pathogens, virulence factors and host pathogen interaction. Bacterial toxins, enterotoxins and their mode of action, diarrhea, cholera; Tuberculosis, infection and pathogenicity, diagnostics, therapeutics and vaccines, drug resistance. Other bacterial diseases such as - Typhoid, Tetanus, Anthrax and Pneumonia; their virulence factors and host pathogen interactions.		14
III	Viral diseases: Structure and classification of viruses, viral virulence factors, host pathogen interactions; AIDS: history, causative agent, pathogenesis, diagnostics, drugs; Other viral diseases such as Hepatitis, Influenza, Rabies, Dengue and Polio; Chicken Pox, Herpes Virus.		12
IV	Parasitic diseases: Classes of parasites and diseases caused by them, Malaria: causative agents, vectors, etiology, diagnostics, drugs, vaccine development. Role of drugs, vaccines and sanitation in prevention and treatment of infectious diseases.		10
Keywords	Infection, Disease, Prevention, Precaution		

Name and Signature of Convener & Members of CBoS:



PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- Jawetz, Melnick and Adelbergs Medical Microbiology 27th ed., McGraw Hill Education
- Klien's Microbiology (2008) 7th ed., Prescott, Harley, Wiley, J.M., Sherwood, L.M., Woolverton, C.J. McGraw Hill International Edition (New York)
- Sherris Medical Microbiology: An introduction to infectious diseases (2010) 4. Kenneth J. Ryan, C., George Ray, Publisher: McGraw-Hill. E-learning Resources

Online Resources–**e-Resources / e-books and e-learning portals**

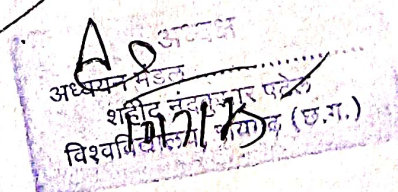
- <https://www.britannica.com/science/metabolism>
- <https://www.sciencedirect.com/science/article/pii/S0009912013001677>
- <https://pubmed.ncbi.nlm.nih.gov/23720291/>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3243375/>

PART -D: Assessment and Evaluation**Suggested Continuous Evaluation Methods:****Maximum Marks: 100 Marks****Continuous 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:

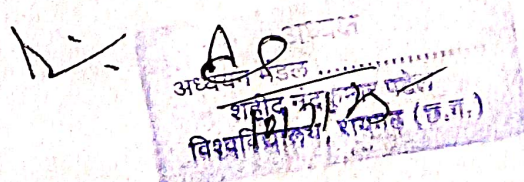
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
Department of Biochemistry
Course Curriculum

PART- A: Introduction			
Program: Bachelor in Science (Diploma / Degree/ Honors)		Semester - IV	Session: 2024-2025
1	Course Code	BCSE- 02 P	
2	Course Title	Biology of Infectious Diseases	
3	Course Type	Discipline Specific Elective- Practical	
4	Pre-requisite (if, any)	As Per the Program	
5	Course Learning Outcomes (CLO)	➤ Students will acquire the knowledge to isolate bacteria from water/sewage samples, to stain bacteria, fungi, acid fast bacilli and to perform important diagnostic tests for infectious diseases such as WIDAL test. ➤ Students will be exposed to permanent slides of pathogens in order to get hands-on training to know nature of various pathogens causing diseases.	
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	➤ Grams staining for bacteria ➤ Isolation and culture of bacteria from water/sewage samples. ➤ Demonstration of various media for bacterial culture ➤ Isolation and enumeration of bacteriophages (PFU) from water/sewage samples ➤ WIDAL test ➤ Acid fast staining ➤ Permanent slides of pathogens: Mycobacterium tuberculosis, Leishmania, Plasmodium falciparum ➤ Fungal staining		30
Keywords	Diagnostic tests, Infection identification, Methods		

Name and Signature of Convener & Members of CBoS:



PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- Klien's Microbiology (2008) 7th ed., Prescott, Harley, Wiley, J.M., Sherwood, L.M., Woolverton, C.J. McGraw Hill International Edition (New York)
- Jawetz, Melnick & Adelbergs Medical Microbiology 27th ed., McGraw Hill Education

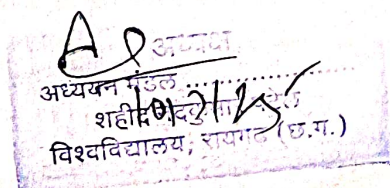
Online Resources–**e-Resources / e-books and e-learning portals**

- <https://link.springer.com/article/10.1007/s00217-008-0998-4>
- https://www.cdc.gov/nchs/data/nhanes/nhanes_03_04/113_c_met.pdf

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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar + Attendance - 05	
	Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment	
	Performed the Task based on lab. work	- 20 Marks
	Spotting based on tools & technology (written) –	10 Marks
	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 / IV / V/ VI	Session: 2024-2025
1	Course Code	BCSEC- 01	
2	Course Title	Biostatistics	
3	Course Type	Skill Enhancement Course	
4	Pre-requisite (if, any)	As Per the Course.	
5	Course Learning Outcomes (CLO)	<i>On successful completion of the course, the student shall be able to:</i> ➤ Understand the principles of collection of data in biological experiments, proper statistical analysis of the data and its presentation. ➤ Understand the importance of sample size and various variables that affect data. ➤ Know the importance of mean, standard error, standard deviation, significance in presenting the data. ➤ Knowing statistical methods will help students in improving their analytical and interpretation skill.	
6	Credit Value	2 Credits (1C + 1C)	Credit = 15 Hours – Theoretical learning and = 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 Teaching-learning Periods:

Theory – 15 Periods (15 Hrs) and Lab. or Field learning/Training 30 Periods (30 Hours)

Module	Topics (Course contents)	No. of Period
Theory Contents	Data Collection and Presentation: Biological data management using statistical tools. Concepts of population and sample, advantages of sampling, Basic concepts in sampling and designing experiments, Modes of presenting data: Frequency distributions, Relative frequency Analysis of variance: Mean, median, mode; Co-efficient of variation and standard deviation. Probability: Laws of Probability. Hypothesis testing: General concepts – Null hypothesis, alternative hypothesis, Rejection of hypothesis; Type I and Type II errors; P value and sample size estimation. Chi Square Test – Observed and expected frequencies, Calculating p values, assumptions of a chi square goodness of fit; One-way ANOVA, student's t-test.	15
Lab./Field Training Contents	Estimation of population means and variance in simple random sampling. Collection of data - Random sampling method. Data representation - Frequency and relative frequency distribution table, Plotting of biological data in a representative, graphical format. Data analysis - Calculating Mean, median, mode, variance, standard deviation and standard error for a given data set. S Standard t-test for grouped samples. Analysis of one way variance Chi square goodness of fit test. Learning to analyze data using SPSS/ Prism software	30
Keywords	Sampling, Frequency and relative frequency, variance, standard deviation, Hypothesis testing.	

Name and Signature of Convener & Members of CBoS:

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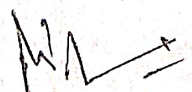
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10/7/25

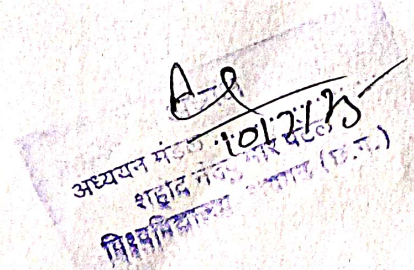
PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- Principles of Biostatistics, M. Pagano and K. Gauvreau (2000); Duxbury Thomas learnings.
- Analysis of Biological Data, M. Whitlock and D. Schluter (2009); Roberts and company publishers.

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

End Semester Exam (ESE):		35 Marks	
Continuous Internal Assessment (CIA): (By Course Coordinator)	Internal Test / Quiz-(2):	10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance -	05	
	Total Marks -	15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment		Managed by Coordinator as per skilling
	A. Performed the Task based on learned skill - 20 Marks		
	B. Spotting based on tools (written) - 10 Marks		
	C. Viva-voce (based on principle/technology) - 05 Marks		


Name and Signature of Convener & Members of CBoS:



अध्यक्ष मंडल
शहाद नगर
मिशनरिय
10/2/23

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

PART- A: Introduction			
Program: Bachelor in Science (Certificate / Diploma / Degree/Honors)		Semester - I / III / V	Session: 2024-2025
1	Course Code	BCVAC- 01	
2	Course Title	Ethno Medicine in Chhattisgarh	
3	Course Type	Value added Course	
4	Pre-requisite (if, any)	As Per the Course	
5	Course Learning Outcomes (CLO)	On successful completion of the course, the student shall be able to: ➤ Explain the basic components of Medicinal plant. ➤ Summarize the bioactive compound in herbs. ➤ Recognize the disorder and ethno medicine for it. ➤ Understand the effect of bioactive compound on the disease as well as interpret the effect of toxic chemicals on body parts and their cure.	
6	Credit Value	2 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 30 Periods (30 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Historical perspective, scope and future prospects. Scrutinizing the term 'Ethno medicine'. Common and crucial Medicinal Plants in Chhattisgarh: Ethno medicine in India.		07
II	Properties and functions of photochemical and their medicinal effects - Glucosamine, Octacosanol, Lycopene, Flavonoids, Carnitine, Melatonin and Ornithine alpha, ketoglutarate. Use of proanthocyanidins, grape products, flaxseed oil as Medicine.		08
III	Disease and Ethno medicine; Common Herbal/ House hold/ food used as Medicines in in treatment for cognitive decline. Herbal/ House hold/ food used as Medicines for common disorders like Arthritis, Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers etc.		07
IV	Brief idea about Medicinal effect of some Nutraceutical rich supplements e.g. Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulina etc.		08
Keywords	Phytochemical, Nutraceuticals, Herbal Medicine, Disorders, Disease.		

Name and Signature of Convener & Members of CBoS:

अध्यक्ष, विभाग
 शहीद भगत सिंह मेमोरियल
 विश्वविद्यालय, रायपुर (छ.ग.)

PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- 1. Gopalan C., et al Dietary Allowances for Indians, NIH, Hyderabad.
- 2. Anita F.P. Clinical Dietetics and Nutrition, 4th Ed, 1997,
- 3. Devlin, T.M. Text Book of Biochemistry with Clinical Correlation,
- 4. Mahan, L.K. & Ecott- Stump, S. [Ed.] Krause's Food, Nutrition and Diet Therapy .

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** Internal Test / Quiz-(2): 10 & 10**Assessment (CIA):** Assignment/Seminar + Attendance - 05**(By Course Teacher)** Total Marks - 15Better marks out of the two Test / Quiz
+ obtained marks in Assignment shall be
considered against 15 Marks**End Semester
Exam (ESE):**

Two section – A & B

Section A: Q1. Objective – 05 x1= 05 Mark; Q2. Short answer type- 5x2 =10 Marks

Section B: Descriptive answer type qts., 1 out of 2 from each unit- 4x05 =20 Marks

Name and Signature of Convener & Members of CBoS:

अध्ययन
शहीद नंदलाल पटेल
विश्वविद्यालय, रायगढ़ (छ.ग.)

शहीद नंदकुमार पटेल विश्वविद्यालय, रायगढ़ (छ.ग.)

(छत्तीसगढ़ विश्वविद्यालय अधिनियम 1973 द्वारा स्थापित राजकीय विश्वविद्यालय)



राष्ट्रीय शिक्षा नीति – 2020
के तहत V एवं VI सेमेस्टर
नवीन पाठ्यक्रम
(सत्र 2026–27)

बायो-केमेस्ट्री

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		VAC	
BCGE -01T	Introductory Biochemistry and Biomolecules	BCVAC-01	Ethno medicine in Chhattisgarh
BCGE -01P	Introductory Biochemistry and Biomolecules	SEC	
BCGE -02T	Bioanalytical Techniques	BCSEC-01	Biostatistics
BCGE -02P	Bioanalytical Techniques		

Name and Signature of Convener & Members of CBoS:

11/06/2024

(Dr. Mrigendra Kumar Dainedi)

प्रभासी अधिकारी (अकादमी)
शहीद नंदकुमार पटेल
विश्वविद्यालय, रायगढ़ (छ.ग.)

11/6
विश्वविद्यालय
Raj...
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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.

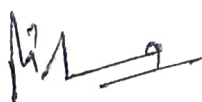
Program Outcome:

On successful completion of this program the graduates shall have:

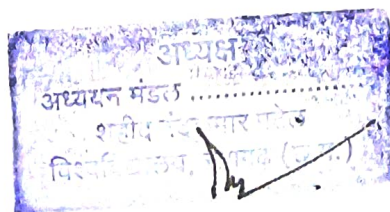
PO1.	Knowledge: A knowledge of contemporary issues related to biochemistry. Ability to demonstrate the fundamental knowledge of molecules of life, molecular techniques, toxicology in the area of biochemistry.
PO2.	Critical Thinking and Reasoning: Ability to think critically and apply the same to update 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:



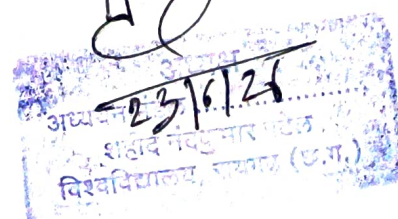
FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

Department of Biochemistry

Course Curriculum

PART- A: Introduction			
Program: Bachelor in Science (Degree/Honors)		Semester - V	Session: 2024-2025
1	Course Code	BCSC-05 T	
2	Course Title	Gene Replication, Expression and Regulation	
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: ➤ Distinguish the process of replication in prokaryotes & eukaryotes. ➤ Distinguish the process of transcription in prokaryotes & eukaryotes. ➤ Distinguish the process of translation in prokaryotes & eukaryotes. ➤ Discuss the transcriptional regulation in prokaryotes & eukaryotes.	
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	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.		12
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.		11
III	Transcription in 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. Transcription in 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.		11

Name and Signature of Convener & Members of CBoS:



2

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. Regulation of gene expression in 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.	11
Keywords	Chirality, DNA Replication, Transcription, Translation, Gene Expression, Operon.	

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- 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 (New York), ISBN:13:978-1-4641-0981-2.
- Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13: 978-0470-23396-2
- 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 Spring Harbor (New York), ISBN:0-321-50781 / ISBN:978-0-321-50781-5.

Online Resources – e-Resources / e-books and e-learning portals

- <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: 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., 1 out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:

23/6/20
अध्यक्ष
शहीद नरसुमार पंथ
विश्वविद्यालय, रायगड (उ.म.)

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

PART- A: Introduction			
Program: Bachelor in Science (Degree/ Honors)		Semester - V	Session: 2024-2025
1	Course Code	BCSC-0 5P	
2	Course Title	Gene Replication, Expression and Regulation	
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: ➤ Demonstrate assay for nucleic acid by various methods. ➤ Demonstrate isolation process of DNA from different samples. ➤ Apply electrophoresis technique for different isolated compounds. ➤ Illustrate SDS-PAGE techniques.	
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	➤ Estimation of DNA by diphenylamine method. ➤ Effect of temperature on the viscosity of DNA using Oswald's viscometer. ➤ Extraction of RNA and its estimation by Orcinol method. ➤ Isolation and estimation of RNA from yeast. ➤ Agarose Gel Electrophoresis and separation of DNA ➤ Isolation of DNA from bacteria/eukaryotic cells and check its purity		30
Keywords	Isolation, DNA Estimation		

Name and Signature of Convener & Members of CBoS:

25/6/28

अध्यक्ष
 अध्ययन मंडल
 शहीद नंदलाल पटेल
 विश्वविद्यालय, रायपुर (उ.प्र.)

PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- 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 (New York), ISBN:13:978-1-4641-0981-2.
- Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13: 978-0470-23396-2
- 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 Spring Harbor (New York), ISBN:0-321-50781 / ISBN:978-0-321-50781-5.

Online Resources–

- e-Resources / e-books and e-learning portals
- <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: 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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks - 15	
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:

अध्ययन मंडल
शहोद नंदकुमार मंडल
विश्वविद्यालय, रायचूर (म.प्र.)

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

PART- A: Introduction			
Program: Bachelor in Science (Degree/Honors)		Semester - V	Session: 2024-2025
1	Course Code	BCSE- 03 T	
2	Course-Title	Biotechnology	
3	Course Type	Discipline Specific Elective (Theory)	
4	Pre-requisite (if, any)	As Per the Program	
5	Course Learning Outcomes (CLO)	<i>On successful completion of the course, the student shall be able to:</i> ➤ 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. ➤ They will get acquainted with the use of cloning and expression vectors, creation of genomic and cDNA libraries and their applications. ➤ Students will also understand the methods for production of proteins using recombinant DNA technology and their application in industrial systems.	
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	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. 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
II	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.		11
III	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.		11
IV	Application of Biotechnology: Pharmaceutical products of DNA technology; Human protein replacements, Human therapies, Vaccines. Transgenics and animal cloning: Creating transgenic animals and plants. Animal cloning.		11
Keywords	Recombinant DNA, Transfection, Recombinant Protein, Transgenics		

Name and Signature of Convener & Members of CBoS:


 अध्यापक
 28/6/20
 श्रीद नंदकुमार पांडे
 विश्वविद्यालय, रायचूर (उ.प्र.)

PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- Principles of Gene Manipulation and Genomics (2006) 7th ed., Primrose, S.B., and Twyman, R. M., Blackwell publishing (Oxford, UK)
- Gene Cloning and DNA Analysis (2010) 6th ed., Brown, T.A., Wiley-Blackwell publishing (Oxford, UK)
- 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)
- Molecular Cloning: A laboratory manual (2014), 4nded., Michael R Green and J. Sambrook Cold spring Harbor laboratory press (3vol.)

Online Resources–

- e-Resources / e-books and e-learning portals
- <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: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 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:





23/6/20

अध्यक्ष, मंडल

प्रो. व. मंडल

विश्वविद्यालय, रायगड (उ.प्र.)

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

PART- A: Introduction			
Program: Bachelor in Science (Degree / Honors)		Semester - V	Session: 2024-2025
1	Course Code	BCSE- 05 P	
2	Course Title	Biotechnology	
3	Course Type	Discipline Specific Elective (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: ➤ 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 <i>E. coli</i>, transformation of <i>E. coli</i> cells, digestion of plasmid DNA, amplification of a DNA fragment by PCR, etc.	
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	➤ Agarose gel electrophoresis for separation of DNA fragments. ➤ Isolation of plasmid DNA from <i>E. coli</i>. ➤ Transformation of <i>E. coli</i> cells with plasmid DNA. ➤ Digestion of plasmid DNA with restriction enzymes. ➤ Amplification of a DNA fragment by PCR. ➤ Complementation of β-galactosidase for Blue and White selection.		30
Keywords	SDS, DNA isolation, Restriction digestion, PCR		

Name and Signature of Convener & Members of CBOS:


 23/6/28


 अध्यक्ष, विज्ञान विभाग
 विश्वविद्यालय, रायगढ़ (उ.प्र.)

PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- Principles of Gene Manipulation and Genomics (2006) 7th ed., Primrose, S.B., and Twyman, R. M., Blackwell publishing (Oxford, UK)
- Gene Cloning and DNA Analysis (2010) 6th ed., Brown, T.A., Wiley-Blackwell publishing (Oxford, UK)
- 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)
- Molecular Cloning: A laboratory manual (2014), 4nded., Michael R Green and J. Sambrook Cold spring Harbor laboratory press (3vol.)

Online Resources–

- **e-Resources / e-books and e-learning portals**
- <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:** 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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05	
	Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment	
	Managed by Course teacher as per lab. status	
	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	

Name and Signature of Convener & Members of CBoS:


 23/6/20
 अध्यक्ष महोदय
 प्रो. दिनेश कुमार शर्मा
 विश्वविद्यालय, रायचूर (उ.प्र.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

Department of Biochemistry

Course Curriculum

PART- A: Introduction			
Program: Bachelor in Science (Degree/Honors)		Semester - VI	Session: 2024-2025
1	Course Code	BCSC- 06T	
2	Course Title	Biochemistry and Function of Hormones	
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 the different modes of communication between cells including signal reception, transduction, amplification and response. ➤ Understand the role of endocrine system in maintaining ionic and glucose homeostasis and the communications that regulate growth appetite, metabolism and reproduction in humans. ➤ 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, ➤ Understand the role of various plant hormones in growth and development of plants.	
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	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. Hypothalamic-Hypophysis system, 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
II	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 and Erythropoietin.		11
III	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		11

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	syndrome.	
IV	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.	11
Keywords	Cell Organelles, Cell Biology, Circulatory System, Respiratory System, Digestive System, Endocrine system, Excretory System.	

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Lehninger: Principles of Biochemistry (2017) 7th ed., Nelson, D.L. and Cox, M.M. W.H. Freeman & Company (New York)
- Vander's Human Physiology (2019) 15th ed., Widmaier, E.P., Raff, H. and Strang, K.T. McGraw Hill International Publications (USA)
- Endocrinology (2007) 6th ed., Hadley, M.C. and Levine, J.E. Pearson Education (New Delhi), Inc.
- The Cell: A Molecular Approach (2009) 5th Ed. Cooper, G.M. and Hausman, R.E. ASM Press & Sunderland, (Washington DC), Sinauer Associates. (MA).

Online Resources– e-Resources / e-books and e-learning portals

- <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:

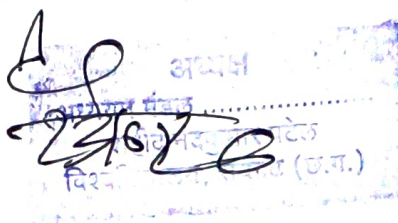
Maximum Marks: 100 Marks

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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10	
	Total Marks - 30	
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., 1 out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBOS:

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

Department of Biochemistry

Course Curriculum

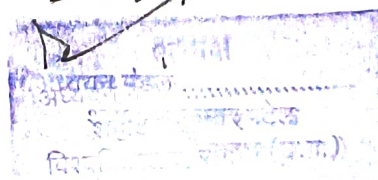
PART- A: Introduction			
Program: Bachelor in Science (Degree/ Honors)		Semester - VI	Session: 2024-2025
1	Course Code	BCSC -6P	
2	Course Title	Biochemistry and Function of Hormones	
3	Course Type	Discipline Specific Course (Practical)	
4	Pre-requisite (if, any)	As Per The Program	
5	Course Learning Outcomes (CLO)	On successful completion of the course, the student shall be able to: ➤ Students will acquire practical training to undertake clinical tests like Glucose Tolerance test, estimation of serum Ca²⁺, serumT₄, serumelectrolytes and HCG based pregnancy test. ➤ Interpret hormonal level with clinical conditions of the individuals.	
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	➤ Estimation of serum Ca²⁺. ➤ Estimation of serum T₄ ➤ HCG based pregnancy test. ➤ Estimation of serum electrolytes. ➤ Case studies		30
Keywords	Glucose Tolerance test, estimation of serum Ca ²⁺ , serumT ₄ , serumelectrolytes , HCG based pregnancy test		

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PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- Lehninger: Principles of Biochemistry (2017) 7th ed., Nelson, D.L. and Cox, M.M. W.H. Freeman & Company (New York)
- Vander's Human Physiology (2019) 15th ed., Widmaier, E.P., Raff, H. and Strang, K.T. McGraw Hill
- International Publications (USA)
- Endocrinology (2007) 6th ed., Hadley, M.C. and Levine, J.E. Pearson Education (New Delhi), Inc.
- The Cell: A Molecular Approach (2009) 5th Ed. Cooper, G.M. and Hausman, R.E. ASM Press & Sunderland, (Washington DC), Sinauer Associates. (MA).

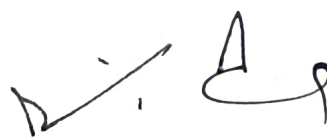
Online Resources–**e-Resources / e-books and e-learning portals**

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

Name and Signature of Convener & Members of CBoS:

23/6/24

अध्यक्ष

अध्यक्ष मंडल

श्रीदीप कुमार पटेल

विश्वविद्यालय, रायपुर (छ.ग.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

Department of Biochemistry

Course Curriculum

PART- A: Introduction			
Program: Bachelor in Science (Degree/Honors)		Semester - VI	Session: 2024-2025
1	Course Code	BCSE-04 T	
2	Course Title	Plant Biochemistry	
3	Course Type	Discipline Specific Elective (Theory)	
4	Pre-requisite (if, any)	As Per The Program	
5	Course Learning Outcomes (CLO)	<i>On successful completion of the course, the student shall be able to:</i> ➤ Learning outcomes for this course include detailed understanding of metabolic processes specific for plants such as nitrate assimilation, photosynthesis, respiration, nitrogen fixation. ➤ Understand the role of different metabolic pathways in plant growth and development. ➤ Understand insight to various stressful conditions of the environment that affect plant growth and productivity ➤ Understand the defense mechanisms in plants due to which plants survive under stresses.	
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	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. Electron transport system in plants: Chemiosmotic theory, ATP synthase and mechanism of ATP synthesis.		12
II	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.		11
III	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, lathyrins, nitriles, protease inhibitors, protein toxins.		11
IV	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. Antioxidative defense system in plants – reactive oxygen species and their generation, enzymic and non-enzymic components of antioxidative defense mechanism.		11
Keywords		Electron transport, Nitrogen assimilation, secondary metabolites, Reactive oxygen species.	

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PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- Buchann (2015), Biochemistry and Molecular Biology of Plants, 2nd ed. Publisher: I K International. ISBN-10: 8188237116, ISBN- 978047 0714218
- Taiz and Zeiger, Plant Physiology, 5th edition, Sinauer Associates Inc. ISBN-13: 978- 0878938667, ISBN-10: 0878938664
- Caroline Bowsher, Martin Steer, Alyson Tobin (2008), Plant Biochemistry, Garland Science ISBN 978-0-8153-4121-5.
- 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:****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., 1 out of 2 from each unit-4x10=40 Marks	

Name and Signature of Convener & Members of CBoS:




23/11/24

अध्यक्ष, मंडळ ...

सहायक निदेशक पदवी

निराकरण, रायगड (उ.प.)

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

PART- A: Introduction			
Program: Bachelor in Science (Degree/Honors)		Semester - VI	Session: 2024-2025
1	Course Code	BCSE-04P	
2	Course Title	Plant Biochemistry	
3	Course Type	Discipline Specific Elective (Practical)	
4	Pre-requisite (if, any)	As Per the Program	
5	Course Learning Outcomes (CLO)	<i>On successful completion of the course, the student shall be able to:</i> ➤ Determine the contents of photosynthetic pigments, ascorbic acid, phenols, tannins, hydrogen peroxide in plant samples. ➤ Understand the spectral patterns of photosynthetic pigments. ➤ Perform extraction and assay enzymes like urease from Jack bean.	
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	➤ Estimation of chlorophylls and carotenoids from grass/spinach leaves ➤ Estimation of ascorbic acid, phenols, tannins in fruits and vegetables ➤ Determination of radical scavenging activity of plant extracts ➤ Estimation of hydrogen peroxide in tissue extracts ➤ Extraction and assay of urease from Jackbean. ➤ Separation of photosynthetic pigments by TLC and determination of absorption Spectra.		30
Keywords	Photosynthetic pigments, ascorbic acid, phenols, tannins,		

Name and Signature of Convener & Members of CBoS:

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 अध्यक्ष मंडल
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 निदेशिका, कक्षा (उ.ग.)

PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- Buchann (2015), Biochemistry and Molecular Biology of Plants, 2nded. Publisher: I KInternational. ISBN-10: 8188237116, ISBN- 978047 0714218
- Taiz and Zeiger, Plant Physiology, 5th edition, Sinauer Associates Inc. ISBN-13: 978- 0878938667, ISBN-10:0878938664
- Caroline Bowsher, Martin steer, Alyson Tobin (2008), Plant Biochemistry, Garland science ISBN978-0-8153-4121-5.
- 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:****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	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks	
	Assignment/Seminar +Attendance - 05		
	Total Marks - 15		
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment		Managed by Course teacher as per lab. status
	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		

Name and Signature of Convener & Members of CBoS:

23/16/28
अध्यक्ष, मंडळ
राजीव मंडळकार पटेल
विश्वविद्यालय, रायगड (उ.म.)

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

Department of Biochemistry

Course Curriculum

PART- A: Introduction			
Program: Bachelor in Science (Certificate / Diploma / Degree/ Honors)		Semester - II / IV / V/ VI	Session: 2024-2025
1	Course Code	BCSEC- 01	
2	Course Title	Biostatistics	
3	Course Type	Skill Enhancement Course	
4	Pre-requisite (if, any)	As Per the Course.	
5	Course Learning Outcomes (CLO)	On successful completion of the course, the student shall be able to: ➤ Understand the principles of collection of data in biological experiments, proper statistical analysis of the data and its presentation. ➤ Understand the importance of sample size and various variables that affect data. ➤ Know the importance of mean, standard error, standard deviation, significance in presenting the data. ➤ Knowing statistical methods will help students in improving their analytical and interpretation skill.	
6	Credit Value	2 Credits (1C + 1C)	Credit = 15 Hours – Theoretical learning and = 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 Teaching-learning Periods:			
Theory – 15 Periods (15 Hrs) and Lab. or Field learning/Training 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Theory Contents	Data Collection and Presentation: Biological data management using statistical tools. Concepts of population and sample, advantages of sampling, Basic concepts in sampling and designing experiments, Modes of presenting data: Frequency distributions, Relative frequency Analysis of variance: Mean, median, mode; Co-efficient of variation and standard deviation. Probability: Laws of Probability. Hypothesis testing: General concepts – Null hypothesis, alternative hypothesis, Rejection of hypothesis; Type I and Type II errors; P value and sample size estimation. Chi Square Test – Observed and expected frequencies, Calculating p values, assumptions of a chi square goodness of fit; One-way ANOVA, student's t-test.		15
Lab./Field Training Contents	Estimation of population means and variance in simple random sampling. Collection of data - Random sampling method. Data representation - Frequency and relative frequency distribution table, Plotting of biological data in a representative, graphical format. Data analysis - Calculating Mean, median, mode, variance, standard deviation and standard error for a given data set. S Standard t-test for grouped samples. Analysis of one way variance Chi square goodness of fit test. Learning to analyze data using SPSS/ Prism software		30
Keywords	Sampling, Frequency and relative frequency, variance, standard deviation, Hypothesis testing.		

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PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- Principles of Biostatistics, M. Pagano and K. Gauvreau (2000); Duxbury Thomas learnings.
- Analysis of Biological Data, M. Whitlock and D. Schluter (2009); Roberts and company publishers.

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

Name and Signature of Convener & Members of CBoS:

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शहीद नरसिंह राव
विश्वविद्यालय, रायपुर (उ.प्र.)

अध्ययन मंडल
शहीद नरसिंह राव
विश्वविद्यालय, रायपुर (उ.प्र.)

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

PART- A: Introduction			
Program: Bachelor in Science (Certificate / Diploma / Degree/Honors)		Semester - I / III / V	Session: 2024-2025
1	Course Code	BCVAC- 01	
2	Course Title	Ethno Medicine in Chhattisgarh	
3	Course Type	Value added Course	
4	Pre-requisite (if, any)	As Per the Course	
5	Course Learning Outcomes (CLO)	On successful completion of the course, the student shall be able to: ➤ Explain the basic components of Medicinal plant. ➤ Summarize the bioactive compound in herbs. ➤ Recognize the disorder and ethno medicine for it. ➤ Understand the effect of bioactive compound on the disease as well as interpret the effect of toxic chemicals on body parts and their cure.	
6	Credit Value	2 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
PART -B: Content of the Course			
Total No. of Teaching-learning Periods (01 Hr. per period) - 30 Periods (30 Hours)			
Unit	Topics (Course contents)		No. of Period
I	Historical perspective, scope and future prospects. Scrutinizing the term 'Ethno medicine'. Common and crucial Medicinal Plants in Chhattisgarh: Ethno medicine in India.		07
II	Properties and functions of photochemical and their medicinal effects - Glucosamine, Octacosanol, Lycopene, Falvanoids, Carnitine, Melatonin and Ornithine alpha, ketoglutarate. Use of proanthocyanidins, grape products, flaxseed oil as Medicine.		08
III	Disease and Ethno medicine; Common Herbal/ House hold/ food used as Medicines in in treatment for cognitive decline. Herbal/ House hold/ food used as Medicines for common disorders like Arthritis, Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers etc.		07
IV	Brief idea about Medicinal effect of some Nutraceutical rich supplements e.g. Bee pollen, Caffeine, Green tea, Lecithin, Mushroom extract, Chlorophyll, Kelp and Spirulina etc.		08
Keywords		Phytochemical, Nutraceuticals, Herbal Medicine, Disorders, Disease.	

Name and Signature of Convener & Members of CBoS:

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 शिक्षण विभाग, रायपुर (छ.ग.)

अध्यक्ष
 शहीद भगत सिंह
 विश्वविद्यालय, रायपुर (छ.ग.)

PART-C: Learning Resources**Text Books, Reference Books and Others****Text Books Recommended –**

- 1. Gopalan C., et al Dietary Allowances for Indians, NIH, Hyderabad.
- 2. Anita F.P. Clinical Dietetics and Nutrition, 4th Ed, 1997,
- 3. Devlin, T.M. Text Book of Biochemistry with Clinical Correlation,
- 4. Mahan, L.K. & Ecott- Stump, S. [Ed.] Krause's Food, Nutrition and Diet Therapy .

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):**

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):**Two section – A & B**

Section A: Q1. Objective – 05 x1= 05 Mark; Q2. Short answer type- 5x2 =10 Marks
 Section B: Descriptive answer type qts., 1 out of 2 from each unit- 4x05 =20 Marks

Name and Signature of Convener & Members of CBoS:

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 विश्वविद्यालय, रायगढ़ (उ.प्र.)

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 विश्वविद्यालय, रायगढ़ (उ.प्र.)