

**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF BOTANY**  
**COURSE CURRICULUM**

<b>PART- A: Introduction</b>			
Program: Bachelor in Life Sciences (Degree/Honors)		Semester - V	Session: 2024-2025
1	Course Code	BOSC-05 T	
2	Course Title	Cytology & Genetics	
3	Course Type	Discipline Specific course (DSC)	
4	Pre-requisite (if, any)	<i>As per program</i>	
5	Course Learning Outcomes (CLO)	At the end of the course, the students will be able: ➤ Acquire knowledge of cell and its components. ➤ Learn about the structure and function of membrane and cell division ➤ Interpret Mendelian and non Mendelian genetics ➤ Interpret linkage, crossing over and gene interaction	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
<b>PART -B: Content of the Course</b>			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)	No. of Period	
I	<b>The cell, cell wall, plasma membrane :</b> Cell structure and function; Characteristics of prokaryotic and eukaryotic cells; Structure, function and chemical composition of Plant cell wall. Plasma membrane structure and chemical nature; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis. Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament	12	
II	<b>Cell organelles, Division of Cell</b> Mitochondria and Chloroplast; Structure and functions. Endoplasmic Reticulum – Structure, and functions, role in protein synthesis. Golgi Apparatus – organization, protein glycosylation, Lysosomes. Cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein kinases.	11	
III	<b>Mendelian genetics, Linkage and Crossing over;</b> Mendelism: History; Principles of inheritance; terminology. Chromosome theory of inheritance; Autosomes and sex chromosomes; Probability and pedigree analysis; Non-Mendelian inheritance: Incomplete dominance and co-dominance. Gene interaction; duplicate, complimentary, supplantmentry, epistasis. Linkage and crossing over.	11	
IV	<b>Extrachromosomal Inheritance, Mutation :</b> Extrachromosomal inheritance: Cytoplasmic inheritance in plants. Mutations; types, Molecular basis of Mutations; Mutagens – physical and chemical. Chromosomal aberration: Deletion, Duplication, Inversion, Translocation, Euploidy and Aneuploidy.	11	
Keywords	Cytology, Cell division, Genetics, Mendelian genetics, Mutation		

**Signature of Convener & Members (CBoS) :**

- ① R. S. Rao
- ② Ramesh
- ③ M. S. Reddy
- ④ M. S. Reddy
- ⑤
- ⑥
- ⑦
- ⑧
- ⑨
- ⑩

## PART-C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended –

1. Cell Biology: Powar C. B. and Daginawala H. I., Himalay Pub. House, Bombay
2. Cell biology by Karp, G. 2010.
3. Cell and Molecular Biology: Concepts and Experiments: 6th Edition. John Wiley & Sons. Inc.
4. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8<sup>th</sup> edition Lippincott Williams and Wilkins, Philadelphia.
5. Genetics by P. K. Gupta, Rastogi Publication
6. Gytogenetics, Molecular biology and Plant breeding by P. K. Gupta, Rastogi Publication

#### Reference Books Recommended–

1. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 The World of of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.
2. L.J. (2012). Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
3. Hausman, R.E. (2009) The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington,
4. D.C.; Sinauer Associates, MA. 9. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009) The World of the Cell. 7 th edition. Pearson Benjamin Cummings Publishing, San Francisco

#### Online Resources–

- e-Resources / e-books and e-learning portals
- [www.swayam.ac.in](http://www.swayam.ac.in)
- [www.ignou.ac.in](http://www.ignou.ac.in)
- [www.egyankosh.ac.in](http://www.egyankosh.ac.in)
- [www.iitm.ac.in](http://www.iitm.ac.in)
- [www.eskillindia.org](http://www.eskillindia.org)
- [www.eshiksha.mp.gov.in](http://www.eshiksha.mp.gov.in)
- [www.vlab.co.in](http://www.vlab.co.in)
- [www.internshala.com](http://www.internshala.com)
- [www.ndl.iitkgp.ac.in](http://www.ndl.iitkgp.ac.in)

#### Online Resources–

- e-Resources / e-books and e-learning portals
- <https://www.cytology-iac.org/educational-resources/virtual-slide-library>
- [https://www.asct.com/ASCTWeb/Content/Cytopreparation\\_Online\\_Course.aspx](https://www.asct.com/ASCTWeb/Content/Cytopreparation_Online_Course.aspx)
- <https://www.mooc-list.com/tags/genetics>
- <https://www.coursera.org/learn/genetics-evolution>
- <https://www.my-mooc.com/en/mooc/introduction-to-genetics-and-evolution>
- [http://rastogipublications.com/index.php?route=product/product&product\\_id=50](http://rastogipublications.com/index.php?route=product/product&product_id=50)
- <https://www.nou.ac.in/sites/default/files/sim/BSCBO>
- [http://ysmubooks.am/uploads/MEDICAL\\_BIOLOGY.pilf](http://ysmubooks.am/uploads/MEDICAL_BIOLOGY.pilf)

## 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): 30 (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): 70	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:

① R. P. Singh  
 ② N. S. Singh  
 ③ A. K. Singh  
 ④ A. K. Singh  
 ⑤ A. K. Singh  
 ⑥ A. K. Singh

⑦ K. Singh  
 ⑧ K. Singh  
 ⑨ K. Singh  
 ⑩ K. Singh

**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF BOTANY**  
**COURSE CURRICULUM**

<b>PART- A: Introduction</b>			
Program: Bachelor in Life Sciences (Degree/ Honours)		Semester - V	Session: 2024-2025
1	Course Code	BOSC-05	
2	Course Title	Lab. Course -05 (Cytology and Genetics)	
3	Course Type	Laboratory Course	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, students will be able to: <ul style="list-style-type: none"> <li>➤ Handle the Compound light Microscope and apply microscopy</li> <li>➤ Achieve elaborate idea about cell staining procedures and mitotic plate observation &amp; analysis</li> <li>➤ Identify the various stages of cell division karyotype analysis Get practice of genetic crosses and genetic analysis.</li> </ul>	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
<b>PART -B: Content of the Course</b>			
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	1. Staining technique of cell organelles. 2. Study of different stages of Mitosis. 3. Study of different stages of Meiosis. 4. Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo/Crinum. 5. Demonstration of the phenomenon of protoplasmic streaming in <i>Hydrilla</i> leaves. 6. Counting the cells per unit volume with the help of haemocytometer. (Yeast/pollen grains) 7. Exercise on genetics (Mendelian ratio and test cross) 8. Karyotype of chromosomes. 9. Study of polytene and lampbrush chromosomes.	<b>30</b>	
Keywords	Mitosis, Mendelian ratio, Karyotype, Chromosome.		

Signature of Convener & Members (CBoS) :

- ① R. Sivan
- ② Arundis
- ③ Arundis
- ④ Arundis
- ⑤ Arundis
- ⑥ Arundis
- ⑦ Arundis
- ⑧ Arundis
- ⑨ Arundis
- ⑩ Arundis

## PART-C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended –

1. Laboratory Manual of Cyto-technique and Chromosome handling By Sharma A K
2. Manual of Cytology, Ministry of Health & Welfare
3. Cytogenetics By PK Gupta.
4. Cell biology By C. B. Powar

#### Online Resources–

- e-Resources / e-books and e-learning portals
- [www.swayam.ac.in](http://www.swayam.ac.in)
- [www.ignou.ac.in](http://www.ignou.ac.in)
- [www.egyankosh.ac.in](http://www.egyankosh.ac.in)
- [www.iitm.ac.in](http://www.iitm.ac.in)
- [www.eskillindia.org](http://www.eskillindia.org)
- [www.eshiksha.mp.gov.in](http://www.eshiksha.mp.gov.in)
- [www.vlab.co.in](http://www.vlab.co.in)
- [www.internshala.com](http://www.internshala.com)
- [www.ndl.iitkgp.ac.in](http://www.ndl.iitkgp.ac.in)

#### Online Resources–

- e-Resources / e-books and e-learning portals
- [https://ijrbat.in/upload\\_papers/0410202102153609.%20Basarkar%20UG%20and%20%20Patil-Behere%20KP.pdf](https://ijrbat.in/upload_papers/0410202102153609.%20Basarkar%20UG%20and%20%20Patil-Behere%20KP.pdf)
- <https://www2.samford.edu/~djohnso2/44962w/334/mitosis.html>
- <https://www.findel-international.com/product/science/biology/prepared-slides/philip-harris-prepared-microscope-slide-set-meiosis-and-mitosis-set-of-9-slides/e8r06642>

## 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): 15 (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): 35	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:

- ① P. B. Powar
- ② Behera
- ③ Sharma
- ④ Patil
- ⑤ Basarkar
- ⑥ Patil
- ⑦ Patil
- ⑧ Patil
- ⑨ Patil
- ⑩ Patil

**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**

**DEPARTMENT OF BOTANY  
COURSE CURRICULUM**

<b>PART- A: Introduction</b>			
Program: Bachelor in Life Science (Degree/Honors)		Semester - V	Session: 2024-2025
1	Course Code	BOSE -03 T	
2	Course Title	Phytopaleontology and Evolutionary Botany	
3	Course Type	Discipline specific Elective (DSE)	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to > have a basic idea of fossils and process of fossilization > Describe how plants evolved including their origin and diversification > Summarize and evaluate information from scientific literature > Identify plat fossil through study of the remains of organisms, anatomical evidence and diversity > Understand and track evolution of species over millions of years identify transional forms of life > Understand how earth's environment has changed over geological time.	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
<b>PART -B: Content of the Course</b>			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	<b>Phytopaleontology-</b> ❖ General account, ❖ Geological time scale; ❖ Brief account of process of fossilization & types of fossils and their study techniques; ❖ Fossils of algae, fungi, bryophytes		12
II	<b>Fossils and India:</b> ❖ Fossil plants: <i>Rhynia</i> , <i>Horneophyton</i> , <i>Williamsonia</i> , <i>Cycadeoidea</i> . ❖ Contribution of Prof. Birbal Sahni, <i>Pentoxyles- Pentoxylon sahnii</i> ❖ Role of Indian Gondwana Flora in Chhattisgarh with reference to coal mines		11
III	<b>Brief account of the families of Pteridospermales –</b> ❖ Lyginopteridaceae, ❖ Medullosaceae, ❖ Caytoniaceae & > Glossopteridaceae		11
IV	<b>General Account and Affinities –</b> ❖ Cycadeoidales and Cordaitales. ❖ Paleozoic seeds ❖ Angiospermic and Gymnospermic fossils ❖ Uses of fossils ❖ Evolution : convergent, divergent and parallel evolution ❖ Telome concept		11
Keywords	Fossil, geological time table, gondwana flora, Telome		

**Signature of Convener & Members (CBoS) :**

① R. Singh  
 ② Pandey  
 ③ Singh  
 ④ Singh  
 ⑤ Singh  
 ⑥ Singh  
 ⑦ Singh  
 ⑧ Singh  
 ⑨ Singh  
 ⑩ Singh

## PART-C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended –

1. Vashishtha, B. R. (2005) Pteridophytes S. Chand and Co., Delhi.
2. Vashishtha, B. R. (2005) Bryophytes S. Chand and Co., Delhi.
3. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.
4. Rashid A (1999) An Introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd. New Delhi.
5. Sharma OP (1990) Textbook of Pteridophyta. MacMillan India Ltd. Delhi.
6. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Pteridophyta, S. Chand and Company,
7. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Gymnosperms, S. Chand and
8. Parihar NS (1976) Biology and Morphology of Pteridophytes. Central Book Depot.
9. Bhatnagar SP (1996) Gymnosperms, New Age International Publisher.
10. Pandey BP (2010) College Botany Vol II S. Chand and Company, New Delhi .

#### Reference Books Recommended –

1. Kumar, H. D. (1988) introductory Phycology, Affiliated East-West Press Ltd., New Delhi.
2. Morris, I (1986) An Introduction to Algae, Cambridge Univ. Press, UK.
3. Puri, P. (1980) Bryophytes, Atma Ram and Sons, Delhi.
4. Sporne, K. K. (1991) The Morphology of Pteridophytes, B. I. Publishing Pvt. Ltd. Bombay.
5. Stewart, W. N. and Ruthwell, G. W. (1993) Paleobotany and the Evolution of Plants. Cambridge Univ. Press, UK.
6. Principles of Paleontology Edition 3 Paperback–1 January 2006 by Arnold Miller, Michael Foote Publishers - W.H.Freeman & Co Ltd

#### Online Resources–

##### > e-Resources / e-books and e-learning portals

1. <https://efaidnbmnnnibpcajpcglclefindmkaj/https://egyankosh.ac.in/bitstream/123456789/69611/1/Unit-9.pdf>
2. <https://www.encyclopedia.com/science/encyclopedias-almanacs-transcripts-and-maps/fossil-and-fossilization>
3. <https://palaeobotany.org>

##### > e-Resources / e-books and e-learning portals

- > [www.swayam.ac.in](http://www.swayam.ac.in)
- > [www.ignou.ac.in](http://www.ignou.ac.in)
- > [www.egyankosh.ac.in](http://www.egyankosh.ac.in)
- > [www.iitm.ac.in](http://www.iitm.ac.in)
- > [www.eskillindia.org](http://www.eskillindia.org)
- > [www.eshiksha.mp.gov.in](http://www.eshiksha.mp.gov.in)
- > [www.vlab.co.in](http://www.vlab.co.in)
- > [www.internshala.com](http://www.internshala.com)
- > [www.ndl.iitkgp.ac.in](http://www.ndl.iitkgp.ac.in)

## 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): 30 (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): 70	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:

① K. Prasad  
② K. Prasad  
③ K. Prasad

④ K. Prasad  
⑤ K. Prasad  
⑥ K. Prasad

⑦ K. Prasad  
⑧ K. Prasad  
⑨ K. Prasad  
⑩ K. Prasad

**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**

**DEPARTMENT OF BOTANY**

**COURSE CURRICULUM**

<b>PART- A: Introduction</b>			
<b>Program: Bachelor in Life Science</b> <i>(Degree/ honors)</i>		<b>Semester - V</b>	<b>Session: 2024-2025</b>
1	<b>Course Code</b>	<b>BOSE-03 P</b>	
2	<b>Course Title</b>	<b>Lab. Course -03 (Phytopaleontology and Evolutionary Botany)</b>	
3	<b>Course Type</b>	<b>Laboratory course</b>	
4	<b>Pre-requisite (if, any)</b>	<b>As per program</b>	
5	<b>Course Learning Outcomes (CLO)</b>	1. Understand evolutionary trends of plant development and diversification. 2. Study remnant of past and its natural conservation. 3. Phylogenetic relationship with the help of paleontological evidences 4. Understand role of fossil as an educational tool promoting science literacy an appreciation for earth's rich biological heritage.	
6	<b>Credit Value</b>	<b>1 Credits</b>	<b>Credit =30 Hours Laboratory or Field learning/Training</b>
7	<b>Total Marks</b>	<b>Max. Marks: 50</b>	<b>Min Passing Marks: 20</b>
<b>PART -B: Content of the Course</b>			
<b>Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)</b>			
<b>Module</b>	<b>Topics (Course contents)</b>		<b>No. of Period</b>
<b>Lab./Field Training/ Experiment Contents of Course</b>	1) Study of important fossil of pteridophytes from prepared slides and specimens 2) Study of important fossil of gymnosperms from prepared slides and specimens 3) Study of important fossil of algae, fungi, bryophytes and angiosperms from prepared slides and specimens 4) Local trip to coal mines or fossil area for collection of fossil specimens and prepare study reports.		<b>30</b>
<b>Keywords</b>	1) Fossil, slides and specimens		

**Signature of Convener & Members (CBoS) :**

① R. Shree	⑦ Jullina
② Devedes	⑧ Aniy
③ Mz	⑨ A
④ Jy	⑩ May
⑤ A. S.	
⑥ B. L.	

## PART-C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended –

1. Principles of Paleontology Edition 3 Paperback–1 January 2006 by Arnold Miller, Michael Foote Publishers - W.H.Freeman & Co Lt
2. The Practical Fossil Finder (Practical Handbook) Hardcover – 1 October 1991 by Steve Parker (Author) Publishers Facts On File Inc

#### Online Resources–

##### ➤ e-Resources / e-books and e-learning portals

1. <https://efaidnbmnnnibpcajpcglclefindmkaj/https://egyankosh.ac.in/bitstream/123456789/696111/Unit-9.pdf>
2. <https://www.encyclopedia.com/science/encyclopedias-almanacs-transcripts-and-maps/fossil-and-fossilization>
3. <https://palaeobotany.org>

#### Online Resources–

##### e-Resources / e-books and e-learning portals

- [www.swayam.ac.in](http://www.swayam.ac.in)
- [www.ignou.ac.in](http://www.ignou.ac.in)
- [www.egyankosh.ac.in](http://www.egyankosh.ac.in)
- [www.iitm.ac.in](http://www.iitm.ac.in)
- [www.eskillindia.org](http://www.eskillindia.org)
- [www.eshiksha.mp.gov.in](http://www.eshiksha.mp.gov.in)
- [www.vlab.co.in](http://www.vlab.co.in)
- [www.internshala.com](http://www.internshala.com)
- [www.ndl.iitkgp.ac.in](http://www.ndl.iitkgp.ac.in)

## 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): 15 (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): 35	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:

① Prof. ...  
② ...  
③ ...  
④ ...  
⑤ ...  
⑥ ...

⑦ ...  
⑧ ...  
⑨ ...  
⑩ ...

**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF ZOOLOGY**  
**COURSE CURRICULUM**

<b>PART- A: Introduction</b>			
<b>Program: Bachelor in life Science</b> <i>(Degree / Honors)</i>		<b>Semester - V</b>	<b>Session: 2024-2025</b>
1	Course Code	ZOSC- 05T	
2	Course Title	Vertebrate Physiology	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	<p>After successfully completing this course, the students will be able to-</p> <ul style="list-style-type: none"> <li>➤ Understand the physiological mechanism at cellular and system level.</li> <li>➤ Learn the significance of nutrients, breathing mechanism, blood coagulation.</li> <li>➤ Understand the water balance in body and working of different senses response.</li> <li>➤ Understand the reproductive physiology and muscles contraction.</li> <li>➤ Apply this knowledge to understand working and disorders of physiological activities.</li> </ul>	
6	Credit Value	<b>3 Credits</b>	<i>Credit = 15 Hours - learning &amp; Observation</i>
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
<b>PART -B: Content of the Course</b>			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	<b>Cell Physiology: Cell membrane and transport mechanism:</b> Transport across membrane: osmosis, passive diffusion- simple and facilitated, & Active transport Mechanism of active transport Primary & secondary active transport, endocytosis and exocytosis, Vesicular Transport: Protein sorting from ER to Golgi, Retrograde transport, Transport across Mitochondrial membrane; pH and its biological significance, Buffer: buffers in biological system, Regulation of pH by Lung and Kidney.		12
II	<b>Physiology of Digestion Respiration and Circulation:</b> <b>Physiology of Digestion:</b> Biological significance of nutrients: carbohydrates, proteins, fats, vitamins and minerals. Physiology of digestion with special reference to enzyme involved, Absorption of Carbohydrate, protein and lipid. <b>Breathing mechanism:</b> Pulmonary ventilation, Respiratory volumes and capacities. Transport of Oxygen and Carbon dioxide in blood. <b>Composition of blood,</b> blood groups, Theories of blood coagulation. Conduction and Regulation of Heart beat, Cardiac cycle, Cardiac output, Integration of cardiovascular function, electrocardiogram (ECG).		11
III	<b>Physiology of Excretion, nerve impulse transmission and Receptor Physiology:</b> <b>Physiology of excretion: Nephron:</b> Structure, Types and their functions Mechanism of Urine formation, Counter-current Mechanism, role of ADH and Renin-Angiotensin-Aldosterone system in Excretion, <b>Mechanism of Osmoregulation</b> in fresh water and marine and terrestrial vertebrates, Stenohalinity and Euryhalinity. <b>Nerve Physiology:</b> Structure and functions of neuron, ionic basis of resting and action potentials, nerve impulse and its transmission, synapse and synaptic transmission, Reflex action. <b>Receptor physiology-</b> Physiology of Vision, Physiology of Hearing and balancing, Mechano, chemo reception, Bioluminescence.		11
IV	<b>Physiology of Reproduction, Muscle Contraction and Tharmoregulation: Physiology of Reproduction:</b> male reproduction: hormonal control of Spermatogenesis, female reproduction: hormonal Control of Oogenesis, menstrual cycle and its hormonal control. <b>Muscle Contraction:</b> Structure and types of muscles, striated, non-striated and cardiac muscles. Molecular structure of muscles protein Actin and Myosin. Physiology of muscles contraction. <b>Theories of Muscles Contraction. Thermoregulation:</b> Mechanism in Homeotherms and Poikilotherm.		11
Keywords	<i>Vertebrate Physiology, Physiology of Respiration, Digestion, Circulation, Blood, Cardiac Cycle, Excretion, Nerve impulse, Thermoregulation, Muscle Contraction, Physiology of Reproduction &amp; Endocrine Glands</i>		
<b>Signature of Convener &amp; Members (CBoS) :</b>			

## PART-C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended –

- Verma P S , Tyagi B S, Agarwal VK *Animal Physiology. Author.*, Edition, illustrated. Publisher, S. Chand Publishing, 2000 - Science - 432 pages
- *Berry AK, A Textbook of Animal Physiology By* (Second edition Emkay publication
- Dr. C. C. Chatterjee, Human physiology, Vol. I & II, 1980, 12th Edn., Medical Applied Agency, Kolkata
- Nagabhushanam, S. V. S. Rana, S. Kalavathy Text book of Animal Physiology, 2008, 2nd Edn., Oxford University Press, India.

#### Reference Books Recommended –

- Ian Kay, 2000, Introduction to Animal Physiology, Bios Scientific Publishers Limited.
- Guyton A. C. & Hall J. E., 2006, Textbook of Medical Physiology, 11th Edition, Hercourt Asia Pvt. Ltd. / W. B. Saunders Company
- Tortora G. J. & Grabowski S., Principles of Anatomy & Physiology, 2006, 11th Edition, John Wiley & sons, Inc.
- Schmidt-Nielsen, Knut, Animal Physiology: Adaptation and Environment, 1997, Cambridge University Press.
- Hoar W. S., General and Comparative Physiology, 1983, 3rd Edn., Prentice Hall, UK.7.
- Barret, K.; Brooks, H.; Boitano, S. and Barman, S. (2010) Ganong's Review of Medical Physiology (23rd edition) Lange Medical.
- Guyton, A.C. and Hall, J.E. (2006) A text book of Medical Physiology (11th edition) Saunders.
- Keele, C.A. & Neil, E. (1989) Samson Wright's Applied Physiology (13th edition) Oxford.

#### Online Resources–

- E PG Pathshala:

<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2rAs1Puvga4LW93zMe83aA==>

- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2rAs1Puvga4LW93zMe83aA==>

## 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


<b>Continuous Internal Assessment (CIA):</b> (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	
<b>End Semester Exam (ESE):</b>	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)**  
**DPARTMENT OF ZOOLOGY**  
**COURSE CURRICULUM**

<b>PART- A: Introduction</b>			
<b>Program: Bachelor in Life Science</b> <i>(Degree / Honors)</i>		<b>Semester - V</b>	<b>Session: 2024-2025</b>
1	Course Code	ZOSC-05 P	
2	Course Title	Vertebrate Physiology	
3	Course Type	Discipline Specific Lab Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	After successfully completing this course, the students will be able to- ➤ Perform and demonstrate some physiological exercises ➤ Learn to record Blood pressure and analyze it ➤ Calculate Oxygen Consumption in model animal ➤ Learn the structure and working of eye and ear. ➤ Apply this knowledge to identify tissues by learning Histological details	
6	Credit Value	1 Credits	<i>Credit = 15 Hours - learning &amp; Observation</i>
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
<b>PART -B: Content of the Course</b>			
Total No. of Teaching-learning Periods (01 Hr. per period) - 30 Periods (30 Hours)			
Unit	Topics (Course contents)		No. of Period
	<ul style="list-style-type: none"> <li>• Hematological practical : Determine blood group, RBC and WBC counting technique, clotting time</li> <li>• Preparation of haemine crystal</li> <li>• Measurement of Blood Pressure through sphygmomanometer.</li> <li>• Action of salivary amylase on starch</li> <li>• Biochemical analysis of food</li> <li>• Determination of oxygen consumption with the help of Respirometer</li> <li>• Preparation of casein from milk</li> <li>• Study of permanent histological section slides of (esophagus , stomach, duodenum, ilium , pancreas ,liver trachea kidney spinal cord, bone, cartilage &amp; blood cells ) mammal,</li> <li>• Demonstration of technique of microtome to have hands-on experience and learning of the technique</li> <li>• Glycolysis, Krebs's cycle, electron transportation demonstrate through Chart / Photographs</li> <li>• Preparation of Practical record</li> <li>• group discussion /quiz / A small project report applying the knowledge</li> </ul>		15
<b>Keywords</b>	<i>Vertebrate Physiology, Human Physiology, Physiology of Respiration, Digestion, Circulation, Blood, Cardiac Cycle, Excretion, Nerve impulse, Thermoregulation, Muscle Contraction, Physiology of Reproduction &amp; Endocrine Glands</i>		
<b>Signature of Convener &amp; Members (CBoS) :</b>			

## **PART-C: Learning Resources**

### **Text Books, Reference Books and Others**

#### **Text Books Recommended –**

- Hoar W. S., General and Comparative Physiology, 1983, 3rd Edn., Prentice Hall, UK.7.
- Keele, C.A. & Neil, E. (1989) Samson Wright's Applied Physiology (13th edition) Oxford.
- Verma P S , Tyagi B S, Agarwal VK *Animal Physiology. Author.*, Edition, illustrated. Publisher, S. Chand Publishing, 2000 - Science - 432 pages
- Berry AK, A Textbook of Animal Physiology By (Second edition Emkay publication
- Pal GK & Pal Parvati, Text book of Practical Physiology, Universities Press
- V P Varshaney and Mona Bedi, Ghai's Text Book of Practical Physiology, Jaypee Brothers Medical Publication

#### **Reference Books Recommended –**

- Ian Kay, 2000, Introduction to Animal Physiology, Bios Scientific Publishers Limited.
- Guyton A. C. & Hall J. E., 2006, Textbook of Medical Physiology, 11th Edition, Hercourt Asia Pvt. Ltd. / W. B. Saunders Company
- Tortora G. J. & Grabowski S., Principles of Anatomy & Physiology, 2006, 11th Edition, John Wiley & sons, Inc.
- Dr. C. C. Chatterjee, Human physiology, Vol. I & II, 1980, 12th Edn., Medical Applied Agency, Kolkata
- Nagabhushanam, S. V. S. Rana, S. Kalavathy Text book of Animal Physiology, 2008, 2nd Edn., Oxford University Press, India.
- Schmidt-Nielsen, Knut, Animal Physiology: Adaptation and Environment, 1997, Cambridge University Press.

#### **Online Resources–**

- <http://ndl.iitkgp.ac.in/he document/swayam prabha/m zly6dppqu>
- <http://ndl.iitkgp.ac.in/he document/swayam prabha/y 0ag clvw0>

## **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**

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

*Name and Signature of Convener & Members of CBoS:*

*S. K. Chakrabarty*

*S. K. Chakrabarty*

*S. K. Chakrabarty*

*S. K. Chakrabarty*

*S. K. Chakrabarty*

*S. K. Chakrabarty*

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

<b>PART- A: Introduction</b>			
<b>Program: Bachelor in Science</b> (Degree/Honors)		<b>Semester - V</b>	<b>Session: 2024-2025</b>
1	<b>Course Code</b>	BCSC-05 T	
2	<b>Course Title</b>	Gene Replication, Expression and Regulation	
3	<b>Course Type</b>	Discipline Specific Course (Theory)	
4	<b>Pre-requisite (if, any)</b>	As Per the Program	
5	<b>Course Learning Outcomes (CLO)</b>	<p><i>On successful completion of the course, the student shall be able to:</i></p> <ul style="list-style-type: none"> <li>➤ Distinguish the process of replication in prokaryotes &amp; eukaryotes.</li> <li>➤ Distinguish the process of transcription in prokaryotes &amp; eukaryotes.</li> <li>➤ Distinguish the process of translation in prokaryotes &amp; eukaryotes.</li> <li>➤ Discuss the transcriptional regulation in prokaryotes &amp; eukaryotes.</li> </ul>	
6	<b>Credit Value</b>	<b>3 Credits</b>	<i>Credit = 15 Hours - learning &amp; Observation</i>
7	<b>Total Marks</b>	<b>Max. Marks: 100</b>	<b>Min Passing Marks: 40</b>
<b>PART -B: Content of the Course</b>			
<b>Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)</b>			
<b>Unit</b>	<b>Topics (Course contents)</b>		<b>No. of Period</b>
<b>I</b>	<b>Basic Concepts of Genetic Information:</b> Salient features of Eukaryotic, prokaryotic and viral genomes; highly repetitive, moderately repetitive and unique DNA sequences. T <sub>m</sub> 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.		<b>12</b>
<b>II</b>	<b>DNA replication:</b> Features of replication, enzymes and proteins in DNA replication, E coli DNA polymerases, stages of replication initiation, elongation and termination. <b>Replication In Eukaryotes:</b> end replication problem, telomerase, various modes of replication. Comparison of replication in prokaryotes and eukaryotes. Inhibitors of DNA replication.		<b>11</b>
<b>III</b>	<b>Transcription in prokaryotes:</b> 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. <b>Transcription in eukaryotes:</b> 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 <b>RNA Processing:</b> 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.		<b>11</b>

Name and Signature of Convener & Members of CBoS:

<b>IV</b>	<p><b>Translation:</b> 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.</p> <p><b>Regulation of gene expression in prokaryotes:</b> 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.</p>	<b>11</b>
<b>Keywords</b>	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**

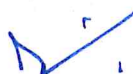
<b>Continuous Internal Assessment (CIA): (By Course Teacher)</b>	Internal Test / Quiz-(2): <b>20 +20</b>	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>30 Marks</b>
	Assignment / Seminar - <b>10</b>	
	Total Marks - <b>30</b>	
<b>End Semester Exam (ESE):</b>	<b>Two section – A &amp; B</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**

<b>PART- A: Introduction</b>			
<b>Program: Bachelor in Science</b> <i>(Degree/ Honors)</i>		<b>Semester - V</b>	<b>Session: 2024-2025</b>
1	<b>Course Code</b>	BCSC-0 5P	
2	<b>Course Title</b>	Gene Replication, Expression and Regulation	
3	<b>Course Type</b>	Discipline Specific Course (Practical)	
4	<b>Pre-requisite (if, any)</b>	As Per the Program	
5	<b>Course Learning Outcomes (CLO)</b>	On successful completion of the course, the student shall be able to: <ul style="list-style-type: none"> <li>➤ Demonstrate assay for nucleic acid by various methods.</li> <li>➤ Demonstrate isolation process of DNA from different samples.</li> <li>➤ Apply electrophoresis technique for different isolated compounds.</li> <li>➤ Illustrate SDS-PAGE techniques.</li> </ul>	
6	<b>Credit Value</b>	1 Credits	<i>Credit =30 Hours Laboratory or Field learning/Training</i>
7	<b>Total Marks</b>	<b>Max. Marks: 50</b>	<b>Min Passing Marks: 20</b>
<b>PART -B: Content of the Course</b>			
<b>Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)</b>			
<b>Module</b>	<b>Topics (Course contents)</b>		<b>No. of Period</b>
<b>Lab./Field Training/ Experiment Contents of Course</b>	<ul style="list-style-type: none"> <li>➤ Estimation of DNA by diphenylamine method.</li> <li>➤ Effect of temperature on the viscosity of DNA using Oswald's viscometer.</li> <li>➤ Extraction of RNA and its estimation by Orcinol method.</li> <li>➤ Isolation and estimation of RNA from yeast.</li> <li>➤ Agarose Gel Electrophoresis and separation of DNA</li> <li>➤ Isolation of DNA from bacteria/eukaryotic cells and check its purity</li> </ul>		<b>30</b>
<b>Keywords</b>	<i>Isolation, DNA Estimation</i>		

Name and Signature of Convener & Members of CBoS:

**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.

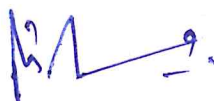
**Online Resources–**

- **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**

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

Name and Signature of Convener & Members of CBoS:

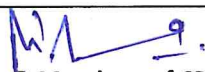



## FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

### Department of Biochemistry Course Curriculum

<b>PART- A: Introduction</b>			
<b>Program: Bachelor in Science (Degree/Honors)</b>		<b>Semester - V</b>	<b>Session: 2024-2025</b>
1	<b>Course Code</b>	<b>BCSE- 03 T</b>	
2	<b>Course Title</b>	<b>Biotechnology</b>	
3	<b>Course Type</b>	<b>Discipline Specific Elective (Theory)</b>	
4	<b>Pre-requisite (if, any)</b>	As Per the Program	
5	<b>Course Learning Outcomes (CLO)</b>	<p><i>On successful completion of the course, the student shall be able to:</i></p> <ul style="list-style-type: none"> <li>➤ 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.</li> <li>➤ They will get acquainted with the use of cloning and expression vectors, creation of genomic and cDNA libraries and their applications.</li> <li>➤ Students will also understand the methods for production of proteins using recombinant DNA technology and their application in industrial systems.</li> </ul>	
6	<b>Credit Value</b>	<b>3 Credits</b>	<b>Credit = 15 Hours - learning &amp; Observation</b>
7	<b>Total Marks</b>	<b>Max. Marks: 100</b>	<b>Min Passing Marks: 40</b>
<b>PART -B: Content of the Course</b>			
<b>Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)</b>			
<b>Unit</b>	<b>Topics (Course contents)</b>		<b>No. of Period</b>
<b>I</b>	<b>Principles of gene cloning:</b> 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 $\lambda$ bacteriophage.		<b>12</b>
<b>II</b>	<b>Uptake of DNA by cells,</b> 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.		<b>11</b>
<b>III</b>	<b>Plant genetic engineering:</b> gene isolation, gene transfer systems, Ti plasmid, plant virus vectors, electroporation, microinjection, microprojectile technology, Transgenic plants and animals. <b>Production of recombinant proteins</b> by eukaryotic cells. Fusion tags such as, polyhistidine, glutathione, maltose binding proteins and their role in purification of recombinant proteins.		<b>11</b>
<b>IV</b>	<b>Application of Biotechnology:</b> Pharmaceutical products of DNA technology; Human protein replacements, Human therapies, Vaccines. Transgenics and animal cloning: Creating transgenic animals and plants. Animal cloning.		<b>11</b>
<b>Keywords</b>	Recombinant DNA, Transfection, Recombinant Protein, Transgenics		

Name and Signature of Convener & Members of CBoS:




**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**

<b>Continuous Internal Assessment (CIA): (By Course Teacher)</b>	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	
<b>End Semester Exam (ESE):</b>	<b>Two section – A &amp; B</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**

<b>PART- A: Introduction</b>			
<b>Program: Bachelor in Science</b> (Degree / Honors)		<b>Semester - V</b>	<b>Session: 2024-2025</b>
1	<b>Course Code</b>	BCSE- 05 P	
2	<b>Course Title</b>	Biotechnology	
3	<b>Course Type</b>	Discipline Specific Elective (Practical)	
4	<b>Pre-requisite (if, any)</b>	As Per The Program	
5	<b>Course Learning Outcomes (CLO)</b>	<p><i>On successful completion of the course, the student shall be able to:</i></p> <ul style="list-style-type: none"> <li>➤ 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.</li> </ul>	
6	<b>Credit Value</b>	1 Credits	<i>Credit =30 Hours Laboratory or Field learning/Training</i>
7	<b>Total Marks</b>	<b>Max. Marks: 50</b>	<b>Min Passing Marks: 20</b>
<b>PART -B: Content of the Course</b>			
<b>Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)</b>			
<b>Module</b>	<b>Topics (Course contents)</b>		<b>No. of Period</b>
<b>Lab./Field Training/ Experiment Contents of Course</b>	<ul style="list-style-type: none"> <li>➤ Agarose gel electrophoresis for separation of DNA fragments.</li> <li>➤ Isolation of plasmid DNA from <i>E. coli</i>.</li> <li>➤ Transformation of <i>E. coli</i> cells with plasmid DNA.</li> <li>➤ Digestion of plasmid DNA with restriction enzymes.</li> <li>➤ Amplification of a DNA fragment by PCR.</li> <li>➤ Complementation of <math>\beta</math>-galactosidase for Blue and White selection.</li> </ul>		<b>30</b>
<b>Keywords</b>	SDS, DNA isolation, Restriction digestion, PCR		


  
 Name and Signature of Convener & Members of CBoS:

**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.)

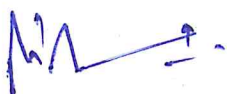
**Online Resources–**

- **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**

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

Name and Signature of Convener & Members of CBOS:




**FOUR YEAR UNDERGRADUATE PROGRAM(2024 – 28)**

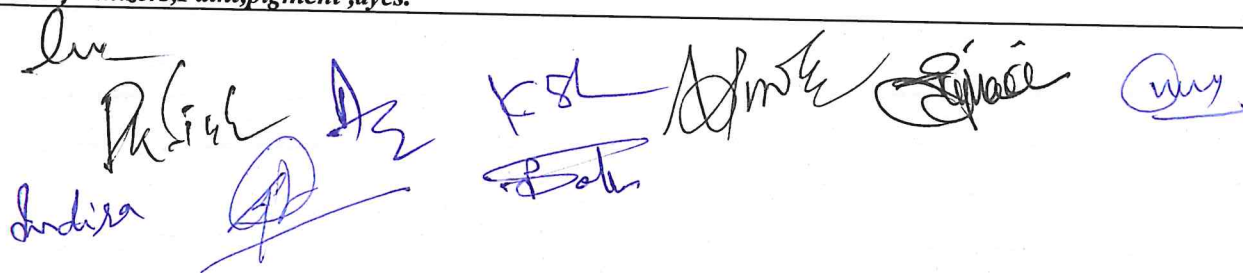
**DEPARTMENT OF CHEMISTRY**

**COURSE CURRICULUM**

<b>PART-A: Introduction</b>			
Program: Bachelor in Science <i>(Certificate / Diploma / Degree/Honors)</i>		Semester-I/III/V	Session: 2024-2025
1	Course Code	CHVAC	
2	Course Title	Chemistry in Daily Life	
3	Course Type	Value Added Course(VAC)	
4	Pre-requisite(if,any)	As per Program	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> <li>➤ To introduce the student about dairy product, beverages, food additives, artificial sweeteners, flavors, food colorants, paints, pigments, dyes etc.</li> <li>➤ To make aware the students about air pollution, hydrological cycle, composition of soil, fertilizers etc.</li> <li>➤ To introduce the students about carbohydrate, vitamins, drugs.</li> <li>➤ To introduce students about concept of thermodynamics used in day to day life.</li> </ul>	
6	Credit Value	2 Credits	Credit = 15 Hours -learning & Observation
7	Total Marks	Max.Marks:50	Min Passing Marks:20
<b>PART -B: Content of the Course</b>			
TotalNo.of Teaching-learning Periods(01 Hr. per period) - 30 Periods (30 Hours)			
Unit	Topics(Course contents)		No. of Period
I	<p><b>Dairy Products:</b> Composition of milk and milk products. Analysis of fat content, minerals in milk and butter. Estimation of added water in milk.</p> <p><b>Beverages:</b> Analysis of caffeine in coffee and tea, detection of chicory in coffee, chloral hydrate in toddy, estimation of methyl alcohol in alcoholic beverages.</p> <p><b>Food additives, adulterants and contaminants:</b> Food preservatives like benzoates, propionates, sorbates, disulphites.</p> <p><b>Artificial sweeteners:</b> spartame, saccharin, dulcin, sucralose and sodium cyclamate.</p> <p><b>Flavors:</b> Vanillin, alkyl esters (fruit flavours) and monosodium glutamate. Artificial food colorants: Coal tar dyes and non-permitted colours and metallic salts. Analysis of pesticide residues in food.</p> <p><b>Paints &amp; Pigments:</b> White pigments (white lead, ZnO, lithopone, TiO<sub>2</sub>). Blue, red, yellow and green pigments. Paints and distempers: Requirement of a good paint. Emulsion, latex; luminescent paints. Fire retardant paints and enamels, lacquers. Solvents and thinners for paints.</p> <p><b>Dyes:</b> Colour and constitution (electronic concept). Classification of dyes. Methods of applying dyes to the fabrics. A general study of azo dyes, Mordant brown, Congo red and methyl orange.</p>		08
II	<p><b>Air Pollution:</b> Air pollutants, prevention and control, Greenhouse gases and acid rain. Ozone hole and CFC's. Photochemical smog and PAN. Catalytic converters for mobile sources. Bhopal gas tragedy.</p> <p>Hydrologic cycle, sources, criteria and standards of water quality - safe drinking water. Public health significance and measurement of water quality parameters - (Colour, turbidity, total solids, acidity, alkalinity, hardness, sulphate, fluoride, phosphate, nitrite, nitrate, BOD and COD).</p> <p>Water purification for drinking and industrial purposes. Toxic chemicals in the environment. Detergents - pollution aspects, eutrophication. Pesticides and insecticides - pollution aspects. Heavy metal pollution. Solid pollutants - treatment and disposal. Treatment of industrial liquid wastes. Sewage and industrial effluent treatment.</p>		07

Indira, K. S., M. S., B. S., and others.

	<p>Composition of soil – inorganic and organic components in soil - micro and macronutrients.</p> <p><b>Fertilizers:</b> Classification of fertilizers - Straight Fertilizers, Compound/Complex Fertilizers, Fertilizer Mixtures. Manufacture and general properties of fertilizer products - Urea and DAP.</p>	
III	<p><b>Carbohydrates:</b> Structure, function and Chemistry of some important mono and disaccharides.</p> <p><b>Vitamins:</b> Classification and Nomenclature. Sources, deficiency diseases and structures of Vitamin A<sub>1</sub>, Vitamin B<sub>1</sub>, Vitamin C, Vitamin D, Vitamin E &amp; Vitamin K<sub>1</sub>.</p> <p><b>Drugs:</b> Classification and nomenclature.</p> <p>Structure and function of: <i>Analgesics</i> – aspirin, paracetamol.</p> <p><i>Anthelmintic drug:</i> mebendazole.</p> <p><i>Antiallergic drug:</i> Chlorpheniramine maleate.</p> <p><i>Antibiotics:</i> Penicillin V, Chloromycetin, Streptomycin.</p> <p><i>Anti-inflammatory agent:</i> Oxypheno-butazone.</p> <p><i>Antimalarials:</i> Primazquine phosphate &amp; Chloroquine.</p> <p><b>Oils and fats:</b> Composition of edible oils, detection of purity, rancidity of fats and oil. Tests for adulterants like aregemone oil and mineral oils.</p> <p><b>Soaps &amp; Detergents:</b> Structures and methods of use of soaps and detergents.</p>	08
IV	<p><b>Chemical Thermodynamics:</b> Concept of fugacity and free energy, Activity and activity coefficient, spontaneity of processes-entropy and free energy changes. Partial molar quantities, colligative properties, Le-Chatelier principle, phase equilibrium. Enzyme catalyzed reactions.</p> <p><b>Principles of Reactivity:</b> Basis kinetic concepts, rates of simple and complex chemical reactions, empirical rate equations. Temperature dependence of rates and activation parameters. Branched chain reactions – explosion limits. Oscillatory reactions.</p> <p><b>Chemical energy system</b> and limitations, principles and applications of primary &amp; secondary batteries and fuel cell. Basics of solar energy, future energy storer. aerospace materials. Problems of plastic waste management. Strategies for the development of environment friendly polymers.</p>	08
<i>Keywords</i>	<p><i>Air pollution, carbohydrate, vitamins, LeChattelier's law, Dairy product, artificial sweeteners. fertilizers, Paint, pigment, dyes.</i></p>	





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

<b>PART- A: Introduction</b>			
<b>Program: Bachelor in Science</b> <i>(Certificate / Diploma / Degree/Honors)</i>		<b>Semester - I / III / V</b>	<b>Session: 2024-2025</b>
1	<b>Course Code</b>	BCVAC- 01	
2	<b>Course Title</b>	Ethno Medicine in Chhattisgarh	
3	<b>Course Type</b>	Value added Course	
4	<b>Pre-requisite (if, any)</b>	As Per the Course	
5	<b>Course Learning Outcomes (CLO)</b>	<p><i>On successful completion of the course, the student shall be able to:</i></p> <ul style="list-style-type: none"> <li>➤ Explain the basic components of Medicinal plant.</li> <li>➤ Summarize the bioactive compound in herbs.</li> <li>➤ Recognize the disorder and ethno medicine for it.</li> <li>➤ Understand the effect of bioactive compound on the disease as well as interpret the effect of toxic chemicals on body parts and their cure.</li> </ul>	
6	<b>Credit Value</b>	<b>2 Credits</b>	<i>Credit = 15 Hours - learning &amp; Observation</i>
7	<b>Total Marks</b>	<b>Max. Marks: 50</b>	<b>Min Passing Marks: 20</b>
<b>PART -B: Content of the Course</b>			
<b>Total No. of Teaching-learning Periods (01 Hr. per period) - 30 Periods (30 Hours)</b>			
<b>Unit</b>	<b>Topics (Course contents)</b>		<b>No. of Period</b>
<b>I</b>	Historical perspective, scope and future prospects. Scrutinizing the term 'Ethno medicine'. Common and crucial Medicinal Plants in Chhattisgarh: Ethno medicine in India.		07
<b>II</b>	<b>Properties and functions of photochemical and their medicinal effects</b> - Glucosamine, Octacosanol, Lycopene, Flavonoids, Carnitine, Melatonin and Ornithine alpha, ketoglutarate. Use of proanthocyanidins, grape products, flaxseed oil as Medicine.		08
<b>III</b>	<b>Disease and Ethno medicine;</b> 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
<b>IV</b>	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
<b>Keywords</b>	Phytochemical, Nutraceuticals, Herbal Medicine, Disorders, Disease.		

Name and Signature of Convener & Members of CBoS:

<b>PART-C: Learning Resources</b>		
<b>Text Books, Reference Books and Others</b>		
<i>Text Books Recommended –</i>		
<ul style="list-style-type: none"> <li>➤ 1. Gopalan C., et al Dietary Allowances for Indians, NIH, Hyderabad.</li> <li>➤ 2. Anita F.P. Clinical Dietetics and Nutrition, 4th Ed, 1997,</li> <li>➤ 3. Devlin, T.M. Text Book of Biochemistry with Clinical Correlation,</li> <li>➤ 4. Mahan, L.K. &amp; Ecott- Stump, S. [Ed.] Krause's Food, Nutrition and Diet Therapy .</li> </ul>		
<b>PART -D: Assessment and Evaluation</b>		
<b>Suggested Continuous Evaluation Methods:</b>		
<b>Maximum Marks: 50 Marks</b>		
<b>Continuous Internal Assessment (CIA): 15 Marks</b>		
<b>End Semester Exam (ESE): 35 Marks</b>		
<b>Continuous Internal Assessment (CIA): (By Course Teacher)</b>	Internal Test / Quiz-(2): <b>10 &amp; 10</b> Assignment/Seminar +Attendance - <b>05</b> Total Marks - <b>15</b>	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against <b>15 Marks</b>
<b>End Semester Exam (ESE):</b>	<b>Two section – A &amp; B</b> Section A: Q1. Objective – <b>05 x1= 05 Mark</b> ; Q2. Short answer type- <b>5x2 =10 Marks</b> Section B: Descriptive answer type qts., <b>1out of 2</b> from each unit- <b>4x05 =20 Marks</b>	

Name and Signature of Convener & Members of CBoS: