

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

**DEPARTMENT OF BOTANY
COURSE CURRICULUM**

PART- A: Introduction			
Program: Bachelor in Life sciences <i>(Degree/Honors)</i>		Semester - VI	Session: 2024-2025
1	Course Code	BOSC-06 T	
2	Course Title	Plant Physiology and Economic Botany	
3	Course Type	Discipline Specific course (DSC)	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will understand to <ul style="list-style-type: none"> ➤ Gain a deep understanding of the fundamental physiological processes in plants, including photosynthesis, respiration, transpiration, and nutrient uptake, and their regulation. ➤ Acquire practical skills in conducting experiments and using various techniques. ➤ Develop a comprehensive understanding of the economic value and utilization of plant resources. ➤ Acquire knowledge and skills to identify and classify economically important plant species. 	
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)			
Unit	Topics (Course contents)		No. of Period
I	Plant-water relations & Mineral nutrition Importance of water, water potential and its components; Transpiration and its significance; Factors affecting transpiration; Root pressure and guttation. Essential elements, macro and micronutrients; Criteria of essentiality of elements; Role of essential elements; Symptoms of mineral deficiency in major crops, Transport of ions across cell membrane, active and passive transport.		12
II	Photosynthesis and Lipid Metabolism Historical background, photosynthetic pigments and their role photochemical reactions, PSI, PSII, Q cycle, C ₄ pathways; Crassulacean acid metabolism; Factors affecting CO ₂ reduction. Synthesis and breakdown of triglycerides, β-oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilization of lipids during seed germination, α oxidation		11
III	Respiration and Nitrogen Metabolism Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, Glyoxylate, Oxidative Pentose Phosphate Pathway. Electron transport and mechanism of ATP synthesis; C ₃ , C ₄ and CAM pathways of carbon fixation, Photorespiration. Nitrate assimilation, biological nitrogen fixation, Physiology and biochemistry of nitrogen fixation, Ammonia assimilation (GS-GOGAT), reductive amination and transamination, amino acid synthesis.		11
IV	Economic Botany: Origin of Cultivated Plants, Examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity. Brief account of crops, millets, legumes, spice, Beverages, oils, drug, fiber, and timber yielding plant.		11
Keywords	Osmosis, Transport, Hill reaction, Genetic diversity.		
Signature of Convener & Members (CBoS) :			

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

⑦ ...
 ⑧ ...
 ⑨ ...
 ⑩ ...

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Taiz, L., Zeiger, E., Møller, I.M. and Murphy, A (2015). Plant Physiology and Development. Sinauer Associates Inc. USA. 6th edition.
2. B. P. Pandey (2017) Economic Botany. S. Chand Publication, New Delhi.
3. Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
4. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.

Reference Books Recommended-

1. Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
2. Chrispeels, M.J. and Sadava, D.E. 1994 Plants, Genes and Agriculture. Jones & Bartlett Publishers.
3. Harborne, J.B. (1973). Phytochemical Methods. John Wiley & Sons. New York.
4. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.

Online Resources–

- e-Resources / e-books and e-learning portals
- <https://education.nationalgeographic.org/resource/photosynthesis/>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4242210/>
- <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/nitrogen-metabolism>
- https://en.wikipedia.org/wiki/Lipid_metabolism

Online Resources–

- e-Resources / e-books and e-learning portals
- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- 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
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Name and Signature of Convener & Members of CBoS:

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

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Sciences <i>(Degree/ Honors)</i>		Semester - VI	Session: 2024-2025
1	Course Code	BOSC-06	
2	Course Title	Lab. Course -06 (Plant Physiology and Economic Botany)	
3	Course Type	Laboratory course	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	Acquire practical skills in conducting experiments and using various techniques to measure and analyze plant physiological parameters, enabling students to design and execute experiments in plant physiology research. ○ Acquire knowledge and skills to identify, and classify economically important plant species, and understand their ecological requirements, cultivation techniques, and potential for sustainable utilization. ○ Apply critical thinking and problem-solving skills to analyze and evaluate the impacts of human activities on plant resources, and develop strategies for the conservation, sustainable management, and utilization of plant biodiversity.	
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	1. Determination of osmosis and plasmolysis. 2. Determination of osmotic potential of plant cell sap by plasmolytic method. 3. Demonstration of the process of transpiration. 4. To find out rate of transpiration by potometer method. 5. To find out stomatal frequency and stomatal index. 6. Chemical separation of photosynthetic pigments. 7. To find out that oxygen evolved during the process of photosynthesis. 8. To study the effect of quality and intensity of light on photosynthesis. 9. To find out the effect of carbon dioxide concentration on the rate of photosynthesis. 10. To find out the Respiratory Quotient of different respiratory substrates by respirometer method. 11. To compare the rate of respiration in different parts of a plant. 12. Study of amylase and catalase enzymes. 13. Morphological features and economic importance of cereals, millets, legumes, oil, spices, drug, fiber, and timber yielding plant.		30
Keywords	Physiology, Economic Botany, Beverages, Enzyme.		

Signature of Convener & Members (CBoS) :

- ① R. Prasad
- ② Kundu
- ③ Adhikari
- ④ M. S.
- ⑤ [Signature]
- ⑥ [Signature]
- ⑦ [Signature]
- ⑧ [Signature]
- ⑨ [Signature]
- ⑩ [Signature]

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. . Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
2. Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
3. Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic

Reference Books Recommended –

1. Taiz, L., Zeiger, E., MØller, I.M. and Murphy, A (2015). Plant Physiology and Development. Sinauer Associates Inc. USA. 6th edition.
2. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.

Online Resources–

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

- > www.swayam.ac.in
- > www.ignou.ac.in
- > www.egyankosh.ac.in
- > www.iitm.ac.in
- > www.eskillindia.org
- > www.eschiksha.mp.gov.in
- > www.vlab.co.in
- > www.internshala.com
- > www.ndl.iitkgp.ac.in

Online Resources–

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

- > <https://education.nationalgeographic.org/resource/photosynthesis/>
- > <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4242210/>
- > <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/nitrogen-metabolism>
- > https://en.wikipedia.org/wiki/Lipid_metabolism

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	Managed by Course teacher as per lab. status
	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 R. B. Roy
- ② R. B. Roy
- ③ R. B. Roy
- ④ M. K. Roy
- ⑤ R. B. Roy
- ⑥ R. B. Roy
- ⑦ R. B. Roy
- ⑧ R. B. Roy
- ⑨ R. B. Roy
- ⑩ R. B. Roy

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

PART- A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester - VI	Session: 2024-2025
1	Course Code	BOSE-04 T	
2	Course Title	Ethnobotany and Medicinal plants	
3	Course Type	Discipline Specific Elective (DSE)	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to</p> <ul style="list-style-type: none"> Develop a comprehensive understanding of the identification, cultivation, and processing of medicinal plants, and their chemical constituents responsible for therapeutic properties, enabling the evaluation of their potential for drug development and healthcare applications. Explore the integration of traditional medicine practices, ethnobotany, and pharmacological principles in the study of medicinal plants, enabling the critical evaluation of their efficacy, safety, and cultural significance in different healthcare 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	Ethnobotany: <ul style="list-style-type: none"> Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context; Major and minor ethnic groups or Tribals of India, and their life styles. Plants used by the tribals: a) Food plants b) intoxicants and beverages c) Resins and oils and miscellaneous uses. Role of ethnobotany in sustainable development 		12
II	Role of ethnobotany in modern Medicine: <ul style="list-style-type: none"> Medico-ethnobotanical sources in India; Significance of the locally available plants in ethno botanical practices (along with their habitat and morphology Role of ethnic groups in conservation of plant genetic resources. Endangered taxa and forest management (participatory in Chhattisgarh). Role of plant drugs in pharmaceutical industries Quality, safety and efficacy of herbal medicines. 		11
III	Medicinal Plants: <ul style="list-style-type: none"> History, Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences; Definition and Scope- Traditional system of medicine in India- concept principles and importance of Ayurveda, Shidha, Yunani and Homeopathy Concept of Herbalism and its significance Phytomedicines and herbal raw materials , local health traditions and traditional medicine 		11
IV	Conservation and Propagation of medicinal plants: <ul style="list-style-type: none"> Medicinal plants Conservation – issues and approaches IUCN criteria - Red list criteria; <i>In situ</i> conservation: Biosphere reserves, sacred groves, National Parks; <i>Ex situ</i> conservation: Botanical Gardens, Ethnomedicinal plant Gardens. Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding 		11
Keywords Ethnobotany, conservation, Medicinal Plants, Tribals			
Signature of Convener & Members (CBoS) :			

① P. Singh
 ② Kumar

③ M. S.

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PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

1. S.K. Jain, Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1995.
2. S.K. Jain (ed.) Glimpses of Indian. Ethnobotny, Oxford and I B H, New Delhi – 1981 Lone et al, Palaeo ethnobotany
3. S.K. Jain (ed.) 1989. Methods and approaches in ethnobotany. Society of ethnobotanists, Lucknow, India.
4. S.K. Jain, 1990. Contributions of Indian ethnobotny. Scientific publishers, Jodhpur.

Reference Books Recommended:

1. Colton C.M. 1997. Ethnobotany – Principles and applications. John Wiley and sons – Chichester
2. Rama Ro, N and A.N. Henry (1996). The Ethnobotany of Eastern Ghats in Andhra Pradesh, India. Botanical Survey of India. Howrah
3. .Rajiv K. Sinha – Ethnobotany The Renaissance of Traditional Herbal Medicine – INA –SHREE Publishers, Jaipur-1996
4. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
5. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India. Approach, 2nd edn. Agrobios, India.
6. Medicinal Plants of India" by C.P. Khare
7. "Handbook of Medicinal Plants" by L.D. Kapoor Rogers, P.P., Jalal, K.F. and Boyd, J.A. (2008). An Introduction to Sustainable Development. Prentice Hall of India Private Limited, New Delhi.

Online Resources–

- e-Resources / e-books and e-learning portals
- <https://www.fs.usda.gov/wildflowers/ethnobotany/index.shtml>
- https://www.researchgate.net/publication/333017295_Role_of_ethnobotany_in_modern_medicines_with_special_reference_to_Rauvolfia_serpentina_Trichopus_zeylanicus_Artemisia_sp_and_Withania_somnifera
- <https://www.sciencedirect.com/science/article/abs/pii/S0738081X18300415>
- https://www.mdpi.com/journal/diversity/special_issues/ethnobotany_biodiversity

Online Resources–

- e-Resources / e-books and e-learning portals
- www.swayam.ac.in
- www.ignou.ac.in
- www.egyankosh.ac.in
- www.iitm.ac.in
- www.eskillindia.org
- www.eshiksha.mp.gov.in
- www.vlab.co.in
- www.internshala.com
- 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 R. D. S. Rao
② S. D. S. Rao
③ K. S. Rao
④ S. D. S. Rao
⑤ S. D. S. Rao
⑥ S. D. S. Rao
⑦ S. D. S. Rao
⑧ S. D. S. Rao
⑨ S. D. S. Rao
⑩ S. D. S. Rao

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Degree/ honors)		Semester - VI	Session: 2024-2025
1	Course Code	BOSE-04 P	
2	Course Title	Lab. Course 04 (Ethnobotany and Medicinal plants)	
3	Course Type	Laboratory course	
4	Pre-requisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to get</p> <ul style="list-style-type: none"> ➤ Acquire practical skills about the connection between plants and human society. ➤ Acquire knowledge of ethnobotanical research methods. ➤ Apply critical thinking and problem-solving skills of traditional plant uses. ➤ Idea about protection and conservation of medicinal and ethnobotanical plants. ➤ Documentation of cultural knowledge about healing. 	
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	<ol style="list-style-type: none"> 1. Identify and collect medicinal plant specimens from various habitats. Documentation for relevant information such as plant parts used, traditional uses, and ecological characteristics. 2. Preparation of herbarium of the collected plants 3. To study the distribution of tribals / ethnic peoples of a selected area. 4. Collection of locally used plants of ethnobotanically important plants 5. To study morphological description and identification of various medicinal plants. 6. Engage with local communities and traditional healers to document their knowledge of medicinal plants. Record their uses, preparation methods, and cultural significance, emphasizing the importance of preserving traditional knowledge. 7. To study common name, botanical name, important varieties and commercially important parts of medicinal and aromatic plants. 8. To study different methods of plant extraction to obtain bioactive compounds 9. Phytochemical and secondary metabolites analysis to determine the chemical potential therapeutic properties of collected specimens of local area. 10. Tribal knowledge towards disease diagnosis, treatment for different medicinal plants and its cultivation and conservation. 11. To find out antimicrobial potential of medicinal plant extracts. 	30
Keywords	1. Therapeutic, antimicrobial, medicinal plants. herbarium	

Signature of Convener & Members (CBoS) :

① P. Praveen
 ② P. Praveen
 ③ M. S. Srinivasan
 ④ P. Praveen
 ⑤ P. Praveen
 ⑥ P. Praveen
 ⑦ P. Praveen
 ⑧ P. Praveen
 ⑨ P. Praveen
 ⑩ P. Praveen

PART-C: Learning Resources	
Text Books, Reference Books and Others	
Text Books Recommended –	
1. S.K. Jain, Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1995. 2. Jain, S. K. and V. Mudgal. 1999. A Handbook of Ethnobotany. Bishen Singh Mahendra Pal Singh, Dehradun	
Reference Books Recommended –	
1. "Handbook of Medicinal Plants" by L.D. Kapoor. 2. "Indian Medicinal Plants: An Illustrated Dictionary" by C.P. Khare.	
Online Resources–	
➤ e-Resources / e-books and e-learning portals 1) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9526633/ 2) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9922502/ 3) https://bnrc.springeropen.com/articles/10.1186/s42269-022-00770-8 4) https://cmjournal.biomedcentral.com/articles/10.1186/s13020-016-0108-7	
Online Resources–	
➤ e-Resources / e-books and e-learning portals ➤ www.swayam.ac.in ➤ www.ignou.ac.in ➤ www.egyankosh.ac.in ➤ www.iitm.ac.in ➤ www.eskillindia.org ➤ www.eshiksha.mp.gov.in ➤ www.vlab.co.in ➤ www.internshala.com ➤ 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 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): 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 R Shree
 ② Khande
 ③ Mr
 ④
 ⑤ Anil
 ⑥ Bhat

⑦ Anshu
 ⑧
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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Degree / Honors)		Semester - VI	Session: 2024-2025
1	Course Code	ZOSC-06T	
2	Course Title	Genetics	
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"> ➤ Understand and grasp the principles of Mendelian inheritance and interaction of genes. ➤ Understand the sources and consequences of genetic variation, including mutations, genetic recombination, and gene flow. ➤ Know various methods of sex determination in animal kingdom. ➤ Analyse the cause and effect of alterations in chromosome number and structure ➤ Understand DNA structure and function, gene expression, and genetic inheritance patterns ➤ Know the Recent Assisted Reproductive Techniques 	
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)			
Unit	Topics (Course contents)		No. of Period
I	<p>Concept of Genes and Genomics: Scope and importance. Elements of heredity and variation: Classical and Modern concept of Gene (Cistron, Mutton, Recon), Alleles. Mendel's laws of inheritance, Chromosomal basis of inheritance and its applications. Exceptions to Mendelian Inheritance: Incomplete dominance, Codominance, Multiple allelism. Interaction of Gene-Lethal alleles, Pleiotropy, Epistasis- Dominant and Recessive, Supplementary, Complementary, Inhibitory gene and polygene. Define Penetrance, Expressivity and Phenocopy.</p>		12
II	<p>The recombination and interaction of Genes: Linkage and crossing over, cytological basis of crossing over. Organelle inheritance (Mitochondrial), Sex Chromosomes and sexlinked Gene X-linked dominant and X-linked recessive. Sex determination: Theories of sex determination: Chromosomal Theory (XX/XO, XX/XY, ZZ/ZW, ZZ/ZO), Genetic balance theory, intersex, Haplodiploidy, Gynandromorphs. Hormonal influence on sex determination- Freemartin and sex reversal. Role of environmental factors- Bonellia and Crocodile. Eugenics. Mutation, Chromosomal and Gene Mutation, Structural and numerical alterations of chromosomes.</p>		11
III	<p>Regulation of Gene expression, regulation and mapping: Gene Expressions and regulation: One gene-one enzyme hypothesis /one polypeptide hypothesis. Concept of operon of bacteria (Lac Operon) and bacteriophages. Bacterial transposons. Vertical and horizontal gene transfer. Transformation, transfection and transduction. Genetic mapping. RNA-inheritance, FLP-FRT. Utility of the model organisms: Escherichia coli, <i>Drosophila melanogaster</i> & <i>Mus musculus</i></p>		11
IV	<p>Population Genetics and Genetic Counselling: Human Genetics: Pedigree analysis; Karyotype, Genetic disorders: chromosomal aneuploidy (Down, Edward, Patau, Turner and Klinefelter syndromes), chromosome translocation (Chronic Myeloid Leukemia) and deletion ("cry of cat" syndrome). Single Gene Disorder: gene mutation (sickle cell anemia,) and Genetic counselling, Gene isolation Manipulation and techniques. Basic concept of Polymerase Chain Reaction. DNA Sequencing; Southern, Western & Northern Blots. In situ Hybridization, FISH, RFLPs and Oligonucleotide arrays. Gene Cloning vs Animal Cloning, Nuclear transplantation,</p>		11
Keywords	<p><i>Genetics, Mendel's law, Interaction of Gene, Sex Linkage, Sex Determination, Operon, Genetic Screening, Pedigree Analysis, Aneuploidy</i></p>		
Signature of Convener & Members (CBoS) :			

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Arora M.P. and Sandhu G.S. Genetics, Himalayan Publishing House
- Winter P.C. Et al, Genetics Viva Publication
- Gupta P.K., Cell and Molecular Biology Rastogi Publication

Reference Books Recommended –

- Gardner, E.J. *et al.* (2006) Principles of Genetics (John Wiley).
- Russell, P.J. (2010) Genetics (Benjamin Cummings).
- Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. (VIII edition) Wiley India.
- Snustad, D.P. and Simmons, M.J. (2009). Principles of Genetics. (V edition) John Wiley and Sons Inc.
- Klug, W.S., Cummings, M.R. and Spencer, C.A. (2012). Concepts of Genetics. (X edition) Benjamin Cummings.
- Carroll S.B.; Doebley J.; Griffiths, A.J.F. and Wessler, S.R. (2018) An Introduction to Genetic Analysis. W. H. Freeman and Co. Ltd.
- Campbell, N. and Reece, J. (2014) Biology (10th edition). Benjamin Cummings

Online Resources–

- National digital Library.
- <http://ndl.iitkgp.ac.in/document/Rm5qb3lqRngwWDZ2Tnl6UXI4VU9YR201R0cwYXJHV25HSHFacGxtS1h3REZGd1ByL28xcmlleEFFZU5najlCZl1HdXBBTzBlTBVVRGIDSFhkMEtuUkE9PQ>
- E-PG Pathshala.
- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2rAs1Puvga4LW93zMe83aA>
- eGyankosh- Genetics and Evolutionary Biology
- eGyanKosh: BZYCT-137 Genetics and Evolutionary Biology

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

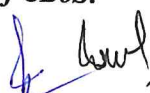
End Semester Exam (ESE): 70 Marks

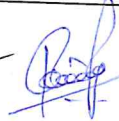
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10 Total Marks - 30	
End Semester Exam (ESE):	Two section – A & B Section A: Q1. 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	

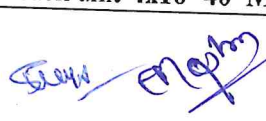
Name and Signature of Convener & Members of CBoS:











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

PART- A: Introduction			
Program: Bachelor in Life Science <i>(Degree / Honors)</i>		Semester - VI	Session: 2024-2025
1	Course Code	ZOSC- 06P	
2	Course Title	Genetics	
3	Course Type	Discipline Specific Lab 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"> ➤ Able to understand and explain Mendel's Law of Inheritance ➤ Capable to analyze inheritance of gene by pedigree analysis. ➤ Know laboratory culture of <i>Drosophila</i>. ➤ Understand and configuration for animal life. ➤ Capable to understand Human karyotype and Numerical alteration in chromosomes 	
6	Credit Value	1 Credits	<i>Credit =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 learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	<ul style="list-style-type: none"> ➤ Application of probability in the law of segregation with coin tossing. ➤ Study of mode of inheritance of the following traits by pedigree charts – attached ear lobe, widow's peak. ➤ Familiarization with techniques of handling <i>Drosophila</i>, identifying males and females; observing wild type and mutant (white eye, wing less) flies, and setting up cultures. ➤ Study of human karyotypes and numerical alterations (Down syndrome, Klinefelter syndrome and Turner syndrome). ➤ Demonstration of law of segregation (monohybrid and test cross) sex-linked inheritance in <i>Drosophila</i> making a cross between white eye dumpy winged or sepia eyed and wild type flies (criss-cross inheritance) Explain with Model ➤ Study of structural chromosome aberrations (dicentric, ring chromosomes and inversions in polytene chromosomes) from prepared slides/photograph ➤ Extraction of Genomic DNA from bacteria. ➤ Group discussion/ Seminar/ Quiz presentation on one or two related topics 		30
Keywords	Mendel's Law, Human Karyotype, <i>Drosophila</i> Culture, Pedigree		
Signature of Convener & Members (CBoS) :			

S. K. Kulkarni

by

Prof. [Signature]

[Signature]

[Signature]

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Practical Hand Book of Genetics: Vikas Pali Kalyani Publication
- Essential Practical Handbook of Cell Biology & Genetics, Biometry & Microbiology, A Laboratory Manual Debarati Das, Academic Publishers.
- Cytogenetics: Mohan P Arora, Himalayan Publishing House

Reference Books Recommended –

- Klug, W.S., Cummings, M.R. and Spencer, C.A. (2012). Concepts of Genetics. (X edition) Benjamin Cummings.
- Carroll S.B.; Doebley J.; Griffiths, A.J.F. and Wessler, S.R. (2018) An Introduction to Genetic Analysis. W. H. Freeman and Co. Ltd.

Online Resources–

- <https://jru.edu.in/studentcorner/lab-manual/agriculture/Fundamentals%20of%20Genetics.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	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:



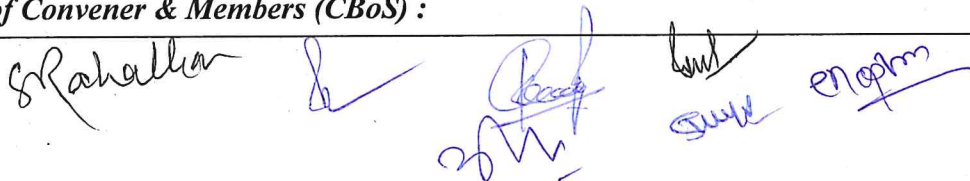






FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF ZOOLOGY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science <i>(Degree/Honors)</i>		Semester - VI	Session: 2024-2025
1	Course Code	ZOSE-04T	
2	Course Title	Evolutionary Biology	
3	Course Type	Discipline Specific Elective	
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"> ➤ Understanding the historical concept of Evolution. ➤ Develop an understanding on the Evolutionary Concept and theories in evolution. ➤ Understanding on the different interacting evolutionary process by various examples. ➤ Learn animal phylogeny and adaptations. ➤ Develop an interest in the debates and discussion taking place in the field of evolutionary biology. 	
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)			
Unit	Topics (Course contents)		No. of Period
I	Historical review of evolutionary concept: Evidences in favor of Evolution: Evidences from morphology and comparative anatomy (Homology, Analogy and Vestigial organs), Evidences from Paleontology, Connecting Links, Embryology, Taxonomy, Cytology, Biochemistry & physiology and from Genetics. Theories of Evolution: Lamarckism, Neo-Lamarckism and Darwinism (Basic Postulates of Darwinism, Supplementary theories of Darwin, Support & Criticism of Darwinism) Modern Synthetic theory of Evolution: Gene and Chromosomal Mutation.		12
II	Evolutionary forces: Natural Selection, Genetic variation, Genetic drift (mechanism, founder's effect, bottleneck phenomenon), Gene Migration. Hardy-Weinberg Law, Molecular clock (example of globin gene family) rRNA/cyt c). Isolation: Pattern & mechanism of isolation.		11
III	Products of evolution: speciation mechanisms: Quantitative traits, Species Concept: Morphological, Biological, Genetical and phylogenetic species concept. Species Categories: Geographical races, Demes, Clines, Ecological races, Semi species, Speciation: Phyletic speciation, Gradual speciation: Allopatric, sympatric, peripatric, parapatric, Alloparapatric. Theories of speciation: Classical theory of Gradualism, Founder flush speciation theory. Mimicry: Protective, Aggressive, Batesian & Mullerian mimicry and significance of mimicry, Aposematic coloration, Thanatosis, Extinctions: massextinctions (causes and effects), detailed example of K-T extinction.		11
IV	Basic patterns of Evolution: Micro & Macro Evolution. Phylogenetic Tree: Its construction and Interpretation. Fossils and fossilization, dating and significance of fossil. Geological Time Scale, Evolution of Man and Evolution of Horse.		11
Keywords	<i>Homology, Analogy, Natural Selection, Genetic variation, Genetic drift, Speciation, Mimicry.</i>		
Signature of Convener & Members (CBoS) :			



PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Rastogi, Veerbala, Organic Evolution (2018). Third Revised Edition. MEDTECH.
- Singh, S.P., Tomar, B.S., Evolutionary Biology, Rastogi Publication
- Verma P.S., Agrawal V.K., Cell Biology, Genetics, Evolution & Ecology, S.Chand Publication

Reference Books Recommended –

- Ridley, M. (2004). *Evolution*. III Edition. Blackwell Publishing
- Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007). *Evolution*. Cold Spring, Harbour Laboratory Press.
- Hall, B. K. and Hallgrímsson, B. (2008). *Evolution*. IV Edition. Jones and Bartlett Publishers.
- Douglas, J. Futuyma (1997). *Evolutionary Biology*. Sinauer Associates.
- Campbell, N.A. and Reece J.B (2011) *Biology* (9th edition) Pearson, Benjamin, Cummings
- De Robertis, E.D.P. and De Robertis, E.M.F. (2006) *Cell and Molecular Biology* (8th edition) Lippincott Williams and Wilkins, Philadelphia.

Online Resources–

- Egyankosh-
- <https://egyankosh.ac.in/bitstream/123456789/16425/1/Unit-10.pdf>
- National Digital Library
- http://ndl.iitkgp.ac.in/he_document/libretexts/libretexts/2f661e95fc3f32dd7204f7188addec22?e=17|EVOLUTION|||
- http://ndl.iitkgp.ac.in/he_document/swayamprabha/swayam_prabha/1o8mxiahue8?e=1*|||

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)
ZOOLOGY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science (Degree/Honors)		Semester - VI	Session: 2024-2025
1	Course Code	ZOSE-04P	
2	Course Title	Evolutionary Biology	
3	Course Type	Discipline Specific Elective Lab Course	
4	Pre-requisite (if, any)	<i>As per Program</i>	
5	Course Learning Outcomes (CLO)	<p>After successfully completing lab course the students will be able to-</p> <ul style="list-style-type: none"> ➤ Understanding on the process evolutionary biology by the study of some animals. ➤ Learn the different interacting evolutionary process by various examples. ➤ Understand evolution through fossils Acquire an in-depth knowledge on the diversity and relationships in animal world through evolutionary process. 	
6	Credit Value	1 Credits	<i>Credit =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 learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	<ul style="list-style-type: none"> • Study of homology (forelimbs, heart, brain in vertebrates) through models and charts. • Study of Analogy (wings of insect, birds and bat) through models and charts. • Study of Serial homology in appendages of <i>Palaemon</i>. • Study of Virus, Euglena, Peripatus, Balanoglossus, Chimaera, Lung fish, Archeopteryx, and Echidna on the basis of Evolution (connecting link). • Study of adaptive radiations in vertebrates and mouth parts of insects. • Exercise based on Hardy-Weinberg Law. • Demonstration of role of natural selection and genetic drift in changing allele frequencies using simulation studies. • Construction of phylogenetic trees and its interpretation. • Phylogenetic tree of Man and Horse • Study of fossils from models/pictures • Preparation of Practical Record • Group Discussion/Quiz/Seminar/Project on related topics. 		
Keywords	<i>Evolution, Homology, Analogy, Phylogenetic tree, Adaptive radiation</i>		
Signature of Convener & Members (CBoS) :			

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

- Rastogi, Veerbala, Organic Evolution (2018). Third Revised Edition. MEDTECH.
- S.S. Lal, Practical Zoology, Invertebrate. 12th Edition Rastogi Publications, Meerut, New Delhi.
- A manual of practical Zoology. Dr. P.S Verma, S. Chand Publication, New Delhi

Reference Books Recommended –

- Ridley, M. (2004). Evolution. III Edition. Blackwell Publishing
- Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007).
- Evolution. Cold Spring, Harbour Laboratory Press.

Online Resources–

National Digital Library

- http://ndl.iitkgp.ac.in/he_document/libretexts/3d7e9973648c332bee5336b05c6cf84f

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:

(Handwritten signatures in blue ink)

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

PART- A: Introduction			
Program: Bachelor in Science <i>(Degree/Honors)</i>		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)	<p><i>On successful completion of the course, the student shall be able to:</i></p> <ul style="list-style-type: none"> ➤ 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	<p>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.</p> <p>Hypothalamic-Hypophysial 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.</p>		12
II	<p>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.</p> <p>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.</p>		11
III	<p>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</p>		11

Name and Signature of Convener & Members of CBoS:



	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
Key words	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:

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

PART- A: Introduction			
Program: Bachelor in Science <i>(Degree/ Honors)</i>		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)	<i>On successful completion of the course, the student shall be able to:</i> <ul style="list-style-type: none"> ➤ 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	<i>Credit =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 learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	<ul style="list-style-type: none"> ➤ 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		

Name and Signature of Convener & Members of CBoS:




PART-C: Learning Resources		
Text Books, Reference Books and Others		
Text Books Recommended –		
<ul style="list-style-type: none"> ➤ 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		
<ul style="list-style-type: none"> ➤ 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 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 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 <i>(Degree/Honors)</i>		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)	<p><i>On successful completion of the course, the student shall be able to:</i></p> <ul style="list-style-type: none"> ➤ 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	<p>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.</p> <p>Electron transport system in plants: Chemiosmotic theory, ATP synthase and mechanism of ATP synthesis.</p>		12
II	<p>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.</p>		11
III	<p>Special features of secondary plant metabolism, terpenes (classification, biosynthesis), lignin, tannins, pigments, phytochrome, waxes, alkaloids, biosynthesis of nicotine, functions of alkaloids, cell wall components.</p> <p>Toxins of plant origin – mycotoxins, phytohemagglutinins, lathrogens, nitriles, protease inhibitors, protein toxins.</p>		11
IV	<p>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.</p> <p>Antioxidative defense system in plants – reactive oxygen species and their generation, enzymic and non-enzymic components of antioxidative defense mechanism.</p>		11
Keywords	Electron transport, Nitrogen assimilation, secondary metabolites, Reactive oxygen species.		

Name and Signature of Convener & Members of CBoS:




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, 5thedition, 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: 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 <i>(Degree/Honors)</i>		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> <ul style="list-style-type: none"> ➤ 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	<i>Credit =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 learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment Contents of Course	<ul style="list-style-type: none"> ➤ 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:

PART-C: Learning Resources		
Text Books, Reference Books and Others		
Text Books Recommended –		
<ul style="list-style-type: none"> ➤ Buchann (2015), Biochemistry and Molecular Biology of Plants, 2nded. Publisher: I KInternational. ISBN-10: 8188237116, ISBN- 978047 0714218 ➤ Taiz and Zeiger, Plant Physiology, 5thedition, 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 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: