FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY
COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science *(Honors)*		**Semester - VII**	Session: **2024-2025**
1	**Course Code**	**BOSE-05 T**	
2	**Course Title**	**Biosystematics and Biodiversity**	
3	**Course Type**	**Discipline Specific elective (DSE)**	
4	**Pre-requisite** (if, any)	***As per program***	
5	**Course Learning. Outcomes (CLO)**	*At the end of the course, the students will be able :* ➢ Understand different classification and nomenclature system in botany. ➢ Learn plant collection and preservation techniques . ➢ Get knowledge about the biodiversity and its importance. ➢ Analyse the different conservation practices for nature.	
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	Definition and basic concepts of biosystematics taxonomy and classification. History and theories of biological Classification. Difference between botanical and zoological nomenclature system. Trends in biosystematics: Chemotaxonomy, cytotaxonomy and molecular taxonomy. Dimensions of speciation.	12
II	Taxonomic procedures: Taxonomic collections, preservation, process of identification. Taxonomic keys, different types of keys, their merits and demerits. How to use flora, Species concepts: Typological, Nominalist and Biological species concepts. Subspecies and other infra-specific categories.	11
III	Biodiversity : Concept and level, role of biodiversity in ecosystem, function and stability, speciation and extinction, IUCN categories of threat, distribution and global pattern, terrestrial biodiversity, hot spots. Plant biodiversity: Concept, status in India, utilization and concerns.	11
IV	Principle of Conservation: *In-situ* conservation: Strategies for In situ conservation, international efforts and Indian initiatives, protected areas in Indian sanctuaries, national parks, biosphere reserves, wetland, mangroves and coral reefs for conservation of wild biodiversity. Ex-situ Conservation: Strategies for *Ex- situ* conservation, Principles and practices, Botanical gardens, gene bank, seed in vitro repositories, cryo banks.	11
Keywords	***Chemotaxonomy, Cladogram, Biodiversity, Conservation.***	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Kochar, S. L. (1998) Economic Botany of The Tropics. McMillan India Ltd., New Delhi.
2. Paroda, R. S. and Arora R. K. (1991) Plant Genetic Resources and Conservation and Management IPGRI (publications). South Asia Office, c/o NBPGR, Pusa Campus, New Delhi.
3. Scheri, R. W. (1972) Plants for Man. Englewood Cliffs, New Jersey, Prentice Hall.
4. Annonymous (1997) National Gene Bank. Indian Heritage on Plant Genetic Resources (Booklet) NBPGER, New Delhi.
5. Swaminathan, M. S. And Kocchar (1989) Plants and Society, MacMillan Publication Ltd. London.
6. Kothari, A. (1997) Understanding Bio-Diversity: Life Sustainability and Equity. Orient Longam
7. Johri, B.M. (1984). Embryology of Angiosperms. Springer-Verlag, Berlin
8. Singh, G. (2012) Phant Systematics. Theory and Practice. Oxford & IBH Pvt. Ltd, New Delhi.
9. Bhojwani, SS. & Bhatnagar, SP (2011). Embryology of Angiosperms. Vikas Publication House Pvt. Lid. New Delhi 5 edition
10. Mauseth. 1.1) (1988) Plant Anatomy. The Benjamin Cummings Publisher. USA
11. Pandey, B. P. (LatesEdt), Plant Anatomy
12. Maheshwari, J.K. (1963). Flora of Delhi. CSIR, New Delhi.
13. Saxena N.B. and Saxena S. (2012). Plant Taxonomy Pragati Prakashan.
14. Sharma O.P. (2013). Plant Taxonomy. MC GRAW HILL INDIA.
15. Sharma, M.K. (2013) Plant Structures (An Introduction to Plant Anatomy). VayuEducation of India.
16. Chopra G.L. (2005) Angiosperm, Pradeep Publication, Jalandhar.

Reference Books Recommended –

1. Rogers, P.P., Jalal, K.F. and Boyd, J.A. (2008). An Introduction to Sustainable Development. Prentice Hall of India Private Limited, New Delhi.
2. Radford, A.E. (1986). Fundamentals of Plant Systematics. Harper and Row, New York
3. Jeffrey, C. (1982). An Introduction to Plant Taxonomy. Cambridge University Press,Cambridge.
4. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. (2002). Plant Systematics-APhylogenetic Approach. Sinauer Associates Inc., U.S.A. 2 nd edition.
5. Simpson, M.G. (2006) Plant Systematics. Elsevier Academic Press, San Diego, CA, USA
6. Beck, C.B. (2010). An Introduction to Plant Structure and Development, II edition.
7. Heywood, V. (1995) Global Bio-Diversity Assessment, UNEP. Cambridge Univ. Press, Cambridge, U.K.
8. Heywood, V.H. and Wyse Jackson, P. S. (1991) Tropical Botanical Garden: Their Role in Conservation and Developinent. Academic Press, San Digo.
9. Barker, H. G. (1978) Plant and Civilization. C. A. Wadsworth, Belmont.
10. Frankel, O. H., Brown, A. H. D. and Burdon, J. J., (1995) Conservation, of Plant Diversity. Cambridge Univ. Press, Cambridge, U. K.
11. Pinstrup- Anderson, P. Et Al (1999) World Food Prospects; Critical Issues for Early 21st Century. International Food Policy Research Institute, Washington D. C. USA.
12. Rogers, N. A. And Panwar, H. S. (1998) Planning A Wild Life Protected Area Network In India Vol. I The Report, Wildlife Institute Of India, Dehradun.

Online Resources–

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

- **https://www.sciencedirect.com/topics/social-sciences/natural-resource**
- **https://efaidnbmnnnibpcajpcglclefindmkaj/https://egyankosh.ac.in/bitstream/123456789/66166/2/Unit4.pdf**
- **https://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ers.usda.gov/webdocs/publications/41964/30289_biological.pdf?v=0#:~:text=16-,What%20Are%20Biological%20Resources%3F,forests%2C%20and%20other%20natural%20lands.**
- http://surl.li/spcdd
- https://shorturl.at/ewyIP
- https://shorturl.at/cimoF

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**
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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** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE): 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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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science *(Honours)*		**Semester - VII**	Session: **2024-2025**
1	**Course Code**	**BOSE-05 P**	
2	**Course Title**	**Lab course -05 (Biosystematics and Biodiversity)**	
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: ➢ Understand collection and preservation techniques for plants. ➢ Learn use of flora for plant identification. ➢ Understand about protected area of the country ➢ Analyze various IUCN categories of threats.	
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	• Herbarium technique. • Non destructive collection of plants • Preservation techniques for plants part . • Prepration of taxonomic keys • How to use flora and digital flora for plant identification. • Use of flora for identification of plants of college campus. • Cladogram and dendrogram • Visit of any botanical garden , national park/wildlife sanctuary/ protected area. • Learn about IUCN categories of threats. 1) Evaluation of alfa, beta and gama biodiversitiy of college campus..	**30**
Keywords	***Herbarium, Flora, Protected area, IUCN categories.***	
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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Kothari, A. (1997) Understanding Bio-Diversity: Life Sustainability and Equity. Orient Longam
2. Singh, G. (2012) Phant Systematics. Theory and Practice. Oxford & IBH Pvt. Ltd, New Delhi.
3. Maheshwari, J.K. (1963). Flora of Delhi. CSIR, New Delhi.

Reference Books Recommended –

1. . flora of India by Botanical Survey of India
2. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. (2002). Plant Systematics-APhylogenetic Approach. Sinauer Associates Inc., U.S.A. 2 nd edition.
3. Simpson, M.G. (2006) Plant Systematics. Elsevier Academic Press, San Diego, CA, USA

Online Resources–

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

- https://www.worldfloraonline.org/
- https://bsi.gov.in/page/en/digital-resources
- https://indiaflora-ces.iisc.ac.in/FloraPeninsular/
- http://www.efloras.org/
- https://creately.com/guides/what-is-a-dichotomous key/herpsteppp.inflibort.ac.in/Home/VirwSubject?catid=1pBOY7YTBCLSD2K
- https://eppp.inflibert.ac.in/Home/ViewSubjectPratid-10OYJVTRCLSDKUBW
- . httpssivproinflibnet.ac.in/Home/View Subject catid-1pbbyZY1BCS02E
- https://www.amazon.in/Plant-Taxonomy-past-present-future-chook/dp/B016021014
- https://www.instructables.com/How-to-Make-a-Cladogram/
- file:///C:/Users/user/Downloads/ajol-file-journals_452_articles_122070_submission_proof_122070-5365-335203-1-10-20150914%20(1).pdf

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**

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Life Science *(Honors)*			**Semester - VII**	Session: **2024-2025**
1	**Course Code**	**BOSE-06 T**		
2	**Course Title**	**Plant breeding and Seed technology**		
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 ➢ Gain knowledge and comprehension of the breeding systems ➢ knowledge of reproductive biology in angiosperms to address real-world challenges related to plant breeding, crop production, and conservation. provide students with a comprehensive understanding of plant breeding principles and techniques.		
6	**Credit Value**	**3 Credits**	***Credit = 15 Hours - learning & Observation***	
7	**Total Marks**	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

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

Unit	Topics (Course contents)	No. of Period
I	**Plant breeding**: Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding.	12
II	**Methods of crop improvement:** Introduction: Centers of origin and domestication of crop plants, plant genetic resources;Acclimatization; Selection methods: For self pollinated, cross pollinated and vegetativelypropagated plants; Hybridization: For self, cross and vegetatively propagated plants – Procedure, advantages and limitations. Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.	11
III	**Breeding Methods for Stress Resistance:** Breeding for drought, salinity, heat, cold, disease and insect resistance, breeding forprotein and oil quality. Heterosis and inbreeding depression, hybrid and synthetic varieties.Hardy-Weinberg law, systems of mating.	11
IV	**Seed Technology**: Principle & Concept of Seed Technology. Quality seeds, Indian seed act. Classes of quality seeds - breeder, foundation, registered and certified seeds, operations essential for seed production, seed processing, certification and maintenance storage of improved seeds, seed productions organizations- national and state seed corporations and private seed companies. Artificial seeds, terminator seeds.	11
Keywords	**Breeding,Heterosis, Self incompatibility, Hybridization.**	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Plant breeding by B.D Singh.
2. BD Singh (2003) Plant Breeding. Kalyani Publishers
3. PLANT BREEDING: PRINCIPLE AND METHODS B D SINGH - IN HINDI
4. Sharma JR (1994) Principles and Practices of Plant Breeding. Tata McGraw-Hill Pub. Co. New Delhi.
5. Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding. Oxford – IBH.
6. Acquaah, G. (2007). Principles of Plant Genetics & Breeding. Blackwell Publishing.
7. Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.

Reference Books Recommended –

1. Allard (1960) Principles of Plant Breeding. John Wikkey and Sons, Inc. New York.
2. Hayes, Immer and Smith (1955) Methods of Plant Breeding, MacGraw- Hil Book Co. Inc. New York.
3. Jonossy and Lupton (1976) Heaterosis in Plant Breeding. Elsevier, Amsterdam.
4. Poehlman and Borthakur (1969) Breeding Asian Field Crops With Special Reference To Crops I India. Oxford and IBH Publishing Company, New Delhi.

Online Resources–

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

1. **https://chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://courseware.cutm.ac.in/wp-content/uploads/2020/05/Download-Notes-8.pdf**
2. **https://chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://www.eagri.org/eagri50/GBPR211/lec16.pdf**
3. **https://efaidnbmnnnibpcajpcglclefindmkaj/http://www.eagri.org/eagri50/GBPR211/lec16.pdf**
4. **https://www.sciencelearn.org.nz/resources/77-pollination-and-fertilisation**
5. **https://www.crops.org/about-crops/seed-technology#:~:text=What%20is%20seed%20technology%3F,that%20people%20and%20livestock%20eat.**
6. **https://plantbreeding2010.blogspot.com/2020/12/seed-and-seed-technology-introduction.html**
7. **https://www.nature.com/articles/s41477-018-0309-4**

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** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE): 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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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Life Science *(Honors)*			**Semester - VII**	Session: **2024-2025**
1	**Course Code**	**BOSE-06 P**		
2	**Course Title**	**Lab. Course- 06 (Plant breeding and Seed Technology)**		
3	**Course Type**	**Laboratory course**		
4	**Pre-requisite** (if, any)	***As per program***		
5	**Course Learning. Outcomes (CLO)**	At the end of the course students will be - ➢ Idea of seeds which carries a new generation. ➢ Knowledge of plant breeding techniques. ➢ Knowledge of breeding methods for stress tolerance. ➢ Idea of seed processing and certification of seeds.		
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. Study of seed parts 2. Collection of different types of mature seeds 3. Techniques of hybridization- Emasculation. 4. Techniques of hybridization - Bagging and tagging. 5. Study of vegetatively grown plants part of your locality 6. Collection of seeds of different varieties of locally grown crops. 7. Inter-varietal cross in an ornamental plant. 8. Visit to state and national seed corporation companies and prepare a report.	**30**
Keywords	Seed, Emasculation, Bagging and tagging.	

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PART–C: Learning Resources

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Text Books, Reference Books and Others
Text Books Recommended – 1. Allard (1960) Principles of Plant Breeding. John Wikkey and Sons, Inc. New York. 2. Hayes, Immer and Smith (1955) Methods of Plant Breeding, MacGraw- Hil Book Co. Inc. New York. 3. Plant breeding by B.D Singh ***Reference Books Recommended –*** 1. Jonossy and Lupton (1976) Heaterosis in Plant Breeding. Elsevier, Amsterdam. 2. Poehlman and Borthakur (1969) Breeding Asian Field Crops With Special Reference To Crops I India. Oxford and IBH Publishing Company, New Delhi.
Online Resources– ➢ **e-Resources / e-books and e-learning portals** ➢ **https://www.merriam-webster.com/dictionary/emasculate** ➢ **https://agritech.tnau.ac.in/crop_improvement/crop_imprv_emasculation_cereals.html** ➢ **https://www.toppr.com/guides/biology/reproduction-in-organisms/vegetative-propagation/#:~:text=Vegetative%20Propagation%20by%20Roots,example%2C%20Sweet%20potato%20and%20Dahlia.**
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**

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY
COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Life Science *(Honors)*			**Semester - VII**	Session: **2024-2025**
1	**Course Code**	**BOSE-07 T**		
2	**Course Title**	**Instrumentation and biochemical technology**		
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 ➢ Develop a solid understanding of different analytical methods and instruments used in plant sciences. ➢ Acquire practical skills in sample preparation, data collection, and data analysis using analytical techniques. ➢ Understand the working principles of important instrumentation tools. ➢ Understand modern technologies in the field of Biochemistry		
6	**Credit Value**	**3 Credits**	***Credit = 15 Hours - learning & Observation***	
7	**Total Marks**	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

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

Unit	Topics (Course contents)	No. of Period
I	• Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; • Use of fluorochromes in : (a) Flow cytometry (b) fluorescence microscopy: for Chromosome banding • Phase contrast, electron, scanning and transmission electron microscopy, • Single and double staining techniques for light microscopy for temporary and permanent slides • Stain techniques: Single and double staining.	12
II	Instruments: Salient features, Principle and applications. • Autoclave, • Oven, • Laminar air flow, • Centrifuge. • Colorimetry • Spectrophotometry, • Fermenters., • Water bath, • pH meter	11
III	• Chromatography: Principle and its application in biological research: Paper chromatography, Column chromatography, Affinity chromatography, TLC, GLC, HPLC. • Electrophoresis: AGE, PAGE, SDS-PAGE. • Radioisotopes: Principles and its application in biological research. • ELISA test	11
IV	Biochemical Technology, Biofuel, CRISPR Technology Genetic Engineering, Vaccine, Biodegradable plastics Gene Therapy, DNA fingerprinting, GMO food, Pest resistant crops.	11
Keywords	Microscope, biochemical technology	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. **Bioinstrumentation by L. VEERAKUMARI**

Reference Books Recommended –

1. **Biological Instrumentation & Methodology by Bajpai P. K.**

Online Resources–

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

1. **https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMB2103.pdf**
2. **https://cbpbu.ac.in/userfiles/file/2020/STUDY_MAT/ZOO/PK%20(4).pdf**
3. **https://kanchiuniv.ac.in/coursematerials/Biomedical%20instrumentation.pdf**

Online Resources–

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- **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**
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End Semester Exam (ESE):	**70 Marks**

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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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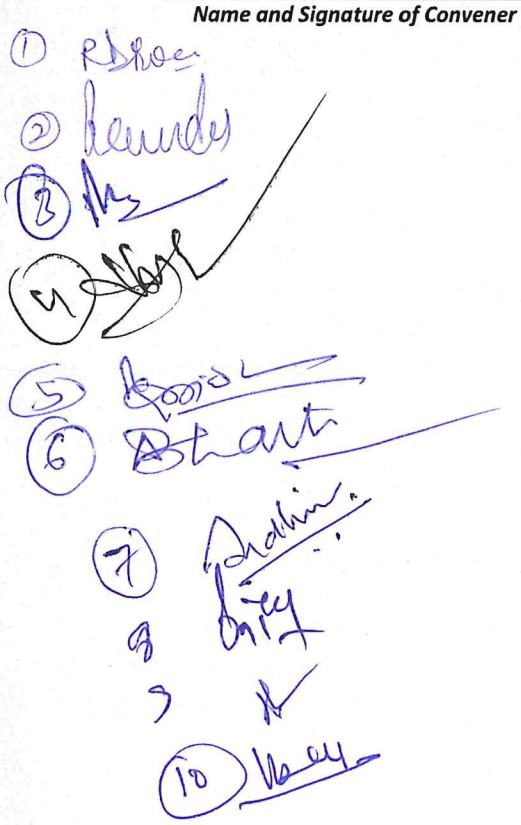

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Life Science *(Honors)*			**Semester - VII**	Session: **2024-2025**
1	**Course Code**	**BOSE-07 P**		
2	**Course Title**	**Lab. course -07(Instrumentation and Biochemical Technology)**		
3	**Course Type**	**Laboratory course**		
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 get. ➢ Knowledge about Bio Instruments. ➢ Understand different parameters of instrumentation. ➢ Operation and handing of latest equipments		
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. Calibration of microscope. 2. Handling of microscope and other instruments. 3. Safety measures in laboratory 4. Principle and application of microscope 5. Principle and application of laboratory instruments-Autoclave, Oven, Laminar air flow,Centrifuge. Colorimetry and Spectrophotometry, Water bath,pH meter 6. Concept of pH and buffer formation 7. Separation of chlorophyll pigment by paper chromatography 8. Separation of chlorophyll pigment by thin layer chromatography (TLC) 9. Study of amino acid and calculation of Rf values bypaper chromatography. 10. SDS -PAGE analysis of proteins 11. Quantitative analysis of DNA using colorimeter 12. Preparation of different types of solutions normal,molal and molar. 13. Visit to a nearby well equipped Scientific lab and prepare report.	**30**
Keywords	microscope,pH,chromatography,solutions,Rf	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

–

1. ExperimentsInMicrobiology,PlantPathologyAndBiotechnologyByK.R.Aneja.Publisher New Age International

Reference book recommended

1. Bioinstrumentation: Research, Development and Applications Hardcover Import,31July 1990 by Donald L. Wise

Online Resources–

- **e-Resources / e-books and e-learning portals**
  1. https://www.lumentum.com/en/commercial-lasers/applications/biomedical-and-analytics-instrumentation
  2. **https://www.rgcb.res.in/instraining**
  3. **https://https://admin/uploads/3/PG_M.Sc._Botony_34631%20MICROBIOLOGY%20AND%20PLANT%20PATHOLOGY.pdf**

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

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DEPARTMENT OF BOTANY
COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Life Science *(Honors)*		**Semester - VII**	Session: **2024-2025**	
1	**Course Code**	**BOSE -08 T**		
2	**Course Title**	**Growth and Stress Physiology**		
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 1. understand the role of Physiological and metabolic processes for plant growth and development under stress. 2. Assimilate about biochemical constitution of plant diversity. 3. Get acquired the students with complex interaction between organism and environment 4. Understand about the role of hormones in plant development.		
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	**PlantGrowth and Phytohormone** ➢ Plant growth curve,sigmoid and J shaped growth.Lag,Log and steady stage. Developmental roles of phytohormones ➢ Auxins, ➢ Gibberellins, ➢ Cytokinins, ➢ ABA, ➢ Ethylene,	12
II	**Movements, Dormancy & Responses** ➢ Photoperiodism (SDP, LDP, Day neutral plants); ➢ Phytochrome (discovery,structure and functions), ➢ Seedand bud Dormancy causes and breaking, ➢ Vernalization ➢ Senescence, ➢ Plant movements	11
III	**Planteco-physiologyand Stress Physiology:** ➢ Concept of Planteco-physiology. ➢ Plant perception, ➢ physiology of ecological considerations. ❖ Hydrophytic, xerophytic morphological and anatomical adaptations in plants	11
IV	**StressPhysiology:** Plant responses to biotic and abiotic stress, mechanism of biotic and abiotic tolerance, HR (Hypersensitive Response) and SAR Systemic Acquired Resistance), water deficit and ❖ Drought resistance, ❖ Salinity stress, ❖ metal toxicity, ❖ freezing and heat stress, ❖ oxidative stress.	11
Keywords	Growth, Phytohormone, Eco-physiology, Vernalization.	

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PART–C: Learning Resources

Text Books, Reference Books and Others

TextBooksRecommended-

1. Galston,A.W.,(1989)LifeProcessesinPlants,ScientificAmericanLibrary.Springer-Verlag,NewYork, USA.
2. Hopkins,W.G.,(1995)IntroductiontoPlantPhysiology,JohnWilleyandSons,Inc.NewYork,USA.
3. Salisbury,F.B.andRoss,C.W.,(1992)PlantPhysiology.WadsworthPublishingCo.,California,USA.
4. Denis,D.T.,Turpin,D.H.Lefebvre,D.D.&Layzell,D.B.(1997)PlantMetabolism.Longaman,Essex, England.

Reference Books Recommended –

1, Taiz,L.andZeiger,E.((1998) Plant Physiology.SinaverAssociations,Inc.Pub.,Masssachusetts, USA.
2. 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://link.springer.com/book/10.1007/978-3-030-78420-1
  https://uou.ac.in/sites/default/files/slm/MSCBOT-601.pdf
  https://www.researchgate.net/publication/347908867_Stress_Physiology_in_Plants
- **https://www.esalq.usp.br/lepse/imgs/conteudo_thumb/Plant-stress-physiology.pdf**

Online Resources–

- **e-Resources / e-books and e-learning portals**
- **www.swayam.ac.in**
- **www.ignou.ac.in**
- **www.egyankosh.ac.in**
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- **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):70 (By Course Teacher)	Internal Test / Quiz-(2): **20 +20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz **+** obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE): 30	**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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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Life Science *(Honors)*			**Semester - VII**	Session: **2024-2025**
1	**Course Code**	**BOSE-08 P**		
2	**Course Title**	**Lab. Course -08 (Growth and stress physiology)**		
3	**Course Type**	**Laboratory course**		
4	**Pre-requisite** (if, any)	***As per program***		
5	**Course Learning. Outcomes (CLO)**	After the completion of the course the students will be able to: 1. Understandthe role of Physiological and metabolic processes for plant growth and development under stress. 2. Assimilate about biochemical constitution of plant diversity 3. Effect of phytohormones on plants. 4. Understand different physiological processes of plants.		
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. *Avena* curvature test of Auxin. 2. Expression of bolting in cabbage. 3. Induction of lateral branches by cytokinin. 4. Demonstration of plasmolysis and deplasmolysis in plant cell. 5. Potato osmoscope for osmosis. 6. Demonstration of transpiration. 7. Measurement of transpiration rate by Farmers/ Ganong's potometer. 8. Extraction of seed proteins depending upon solubility. 9. Fractionation of proteins using gel filtration chromatography 10. Principle of colorimetry, spectrophotometry and fluorimetry.	**30**
Keywords	***Bolting, chlorophyll, osmosis, chromatography.***	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Practical Plant Physiology Hardcover – 1 January 2015 by R. Sivakumar, Narendra Publishing
2. PRACTICALS IN PLANT PHYSIOLOGY AND BIOCHEMISTRY MANJU BALA, SUNITA GUPTA, N.K GUPTA & M.K. SANGHA Scientific Publishers
3. A Practical Manual on Fundamentals of Plant Physiology Paperback – 16 September 2022 by R. K. Samaiya Subrata Sharma, Gyanendra Tiwari, R. Shivraj krishnan, Sunil Pandey, Preeti Sagar Nayak (Author) BFC PUBLICATIONS PVT LTD

Reference Books Recommended –

1. **Practical Manual Experimental Plant Physiology and Biochemistry Manual** Paperback – 1 January 2023 by Rajesh Kumar Asok Kumar Bera, Bandana Bose (Author) Publisher- Science Technology

Online Resources–

- **e-Resources / e-books and e-learning portals**
- **https://www.britannica.com/science/transpiration**
- **https://www.frontiersin.org/articles/10.3389/fagro.2022.765068/full**
- **https://www.sciencedirect.com/science/article/abs/pii/S0176161796802872**

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): 35 **(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): 15	**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**

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science *(Honors)*		**Semester -VIII**	Session: **2024-2025**
1	**Course Code**	**BOSE -09 T**	
2	**Course Title**	**Plant Biotechnology and Crop Improvement**	
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 ➢ The basic concept,scope and significance of Biotechnology. ➢ Micropropagation using meristem and shoot cultureto produce large number of identical individuals. ➢ The role of biotechnology in crop improvement. ➢ Various applications of Biotechnology in different fields.	
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	**Fundamentals of Biotechnology:** Basic concepts, principles and scope. **Plant Cell and Tissue Culture:** General concept, history, scope, totipotency, concept of cellular differentiation, tissue culture media and explants. Applications of Plant Biotechnology.	12
II	**Organogenesis and Embryogenesis:** Concept of morphogenesis, organogenesis and embryogenesis; Fundamental aspects of organogenesis in plant tissue culture, factors influencing organogenesis; somatic embryogenesis and androgenesis - mechanism, techniques and utility.	11
III	**Somatic Hybridization:** Concept of somatic fusion and hybridization; Protoplast isolation, fusion and culture, hybrid selection and regeneration; progress, possibilities, achievements and limitations of protoplast research.	11
IV	**Application of Plant Tissue Culture in crop improvement:** Clonal propagation, artificial seed, production of hybrids and soma clones, Soma clonal variation – cause & advantages and its application in crop improvement; production of secondary metabolites / natural products, cryopreservation and germplasm storage.	11 (11Hr))
Keywords	Biotechnology, Tissue Culture, Crop improvement, Clonal propagation	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Bhojwani, S. S and Razdan, N.K. (1996) Plant Tissue Culture: Theory and Practice, Elsevier Science Publishers, New York, USA
2. .Kartha, K.K. (1985) Cryopreservation of Plant Cells and Organs. CRC Press, Boca Raton, Florida, USA.
3. Vasil, I. K. and Thorbe, T. A. (1994) Plant Cell and Tissue Culture. Kluwer Academic Publishers, Netherlands.

Reference Books Recommended –

1. Smith, R. H. (2000) Plant Tissue Culture; Techniques and Experiments, Academic Press,New York.
2. Collins, H.A. and Edwards, S. (1998) Plant Cell Culture, Bios. Scientific Publisher Oxford, U.K.

Online Resources–

- **e-Resources / e-books and e-learning portals**
- **https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/plant-biotechnology#:~:text=Plant%20Tissue%20Culture%2DBased%20Industries&text=Plant%20tissue%20culture%20in%20agricultural,into%20next%20step%20of%20commercialization.**
- **https://www.nifa.usda.gov/grants/programs/biotechnology-programs/plant-biotechnology**
- **https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-022-00369-2**
-

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** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE): 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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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Life Science *(Honors)*			**Semester - VIII**	Session: **2024-2025**
1	**Course Code**	**BOSE-09 P**		
2	**Course Title**	**Lab. Course -09 (Plant biotechnology and crop improvement)**		
3	**Course Type**	**Laboratory course**		
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 understand- ➢ The basic techniques of Plant Tissue Culture. ➢ Screening programmes of cells, rather than plants, for advantageous characters. ➢ The biochemical and physiological aspects of plant growth. ➢ How to explore entrepreneurship avenues in this field.		
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. Familiarization with basic equipments in tissue culture. 2. Preparation of tissue culture (MS) medium. 3. Study of techniques of tissue culture: sterilization of glass wares and plant materials, transfer of explants on culture media, incubation.Up to callus formation 4. Initiation of organogenesis and embryogenesis using appropriate explants. 5. Isolation of plant protoplast by mechanical and enzymatic method 6. Test of viability by tetrazolium chloride (TZ) method. 7. Counting of protoplast in the suspension by haemocytometre method 8. Effect of physical and chemical factors in protoplast yield. 9. Demonstration of protoplast fusion employing PEG. 10. Visit to any tissue culture lab of your locality and a prepare project report.	**30**
Keywords	Medium, protoplast, tissue culture, TZ	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. "Plant Tissue and Organ Culture fundamental Methods" by Gamburg OL and Philips GC, Publisher – Springer- verlag Heidelberg GmbH & Co. K
2. Practical Biotechnology by Ramadass Jaypee Brothers Medical Publishers

Reference Books Recommended

1. Biotechnology : fundamental and application by Ashok Ganguli, Publisher- Oxford book company

Online Resources–

- **e-Resources / e-books and e-learning portals**
- **https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/plant-biotechnology#:~:text=Plant%20Tissue%20Culture%2DBased%20Industries&text=Plant%20tissue%20culture%20in%20agricultural,into%20next%20step%20of%20commercialization.**
- **https://www.nifa.usda.gov/grants/programs/biotechnology-programs/plant-biotechnology**
- **https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-022-00369-2**

Online Resources–

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- **www.swayam.ac.in**
- **www.ignou.ac.in**
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- **www.iitm.ac.in**
- **www.eskillindia.org**
- **www.eshiksha.mp.gov.in**
- **www.vlab.co.in**
- **www.internshala.com**
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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

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction			
Program: Bachelor in Life Science *(Honors)*		**Semester - VIII**	Session: **2024-2025**
1	**Course Code**	**BOSE -10 T**	
2	**Course Title**	**Applied Botany and Intellectual property right (IPR)**	
3	**Course Type**	**Discipline specific Elective (DSE)**	
4	**Pre-requisite** (if, any)	***As per program***	
5	**Course Learning. Outcomes (CLO)**	At the end of the course,the students will be able to: ➢ Understand the scope and importance of Social forestry and establishment of orchard. ➢Learn silvics of some important timber plants of India. ➢Learn post-harves tmanagement,marketing and value additionof commercial ornamental plants. ➢ Develop a deep understanding of different forms of intellectual property Rights (IPR)	
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	**Social forestry**: Introduction, Definition, scope and objectives of social forestry. Classification of social forestry, Economic importance of social forestry, important scheme, choice of species for reclamation of waste land, over damp area, saline and alkaline area .**Layout and Establishment of Orchards**:Pruning and training; propagation, Climatic requirement and cultivation ffruits likeMango,Banana,Citrus, Guava.	12
II	**Sliviculture:**Definition,objective and scope of silviculture. Status of forest in India and their role.Trees and their distinguishing features.Regeneration:Natural,artificial and factors Affecting it.Regeneration Survey.Tending operation:Weeding,cleaning,thinning and improvement felling. Silivcs of important forest tree species e.g. Teak, Shorea, Sheesam .	11
III	**Floriculture;**History of Floriculture. Importance and scope of floriculture in India. Flower production –water and nutrient management, weed management, thinning and pruning, disbudding, use of growth regulators, physiological disorders and remedies,Harvesting techniques,post-harvest handling, pre-cooling,pulsing,packing, storage & transportation. Prolonging the vase life of flowers. Marketing and export potential of flowers, institutional support.	11
IV	IPR: Definition and significance of intellectual propertyrights(IPR), Overview of different types of IPR,including patents and it's filingprocess, copyrights, trademarks their registration and infringement, trade secrets,Historical development and international frame works forprotecting IPR,Salient feature of Patent Act 1970.	11
Keywords	***Social forestry, Orchard, Harvesting technique,Trademark***	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended–

1. S, S, Negi: Social forestry
2. S.A.Shah & K .M .Tiwari: Forestry and people
3. G.P.D.Vyas: Social forestry and rural development
4. Jyoti Rattan 2024.Intellectual Property Rights

Reference Books Recommended –

1. Khanna,L.S.(1984).Principles and Practice of Silviculture,Khanna Bhandu,DehraDun.
2. Ram Prakash and L.S.Khanna.(1991)Theory and Practice of Silvicultural systems. International Book Distributors, Dehra Dun.
3. Champman ,G.W.and Allan,T.G.(1978).Establishment Techniques for Forest Plantation F.A.O Forestry Paper No.8. F.A.O Rome.
4. Anonymous.(1976)Indian forest utilization.Volume Iand III CFRE Publication,Dehradun.
5. Mehta,T.(1981)A hand book of forest utilization.Periodical Expert Book Agency,Delhi.298

OnlineResources –

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

www.ipindia.gov.in

www.wipo.int/aboutip/en/

www.india.gov.in /topics/agriculture/floriculture

littps://byjus.com/free-ias-prep/ipr-in-india-upsc notes/

https://vikaspedia.in/agriculture/farm-based-enterprises/floriculture

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** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE): 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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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Life Science *(Honors)*			**Semester - VIII**	Session: **2024-2025**
1	**Course Code**	**BOSE-10 P**		
2	**Course Title**	**Lab. Course -10 (Applied Botany and Intellectual Property Rights)**		
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: ➢ Understand forest structure and composition. ➢ Get knowledge about phenology of various species. ➢ Learn nursery bed preparation technique. ➢ Analyze the density and moisture content of wood.		
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	• Study of forest composition. • Recording the observations on phenological characteristics of different tree species. • Study of the natural and artificial regeneration. • Lay outing of nursery bed and soil preparation, types of seed sowing in nursery bed. • Study of gross features of different types of wood; straight interlocked, spiral and wavy grain, texture, lusture, etc. • Study ofcharacteristics of trees/shrubs/grasses for agroforestry. • Volume and biomass estimation. • Crown measurement. • Study of vase life extension in cut flower using chemicals. • Study and description of botanical features of floricultural plants studied in theory paper. • Drafting a patent application: Students can learn how to draft a patent application for a new invention . • Trademark registration process: Students can learn how to register a trademark in India.	**30**
Keywords	***Phenological, Wood grain,Nnursery bed, Regeneration***	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Chundawat D S and Gautam SK (2010) Textbook of agroforestry. Oxford and IBH publishing co pvt. Ltd.
2. . Nair, P.K.R. (1993) An introduction to agroforestry. Kluwer Academic Publishers. 499 p. 4. Huxley, P. (1999) Tropical agroforestry. Blackwell Science, Oxford.
3. Khosla, P.K. and Khurana, D.K. (1987) Agroforestry for rural needs. Vol. I and II, ISTS, Solan, H.P.
4. Ong, C.K. and Huxley, P.K. (1996) Tree crop interactions - A physiological approach. ICRAF, Kenya.
5. . Ramakrishnan, P.S. (1992) Shifting agriculture and sustainable development. Man and biosphere series. The Parthenon Publishing Group.
6. . SenSarma, P.K. and Jha, L.K. (1993) Agroforestry. Indian Perspectives. Ashish Publishers, Delhi.5. Khanna, L. S. (1984). Principles and Practice of Silviculture, KhannaBhandu, Dehra Dun.
7. 7 . Ram Prakash and L.S. Khanna. (1991) Theory and Practice of Silvicultural systems. International Book Distributors, Dehra Dun.

Reference Books Recommended –

1. Champman, G.W. and Allan, T.G. (1978). Establishment Techniques for Forest Plantation F.A.O Forestry Paper No.8. F.A.O Rome.
2. Anonymous. (1976) Indian forest utilization. Volume I and II ICFRE Publication, Dehradun.
3. Mehta, T.(1981) A handbook of forest utilization. Periodical Expert Book Agency, Delhi. 298
4. "Floriculture Principles and Species" by Dhiman Mukherjee
5. "Floriculture in India" by Jyotsna Singh and Ramesh Chandra
6. "Floriculture: A Basic Guide" by K.V. Peter
7. "Handbook of Flowering" by Jitendra Kumar
8. "Commercial Floriculture: Principles and Practices" by A.P. Misra and V.P. Singh
9. Intellectual Property Rights and Biotechnology by Shashikala Gurpur and Sreenivasulu N.S.
10. Intellectual Property Rights and Plant Biotechnology by Ramanujam Srinivasan
11. Intellectual Property Rights: An Overview by Arul George Scaria

Online Resources–

- **e-Resources / e-books and e-learning portals**
- https://ipindia.gov.in/form-and-fees.htm
- https://www.indiafilings.com/trademark-registration?matchtype=e&device
- https://www.youtube.com/watch?v=S7F6bCRBUDg&t=111s
- https://www.youtube.com/watch?v=SrWcYWzJJJ8
- https://www.youtube.com/watch?v=tYysC0dwtU0
- https://www.youtube.com/watch?v=U5_nynPVdTY
- https://www.youtube.com/watch?v=7faqx7N-pS4
- https://www.youtube.com/watch?v=AQdEXkVFGEw
- https://www.youtube.com/watch?v=uDWilCvc3lQ

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

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Life Science *(Honors)*			**Semester - VIII**	Session: **2024-2025**
1	**Course Code**	**BOSE -11 T**		
2	**Course Title**	**Biochemistry and Enzymology**		
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 ➢ Basic idea of life building block biomolecules. ➢ Energy status of the cell ➢ Basic carbohydrates, lipids and proteins structure ➢ Biocatalyst enzymes		
6	**Credit Value**	**3 Credits**	***Credit = 15 Hours - learning & Observation***	
7	**Total Marks**	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

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

Unit	Topics (Course contents)	No. of Period
I	• Structure of atoms, molecules and chemical bonds. • Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.). • Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties).. • Composition, structure and function of biomolecules (carbohydrates,).	12
II	• Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers. • Principles of thermodynamics, free energy and chemical potential, redox reactions, structure and function of ATP.	11
III	• Lipids : structure and function, alpha and beta oxidation and anabolism. • Nucleic acids : DNA, RNA, Conformation of nucleic acids (helix (A, B,C, Z), t-RNA, mRNA, rRNA, HnRNA micro-RNA).hoogestein bridge, hairpin DNA	11
IV	• Proteins- amino acids, primary, secondary, tertiary and quaternary structure. Conformation of proteins (Ramachandran plot, secondary structure, domains, motif and folds). • Fundamentals of Enzymology: General aspect, classification, nature of enzymes, mode of enzyme action, allosteric mechanism, feedback method of inhibition, regulatory and active sites, isoenzymes, Ribozyme,Abzymes, kinetics of enzymatic catalysis, Michaelis – Menton equation and its significance.	11
Keywords	reaction kinetics, inhibition. active sites, Conformation, ATP	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books recommended:

1. Galaston, A. W., (1989) Life Processes in Plants. Scientific American Library, Springer- Verlag, New York, USA.
2. Hopkins, W. G. (1995) Introduction to Plant Physiology John Willey and Sons, Inc. New York, USA.
3. Dennis D. T., Turpin, D. H., Lefebvre D. D. and Layzell, D. B. (1997) Plant Metabolism. Longman, Essex, England.
4. Moore, T. C. (1989) Biochemistry and Physiology of Plant Hormone. Springer Verlog, New York.
5. Nobel, P. S. (1999) Physiochemical and Environmental Plant Physiology. Academic Press, San Diego, USA.
6. Thomas, B. and Vince-Prue(1997) Photoperiodism in Plants. Academic Press; San Diego, USA.

Reference Books Recommended-

1. Taiz, L. and Zeiger, E., (1989) Plant Physiology. Sinaver Associations, Inc. Publishers, Masssachusetts, USA.
2. Salisbury F. B. and Ross, C. W., (1992) Plant Physiology Wadsworth Publishing Co., California, USA
3. Lehninger : Principles Of Biochemistry by David L Nelson, Michael M Cox 2021

Online Resources–

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

1. **https://www.mdpi.com/journal/biomolecules**
2. **https://www.news-medical.net/life-sciences/An-Overview-of-Enzymology.aspx#:~:text=Enzymology%20is%20the%20study%20of,products%20controlled%20by%20equilibrium%20properties.**
3. **https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/06%3A_Metabolism/6.02%3A_Energy_and_Metabolism_-_Types_of_Energy**
4. **https://www.thoughtco.com/dna-versus-rna-608191**

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** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE): 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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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Life Science *(Honors)*		**Semester -VIII**	Session: **2024-2025**	
1	**Course Code**	**BOSE -11 P**		
2	**Course Title**	**Lab. Course -11 P (Biochemistry and enzymology)**		
3	**Course Type**	**Laboratory course**		
4	**Pre-requisite** (if, any)	***As per program***		
5	**Course Learning. Outcomes (CLO)**	➢ Students will be familiar with the common biobuilding block ➢ Biochemical analysis of common biomolecules ➢ Enzyme kinetics and its role ➢ Characterization of light harvesting molecule chlorophyll.		
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) Biochemical test of carbohydrates, sucrose, glucose proteins, lipids 2) Biochemical test of Catalase, dehydrogenase, peroxidase test 3) Preparation of chlorophyll extract 4) Separation of chlorophyll by paper chromatography. 5) Separation of chlorophyll amino acids by paper chromatography. 6) Effect of temperature on enzyme activity 7) Effect of pH on enzyme activity	**30**
Keywords	Biochemical test, Catalase, dehydrogenase, chlorophyll, enzyme	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Practical Biochemistry by Damodaran Geetha K (Author) Jaypee Brothers Medical Publishers
2. *Practical Manual of Biochemistry,* CBS Publishers & Distributors Pvt. Ltd. (1 January 2020); CBS Publishers & Distributors Pvt. Ltd.

Reference Books Recommended –

1. Introductory Practical Biochemistry Paperback – 2 January 2001by S.K. Sawhney (Editor), R. Singh (Editor) Narosa Publishing House
2. Practical Enzymology Author(s): Prof. Dr. Hans Bisswanger First published:23 February 2011Print ISBN:9783527320769 |Online ISBN:9783527659227 |DOI:10.1002/9783527659227 Copyright © 2011 Wiley-VCH Verlag GmbH & Co. KGaA

Online Resources–

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

1) https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=KAUSHIK+G+G&search-alias=stripbooks
2) https://efaidnbmnnnibpcajpcglclefindmkaj/https://www.mlsu.ac.in/econtents/1616_Biochemical%20Tests%20of%20Carbohydrate,%20protein,%20lipids%20and%20salivary%20amylase.pdf
3) https://alevelbiology.co.uk/notes/tests-for-carbohydrates/
4) https://alevelbiology.co.uk/notes/test-for-proteins/
5) https://studymind.co.uk/notes/test-for-lipids-and-proteins/
6) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4121948/

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**

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DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Life Science *(Honors)*			**Semester - VIII**	Session: **2024-2025**
1	**Course Code**	**BOSE- 12 T** Genetic		
2	**Course Title**	**Bioinformatics and Gene Technology**		
3	**Course Type**	**Discipline specific Elective (DSE)**		
4	**Pre-requisite** (if, any)	***As per program***		
5	**Course Learning. Outcomes (CLO)**	*At the end of the course, the students will be able :* ➢ Understand basics of bioinformatics and it's tools. ➢ Learn application of bioinformatics in various areas. ➢ Analyse and perform RAPD,RFLP,PCR etc. ➢ Understand GMO and ethics behind the cloning.		
6	**Credit Value**	**3 Credits**	***Credit = 15 Hours - learning & Observation***	
7	**Total Marks**	**Max. Marks: 100**	**Min Passing Marks: 40**	

PART -B: Content of the Course

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

Unit	Topics (Course contents)	No. of Period
I	**Introduction to Bioinformatics:**Introduction, Branches of Bioinformatics, Aim, Scope and Research areas of Bioinformatics. Biological Databases,Basic bimolecular concepts: Protein, and amino acid, DNA & RNA, Sequence Classification format ofBiological Databases.. National Center for Biotechnology Information (NCBI),Examples of related tools(FASTA, BLAST, BLAT, RASMOL), databases(GENBANK, Pubmed, PDB .	12
II	**Applications of Bioinformatics** :Structural Bioinformatics in Drug Discovery, Quantitative structure-activity relationship (QSAR) techniques in Drug Design, Microbial genome applications, protein sequencing, gene sequencing, Crop improvement.	11
III	**Genetic technology** :Recombinant DNA technology; restriction endonuclease, cloning vectors. Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting;Molecular DNA markers i.e. RAPD, RFLP. DNA sequencing, PCR and ReverseTranscriptase-PCR.	11
IV	**Application of genetic technology**: Genetically modified organism; bt cotton and btbrinjal.Transgenic crop; Golden rice. *Agrobacterium* transformation,Hybridomaand monoclonal antibodies, ELISA and Immunodetection. Molecular diagnosis of human disease, Human gene Therapy, social, legal and ethical aspect of cloning.	11
Keywords	***Bioinformatics, Durg design, Crop improvement, ELISA***	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
2. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
3. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons, U.K. 5th edition.
4. Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A

Reference Books Recommended –

1. Mount D., Bioinformatics: Sequence and Genome Analysis. Cold Spring Harbor Laboratory Press, New York. (2004).
2. Baxevanis, A.D. and Francis Ouellellette, B.F., Bioinformatics- A Practical Guide to the Analysis of Genes and Proteins. Wiley India Pvt Ltd. (2009).
3. Ghosh Z. and Bibekanand M. (2008) Bioinformatics: Principles and Applications. Oxford University Press.
4. Pevsner J. (2009) Bioinformatics and Functional Genomics. II Edition. Wiley- Blackwell.
5. Campbell A. M., Heyer L. J. (2006) Discovering Genomics, Proteomics and Bioinformatics. II Edition. Benjamin Cummings.

Online Resources–

- **e-Resources / e-books and e-learning portals**
- https://pubmed.ncbi.nlm.nih.gov/24272431/#:~:text=Bioinformatics%20is%20an%20interdisciplinary%20field,a%20computational%20point%20of%20view.
- https://byjus.com/biology/bioinformatics/
- https://www.lkouniv.ac.in/site/writereaddata/siteContent/202003291612341467kuaum_yadav_Bioinformatics.pdf
- https://www.geeksforgeeks.org/types-of-biological-database-in-bioinformatics/
- https://www.umass.edu/microbio/rasmol/techintr.htm#:~:text=RasMol%20is%20a%20molecular%20graphics,generation%20of%20publication%20quality%20images.
- https://www.intechopen.com/chapters/88596
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9696050/#:~:text=Bioinformatics%2C%20next%2Dgeneration%20sequencing%2C,improving%20crop%20quality%20%5B87%5D.
- https://www.enzolifesciences.com/science-center/technotes/2017/march/what-are-the-differences-between-pcr-rt-pcr-qpcr-and-rt-qpcr?/
- https://education.nationalgeographic.org/resource/genetically-modified-organisms/

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** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE): 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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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY

COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Life Science *(Honours)*		**Semester - VIII**	Session: **2024-2025**	
1	**Course Code**	**BOSE -12 P**		
2	**Course Title**	**Lab. Course -12 (Bioinformatics and Gene Technology)**		
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: ➢ Retrieve gene and protein from gene bank. ➢ Understand steps of production of GMO. ➢ Learn the isolation of plasmid DNA. ➢ Understand use and application of PCR.		
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	• Retrieve the gene from Gene bank and to save the sequence in FASTA format. • Retrieve the protein from Gene bank and to save the sequence in FASTA format. • Find the similarity of sequence for the given nucleotide or protein sequence. • Find the similarity of sequence for the given protein sequence. • Study of steps of genetic engineering for production of Bt cotton, Golden rice through photographs. • Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene transfer by electroporation, microinjection, micro projectile, bombardment. • Isolation of plasmid DNA. • Restriction digestion and gel electrophoresis of plasmid DNA. • Demonstration of PCR.	**30**
Keywords	***Gene bank , FASTA, Agrobacterium, PCR***	

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PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A
2. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
3. Baxevanis, A.D. and Francis Ouellellette, B.F., Bioinformatics- A Practical Guide to the Analysis of Genes and Proteins. Wiley India Pvt Ltd. (2009).
4. Ghosh Z. and Bibekanand M. (2008) Bioinformatics: Principles and Applications. Oxford University Press.

Reference Books Recommended –

1. Sarma,P V G K , 2021.A Practical Textbook of Genetic Engineering in Bacteria .
2. Yves Tourte, 2003. Genetically Modified OrganismsTransgenesis in Plants

Online Resources–

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

- https://vvvcollege.org/dbt/LabManual-Bioinformatics.pdf
- https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/files/BI0505%20LAB%20MANUAL.pdf
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7712542/#:~:text=Transfer%20the%20supernatant%20that%20contains,the%20purity%20of%20the%20DNA.
- https://miteshshrestha.wordpress.com/wp-content/uploads/2018/03/flavr-savr-tomato-golden-rice-bt-cotton.pdf
- https://www.deshbandhucollege.ac.in/pdf/resources/1589512616_Z(H)-VI-Biotech-1.pdf
- https://bio.libretexts.org/Bookshelves/Biotechnology/Lab_Manual%3A_Introduction_to_Biotechnology/01%3A_Techniques/1.12%3A_Restriction_Digest_with_Gel_Electrophorisis
- https://www.youtube.com/watch?v=matsiHSuoOw

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:

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FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

DEPARTMENT OF BOTANY
COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Life sciences *(Certificate / Diploma / Degree)*			**Semester** - I/III//V	Session: **2024-2025**
1	**Course Code**	**BOVAC-01**		
2	**Course Title**	**Herbal Plant & Human Health**		
3	**Course Type**	**Value Addition Course (BOVAC-01)**		
4	**Pre-requisite** (if, any)	As per program		
5	**Course Learning. Outcomes (CLO)**	***After completion of this course, the students will be able to –*** ➢ *Understand the value of herbs, herbal medicine and use of herbal medicine.* ➢ *Know about botanical medicine professionals in the complementary and alternative medicine (CAM)* ➢ *Demonstrates the knowledge of the toxicity of plant and essential oil ingredients,* ➢ *Understand the possibility for allergic and unpleasant reactions to herbal products and the impact of herbal quality on potential toxicity.* ➢ *Use the herbal plants in their daily life* ➢ *Adopt the value of herbal medicine to save their health*		
6	**Credit Value**	**2 Credits**	***Credit = 15 Hours - learning & Observation***	
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks: 20**	

PART -B: Content of the Course

Total No. of Teaching–learning Periods (01 Hr. per period) - 30 Periods (30 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Introduction:** Elementary knowledge of Herbal plant and Concept of Herb as medicine. Concept of ethno-medicine, folk medicines, ethno-ecology, ethnic communities of the India & the Chhattisgarh. Concept of Herbal garden. Collection of ethnic information. ***Observation/In Practices - Survey and familiarization with herbs & local herbal plants***	08
II	**Importance of medicinal plants:** Importance of Herbal / Medicinal plant in human health care – health and balanced diet (Role of proteins, carbohydrates, lipids and vitamins). Common plants & plant parts providing metals and vitamins. ***Observation/In Practices - Survey and familiarization with local herbal medicinal plants***	07
III	**Tribal medicine and Traditional knowledge:** Introduction, Concept of Tribal medicine, methods of disease diagnosis and treatment – common Plants in folk religion. Traditional knowledge and utility of some medicinal plants in Chhattisgarh. ***Collection /Identification of Herbal plants commonly used by villagers of the state –*** • *Centella asiatica,* • *Aloe vera,* • *Solanum nigrum,* • *Achyranthus aspera,* • *Withania somnifera,* • *Papaver somniferum,* • *Strychnos nux– vomica,* • *Atropa belladonna;*	08
IV	**Plants in day to day life:** Nutritive and medicinal value of common herbal fruits and vegetables of daily use. Precautions during use of herbal medicinal products. Basic idea of contribution of national research laboratories like CDRI, CIMAP, NBRI, etc. ***Collection /Identification of Herbal plants commonly used in daily life*** - *Tulsi, Garlic, Ginger, Turmeric, Ajwain, Methi, Flax, Tea and Coffee.*	08
Keywords	***Herbal medicine, Folk medicine, Ethno-medicine, Tribal medicine***	

Signature of Convener & Members (CBoS)

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