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UNIVERSITY OF MYSORE

Estd. 1916

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No.AC2(S)/151/2020-21

Dated: 01.09.2023

Notification

Sub:- Syllabus and Scheme of Examinations of Botany (UG) (V & VI Semester) with effect from the Academic year 2023-24.

Ref:- 1.This office letter No: AC6/303/2022-23 dated: 28-07-2023.

2. Decision of BOS in Botany (UG) meeting held on 11-08-2023.

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The Board of Studies in Botany (UG) which met on 11-08-2023 has resolved to recommended and approved the syllabus and scheme of Examinations of Botany programme (V & VI Semester) with effect from the Academic year 2023-24.

Pending approval of the Faculty of Science & Technology and Academic Council meetings the above said syllabus and scheme of examinations are hereby notified.

The syllabus and scheme of Examinations contents may be downloaded from the University website i.e., www.uni-mysore.ac.in.

Registrar
University of Mysore
Mysore

Registrar

To:-

1. All the Principal of affiliated Colleges of University of Mysore, Mysore.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS, in Botany, Manasagangothri, Mysore.
4. The Director, Distance Education Programme, Moulya Bhavan, Manasagangotri, Mysuru.
5. The Director, PMEB, Manasagangothri, Mysore.
6. Director, College Development Council , Manasagangothri, Mysore.
7. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
8. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
9. Office Copy.

University of Mysore

B.Sc. Degree Programme in Botany

SYLLABI OF V and VI SEMESTERS

Under National Education Policy (NEP) – 2020

Choice Based Credit System (CBCS) with Multiple Entry and Exit Options

BSc. Curriculum and Credit Framework for Undergraduate Programme

Sem.	Discipline Specific Courses - Core (DSC), Elective (DSE)(Credits) (L+T+P)	Minor/ Multidisciplinary/ Open Elective (OE) Courses(Credits) (L+T+P)	Ability Enhancement Courses (AEC)(Credits)(L+T+P) (Languages)	Skills Enhancement Courses (SEC) (Credits) (L+T+P)/ Value Added Courses (Credits) (L+T+P) (common for all UG Programs)/ Summer Internship.		Total Credits
I	DSC-A1(4), A2(2) DSC-B1(4), B2(2)	OE-1 (3)	L1-1(3), L2-1(3) (4 hrs each)	**SEC-1**: Digital Fluency (2) (1+0+2)/ Env. Studies (3)	Health, Wellness & Yoga (2) (1+0+2)	25/26
II	DSC-A3(4), A4(2), DSC-B3(4), B4(2)	OE-2 (3)	L1-2(3), L2-2(3) (4 hrs each)	Env. Studies (3)/ SEC-1: Digital Fluency (2)(1+0+2)	Sports/NCC/NSS/R&R(S&G) / Cultural (2) (0+0+4)	26/25
Students exiting the programme after securing 46 credits will be awarded UG Certificate in Disciplines A and B provided they secure 4 credits in work based vocational courses during summer term or internship/Apprenticeship in addition to 6 credits from skill-based courses earned during the first year.						
III	DSC-A5(4), A6(2), DSC-B5(4), B6(2)	OE-3 (3)/ India and IndianConstitution (3)	L1-3(3), L2-3(3) (4 hrs. each)	**SEC-2**:AI/Cyber Security/Finan- cial Edu. & Inv. Aw. (2) (1+0+2)	Sports/NCC/NSS/R&R(S&G) /Cultural (2) (0+0+4)/ SEC (2)	25
IV	DSC-A7(4), A8(2), DSC-B7(4), B8(2)	India and Indian Constitution (3) / OE-3(3)	L1-4(3), L2-4(3) (4 hrs. each)	**SEC-3**: Financial Edu. &Inv. Aw. /AI /Cyber Security (2) (1+0+2)	Sports/NCC/NSS/R&R(S&G)/ Cultural (2) (0+0+4)/ SEC (2)	25
Students exiting the programme after securing 92 credits will be awarded UG Diploma in Disciplines A and B provided they secure additional 4 credits in skill based vocational courses offered during first- or second-year summer term.						
V	DSC-A9(4), A10(2), A11(4), A12(2);	DSC-B9(4), B10(2), B11(4), B12(2)		**SEC-4**: Employability Skills/Cyber Security (3) (2+0+2)		27
VI	DSC-A13(4), A14(2), A15(4), A16(2);	DSC-B13(4), B14(2), B15(4), B16(2)		Internship (2)		26
Students exiting the programme after 3-years will be awarded UG Degree in Disciplines A and B as double majors upon securing 136 credits and satisfying the minimum credit requirements under each category of courses prescribed.						

Framework of Courses from I to VI Semesters for Undergraduate Program in Botany

Sem.	Discipline Specific – Core(DSC), Elective (DSE) Courses (Credits) (L+T+P)	Minor/ Multidisciplinary/ Open Elective (OE) Courses(Credits) (L+T+P)	Ability Enhancement Courses (AEC) (Credits)(L+T+P) (Languages)	Skills Enhancement Courses (SEC) (Credits) (L+T+P)/ Value Added Courses (Credits) (L+T+P) (common for all UG Programs)/ Summer Internship.		Total Credits
I	DSC-C1(3), C2(2), C3(3), C4(2), C5(3).	OE-1 (3)	L1-1(3), L2-1(3) (4 hrs each)	**SEC-1**: Digital Fluency (2) (1+0+2)/ Env. Studies (3)	Health, Wellness & Yoga (2) (1+0+2)	26/27
II	DSC-C6(3), C7(2), C8(3), C9(2), C10(3).	OE-2 (3)	L1-2(3), L2-2(3) (4 hrs each)	Env. Studies (3)/ SEC-1: Digital Fluency (2) (1+0+2)	Sports/NCC/NSS/R&R(S&G)/ Cultural (2) (0+0+4)/ SEC (2)	27/26
Students exiting the programme after securing 46 credits will be awarded UG Certificate in Disciplines provided they secure 4 credits in work based vocational courses during summer term or internship/Apprenticeship in addition to 6 credits from skill-based courses earned during the first year.						
III	DSC-C11(3), C12(2), C13(3), C14(2), C15(3).	OE-3 (3)/ India and IndianConstitution (3)	L1-3(3), L2-3(3) (4 hrs. each)	**SEC-2**:AI/Cyber Security/Finan- cial Edu. & Inv. Aw. (2) (1+0+2)	Sports/NCC/NSS/R&R(S&G) /Cultural (2) (0+0+4)/ SEC (2)	26
IV	DSC-C16(3), C17(2), C18(3), C19(2), C20(3).	India and Indian Constitution (3) / OE-3(3)	L1-4(3), L2-4(3) (4 hrs. each)	**SEC-3**: Financial Edu. &Inv. Aw. /AI /Cyber Security (2) (1+0+2)	Sports/NCC/NSS/R&R(S&G)/ Cultural (2) (0+0+4)/ SEC (2)	26
Students exiting the programme after securing 92 credits will be awarded UG Diploma in Disciplines or inter-disciplines provided they secure additional 4 credits in skill based vocational courses offered during the first- or second- year summer term.						
V	DSC-C21(4), C22(2), C23(4), C24(2), C25(4).	DSE-E1(3). Vocational-1(3)		**SEC-4**: Employability Skills/Cyber Security (3) (2+0+2)		25
VI	DSC-C26(4), C27(2), C28(4), C29(2), C30(4).	DSE-E2(3). Vocational-2(3).		Internship (2)		24
Students exiting the Programme after 3-years will be awarded UG Degree, B. Sc. in Disciplines or Inter-disciplines upon securing 136 credits and satisfying the minimum credit requirements under each category of courses prescribed.						

Courses for B.Sc. Botany from I to VI Semester

Sem	Title of the Paper	Hrs	Theory/ Practical	Course Code	Credits
I	Microbial Diversity and Technology	56 Hrs 4Hrs / Week	Theory	DSC-BOT-C1-T	04
	Microbial Diversity and Technology	56 Hrs 4Hrs / Week	Practical	DSC-BOT-C2-P	02
II	Diversity of Non-Flowering Plants	56 Hrs 4Hrs / Week	Theory	DSC-BOT-C3-T	04
	Diversity of Non-Flowering Plants	56 Hrs 4Hrs / Week	Practical	DSC-BOT-C4-P	02
III	Plant Anatomy and Developmental Biology	56 Hrs 4Hrs / Week	Theory	DSC-BOT-C5-T	04
	Plant Anatomy and Developmental Biology	56 Hrs 4Hrs / Week	Practical	DSC-BOT-C6-P	02
IV	Ecology and Conservation Biology	56 Hrs 4Hrs / Week	Theory	DSC-BOT-C8-T	
	Ecology and Conservation Biology	56 Hrs 4Hrs / Week	Practical	DSC-BOT-C6-P	
V	Plant Morphology and Taxonomy	60 Hrs 4Hrs / Week	Theory	DSC- BOT -C9-T	04
	Plant Morphology and Taxonomy	56 Hrs 4Hrs/Week	Practical	DSC -BOT -C10-P	02
	Genetics and Plant Breeding	60 Hrs 4Hrs/Week	Theory	DSC - BOT -C11-T	04
	Genetics and Plant Breeding	56 Hrs 4 Hrs/Week	Practical	DSC - BOT -C12-P	02
VI	Plant Plant Physiology and Plant Biochemistry	60 Hrs 4Hrs / Week	Theory	DSC - BOT -C15-T	04
	Plant Plant Physiology and Plant Biochemistry	56 Hrs 4Hrs/Week	Practical	DSC -BOT -C16-P	02
	Plant Biotechnology	60 Hrs 4Hrs/Week	Theory	DSC – BOT C19-T	04
	Plant Biotechnology	56 Hrs 4 Hrs/Week	Practical	DSC - BOT - C-20-P	02

Internship for Graduate Programme (As per UGC & AICTE)

Course title	Internship Discipline specific
No of contact hours	90
No of credits	2
Method of evaluation	Presentation / Report submission / Both

- Internship shall be Discipline specific of 90 hrs (2 credits) with a duration of 4-6 weeks
- Internship may be full-time (during semester holidays) / part-time (in the academis session)
- The student should submit the final internship report (90 hours of Internship) to the mentor for completion of the internship
- The detailed guidelines and formats shall be formulated by the Universities separately as prescribed in accordance to UGC and AICTE guidelines

5th Semester

Plant Morphology and Taxonomy (Theory)

Program Name	**B.Sc. in BOTANY**	Semester	**V**
Course Title	**Plant Morphology and Taxonomy (Theory)**		
Course Code:	**DSC – BOT-C9 - T**	No. of Credits	**04**
Contact hours	**60 Hours**	Duration of SEA/ Exam	**2 hrs. and 30 min.**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Pre-requisite(s)

Course Outcomes (COs): After the successful completion of the course, the student will be able to:.

CO1. Understanding the main features in Angiosperm evolution.

CO2. Ability to identify, classify and describe a plant in scientific terms, thereby, Identification of plants using dichotomous keys. Skill development in identification and classification of flowering plants.

CO3. Interpret the rules of ICN in Botanical nomenclature.

CO4. Classify Plants systematically and recognize the importance of Herbarium, Virtual Herbarium and Botanical gardens.

CO5. Recognition of locally available angiosperm families, plants and economically important plants. Appreciation of human activities in conservation of useful plants.

Contents	**60 Hrs**
Unit 1	**15 hrs**
Morphology of Root, Stem and Leaf. Their modifications for various functions. Inflorescence – types. Structure and variations of flower. Fruits–types. Floral diagram and floral formula. **Introduction to Taxonomy**: History, objectives, scope and relevance of Taxonomy. **Systems of classification**: Artificial, Natural and Phylogenetic; brief account of Linnaeus', Bentham & Hooker's, Engler and Prantl's system and APG System (IV- 2016). Merits and demerits of classifications. **Taxonomic literatures:** Floras, Monograph, Revisions, Journals and *Hortus Malabaricus*. **Herbaria and Botanical gardens:** Important herbaria and botanical gardens of the world and India and their importance. Technique of Herbarium Preparation. **Virtual herbarium;** E-Flora- documentation and uses.	
Unit 2:	**15 hrs**
Taxonomic Hierarchy: Concept of taxa (family, genus, species); Categories and taxonomic hierarchy; Species concepts (biological, morphological, evolutionary). Modes of speciation. Problems with species concepts. **Botanical Nomenclature:** Principles and Rules (ICBN/ ICN); Latest code. Brief account of Ranks of taxa, Typification, Author citation, valid publication, rejection of names, principle of priority and its limitations. **Plant Taxonomic Evidences:** from Palynology, Embryology, Cytology, Phytochemistry and molecular data. Field inventory.	
Unit 3:	**15 hrs**
Biometrics, Numerical Taxonomy; Phenetics and Cladistics: Characters; Variations; OTUs, character weighting and coding; Cluster analysis; Phenograms, cladograms (definitions and differences).	

Phylogenetic Systematics: Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly, clades, synapomorphy, symplesiomorphy, apomorphy, lineage sorting, serial homology etc). **Origin and evolution of angiosperms;** Co-evolution of angiosperms and animals; Methods of illustrating evolutionary relationship (phylogenetic tree, cladogram). **Molecular taxonomy:** DNA sequences of chloroplast genes (*atp*B, rbcL, ITS, trnL etc) and nuclear gene (nuclear ribosomal 18s DNA).	
Unit 4:	**15 hrs**
Plant identification: Taxonomic dichotomous keys; indented (yoked) and bracketed keys. (brief account only). **Plant descriptions**: Common terminologies used for description of vegetative and reproductive parts of the following families: **Study of the diagnostic features of Angiosperm families:** Annonaceae, Brassicaceae, Malvaceae, Rutaceae, Fabaceae (with sub Families), Myrtaceae, Apiaceae, Asteraceae, Apocynaceae, Solanaceae, Lamiaceae, Euphorbiaceae, Liliaceae, Arecaceae, Orchidaceae and Poaceae.	

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	Program Outcomes (POs)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Pedagogy: Teaching and learning, Seminar, Assignments, etc

Formative Assessment for Theory	
Assessment Occasion/ Type	**Marks**
Attendance	10
Test (Objective type)	10
Assignments	10
Seminar	10
Total	**40 Marks**
Formative Assessment as per NEP guidelines are compulsory	

Course Title	**Plant Morphology and Taxonomy (Practical)**	Practical Credits	**02**
Course Code	**DSC – BOT - C10 - P**	Contact Hours	**56 Hours**
Formative Assessment	**25 Marks**	Summative Assessment	**25 Marks**

Practical Content

1. Study of root, stem and leaf structure and modifications.

2. Study of inflorescence types. Study of flower and its parts, Study of fruits. Floral diagram and flora formula.

3-10. Study of Dicot families mentioned in theory with at least two examples for each family and make suitable diagrams, describe them in technical terms (Description, V.S. flower, section of ovary floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification) and identify up to species using the flora***

11. Construction of plant phylogenetic trees using various loci (*atp*B, rbcL, ITS, trnL etc) with various phylogenetic methods (Neibour Joining, Maximum Likelihood etc).

12-13. Identify plants/plant products of economic importance: Binomial name, Family and part used and uses. Cotton, Mango, Red gram, Green gram, Horse gram, Black gram, Bengal gram, Indigo, Brinjal, Tomato, Chilly, Tamarind, Bitter gourd, *Luffa*, Asafoetida, Cumin, Coriander, Coffee, Rubber, Tapioca, Ricinus, Ginger, Turmeric, Coir, Arecanut, Rice, Wheat, Ragi, Sugarcane, *Annona muricata*, *Catharanthus roseus*, *Rauwolfia serpentina*, *Justicia adhatoda*, *Vitex negundo* and *Leucas aspera*.

14. **Field visit***: Local or outside area/ Botanical garden/ tribal settlements minimum 3 to 5 days.
Submission: Record book, Tour report and Herbarium (Preparation of 05 properly identified herbarium specimens; mounting of a properly dried and pressed specimen of any common plants from your locality with herbarium label).

Pedagogy: Teaching and learning, conducting experiments, field visits,

Formative Assessment for Practical	
Assessment Occasion/ Type	**Marks**
Attendance	05
Test	05
Field visit (3 to 5 days)	05
Submission (Record book, Tour report and Herbarium)	10
Total	**25 Marks**
Formative Assessment as per NEP guidelines are compulsory	

SCHEME OF PRACTICAL EXAMINATION
(Distribution of marks): 25 marks for the Semester end examination

1. Identify, classify and describe the specimen A, B & C taxonomically	9 Marks
2. Describe the plant D using technical terms	4 Marks
3. Write the floral diagram and floral formula of the given specimen E	4 Marks
4. Identify the specimen F and G	4 Marks
5. Viva Voce	4 Marks

Total: 25 Marks

General Instructions:

Q1. Give specimen one each from Polypetalae, Gamopetalae and Monochlamydae/ Monocotyledons.
Q2. Give specimen from family they studied.
Q3. Give specimen from studied plants.
Q4. Materials one each from morphology and economic botany.

Note: Same Scheme may be used for IA (Formative Assessment) examination

References	
1	Baker. H.G. 1970. Plant and Civilization, Wadsworth Publishing Company.
2	Colton C.M. 1997. Ethnobotany – Principles and applications. John Wiley and sons –Chichester
3	Cotton, C.M. 1996. Ethnobotany – Principles and Applications. Wiley and Sons
4	Datta S C, *Systematic Botany*, 4th Ed, Wiley Estern Ltd., New Delhi, 1988.
5	Eames A. J. - *Morphology of Angiosperms* - Mc Graw Hill, New York.
6	Hall, B.G. (2011). *Phylogenetic Trees Made Easy: A How-To Manual*. Sinauer Associates, Inc. USA
7	Heywood - *Plant taxonomy* - Edward Arnold London.
8	Jeffrey C .J. and A. Churchil - *An introduction to taxonomy* – London.
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11	Lawrence - *Taxonomy of Vascular Plants* - Oxford & I B H, New Delhi.
12	Manilal, K.S. and M.S. Muktesh Kumar 1998. *A Handbook on Taxonomy Training*. DST, New Delhi.
13	Manilal, K.S. and A.K. Pandey, 1996. *Taxonomy and Plant Conservation*. C.B.S. Publishers & Distributors, New Delhi.
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16	Pandey, S. N, and S.P. Misra (2008)-*Taxonomy of Angiosperms*- Ane Books India, New Delhi.
17	Radford A B, W C Dickison, J M Massey & C R Bell, *Vascular Plant Systematics*, 1974,Harper & Row Publishers, New York.
18	Singh G.2012. *Plant systematics: Theory and Practice*. Oxford and IBH, Pvt. Ltd., New Delhi.
19	Singh V. & Jain - *Taxonomy of Angiosperms* - Rastogi Publications, Meerut.
20	Sivarajan V. V - *Introduction to Principles of taxonomy* - Oxford &I B H New Delhi.
21	Any local/state/regional flora published by BSI or any other agency.

GENERAL PATTERN OF THEORY QUESTION PAPER
(60 Marks for semester end Examination with 2 hrs. and 30 min. duration)

Part-A

1. Question Number 1-06 carries 2 Marks each. Answer any 05 questions. 10 Marks

Part-B

2. Question Number 07-11 carries 5 Marks each. Answer any 04 questions. 20 Marks

Part-C

3. Question Number 12-15 carries 10 Marks each. Answer any 03 questions. 30 Marks

(Minimum 1 Question from each unit and 10 marks question may have sub-question for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.

SCHEME OF PRACTICAL EXAMINATION
(Distribution of marks): 25 marks for the Semester end examination

1. Identify, classify and describe the specimen A, B & C taxonomically	9 Marks
2. Describe the plant D using technical terms	4 Marks
3. Write the floral diagram and floral formula of the given specimen E	4 Marks
4. Identify the specimen F and G	4 Marks
5. Viva Voce	4 Marks

Total: 25 Marks

General Instructions:

Q1. Give specimen one each from Polypetalae, Gamopetalae and Monochlamydae/ Monocotyledons.
Q2. Give specimen from family they studied.
Q3. Give specimen from studied plants.
Q4. Materials one each from morphology and economic botany.

Genetics and Plant Breeding (Theory)

Program Name	**B.Sc. in BOTANY**	Semester	**V**
Course Title	**Genetics and Plant Breeding (Theory)**		
Course Code:	**DSC – BOT-C11 - T**	No. of Credits	**04**
Contact hours	**60 Hours**	Duration of SEA/ Exam	**2 hrs. and 30 min.**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Pre-requisite(s)

Course Outcomes (COs): After the successful completion of the course, the student will be able to:.
CO1. Understanding the basics of genetics, plant breeding and cell biology.
CO2. Ability to identify, calculate and describe crossing over and frequencies of recombination
CO3. Interpret the results of mating and pollinations.
CO4. Recognition of modes of inheritance of traits/ phenotypes and Phenotype-genotype correlation.

Contents	**60 Hrs**
Unit 1:	**15 hrs**
Genetics: Mendelism- History; Principles of inheritance; Mendelian genetics and its extension; Chromosome theory of inheritance; Autosomes and sex chromosomes. Incomplete dominance and codominance. Multiple alleles, Lethal alleles, Epistasis, Polygenic inheritance; Pleiotropy. Penetrance and Expressivity. Extrachromosomal Inheritance- Chloroplast mutation: Variegation in Four O'clock plant; Mitochondrial mutations in yeast.	
Unit 2:	**15 hrs**
Linkage, crossing over and chromosome mapping; Linkage and crossing over-Cytological basis of crossing over; Recombination frequency, two factor and three factor crosses; Interference and coincidence; Gene mapping; Sex Linkage. Variation in chromosome number and structure. Gene mutations- Types of mutations; Molecular basis of Mutations; Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); Detection of mutations: ClB method. Fine structure of gene, Population and Evolutionary Genetics, Allele frequencies, Genotype frequencies, Hardy-Weinberg's Law, Role of natural selection, mutation, genetic drift. Genetic variation and Speciation.	
Unit 3:	**15 hrs**
Cell Biology: Microscopy- Light microscopy, Phase contrast microscopy, Electron microscopy (SEM and TEM) and Fluorescence Microscopy. Ultrastructure and functions of cell wall, cell membrane and cell organelles (nucleus, mitochondria, chloroplast, Golgi apparatus, vacuole, endoplasmic reticulum, ribosome, spherosome and lysosome). Phases of eukaryotic cell cycle: mitosis and meiosis. Regulation of cell cycle and significance of mitosis and meiosis. Structure and function of Chromosome, DNA and RNAs	
Unit4:	**15 hrs**
Plant Breeding: Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding. Centers of origin and domestication of crop plants, plant genetic resources; Acclimatization, Selection methods- for self-pollination, cross pollination and vegetatively propagated plants. Hybridization: For self, cross and vegetative propagation in plants – Procedure, advantages and limitations. Inbreeding depression and Heterosis, genetic basis of inbreeding depression and heterosis; Applications. Crop improvement and breeding Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.	

Pedagogy: Teaching and learning, Seminar, Assignments, etc

Formative Assessment for Theory	
Assessment Occasion/ Type	**Marks**
Attendance	10
Test (Objective type)	10
Assignments	10
Seminar	10
Total	**40 Marks**
Formative Assessment as per NEP guidelines are compulsory	

Pedagogy: Teaching and learning, conducting experiments, field visits

Formative Assessment for Practical	
Assessment Occasion/ Type	**Marks**
Attendance	05
Test	05
Field visit	05
Submission	10
Total	**25 Marks**
Formative Assessment as per NEP guidelines are compulsory	

Course Title	**Genetics and Plant Breeding (Practical)**	Practical Credits	**02**
Course Code	**DSC – BOT – C12 - P**	Contact Hours	**56 Hours**
Formative Assessment	**25 Marks**	Summative Assessment	**25 Marks**

Practical Content

1. Hybridization: Emasculation, bagging, pollination and production of hybrids.
2. Pollen viability test- Hanging drop and tetrazolium test
3. Seed viability- TTC and Paper towel method
4-5. Origin, distribution and centre of diversity of crop plants: Wheat, sorghum, rice, chilli, sugarcane, cotton, potato, coffee, sunflower and groundnut.
6. Charts related to plant breeding.
7-8. Genetic problems: 2 each from monohybrid, dihybrid, incomplete dominance and interaction of genes.
9. Study of aneuploidy: Down's, Klinefelter's and Turner's syndrome.
10. Photographs/ permanent slides showing translocation ring, laggards and inversion bridge.
11. Study of Mitosis in onion root tips
12. Study of Meiosis in onion/ Chlorophytum flower buds.
13. Study of Micrometry
14. Karyotype (onion)

References	
1	Acquaah, G. (2007). Principles of Plant Genetics & Breeding. NewJearsey, U.S.: Blackwell Publishing.
2	Singh, B.D. (2005). Plant Breeding: Principles and Methods, 7th edition. New Delhi, Delhi: Kalyani Publishers.
3	Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding, 2nd edition. New Delhi, Delhi: Oxford – IBH.
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6	Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics, 10th edition. San Francisco, California: Benjamin Cummings
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12	Karp, G. (2010). Cell Biology, 6th edition. New Jersey, U.S.A.: John Wiley & Sons.
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16	Alberts, B., Bray, D., Hopkin, K., Johnson, A. D., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2013). Essential cell biology (4th ed.). Garland Publishing.
17	Raven, F.H., Evert, R. F., Eichhorn, S.E. (1992).Biology of Plants. New York, NY: W.H. Freeman and Co.
18	Verma, P. S. (2004). Cell Biology, Genetics, Molecular Biology: Evolution and Ecology. India: S. Chand Limited.

GENERAL PATTERN OF THEORY QUESTION PAPER
(60 Marks for semester end Examination with 2 hrs. and 30 min. duration)

Part-A

1. Question Number 1-06 carries 2 Marks each. Answer any 05 questions. 10 Marks

Part-B

2. Question Number 07-11 carries 5 Marks each. Answer any 04 questions. 20 Marks

Part-C

3. Question Number 12-15 carries 10 Marks each. Answer any 03 questions. 30 Marks

(Minimum 1 Question from each unit and 10 marks question may have sub-question for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.

SCHEME OF PRACTICAL EXAMINATION
(Distribution of marks): 25 marks for the Semester end examination

1.Solve the genetic problem A and B	8 Marks
2. Perform the experiment C and D	6 Marks
3. Comment on D	3 Marks
4. Make micro preparation of E	4 Marks
5. Viva - Voce	4 Marks

Total: 25 Marks

General Instructions:

Q1. One each from monohybrid/ dihybrid and inter action of genes/linkage
Q2. Pollen/ seed viability and micrometry/karyotype
Q3. Chart from emasculation and bagging/ Vavilov's centres
Q4. Mitosis/Meiosis

Genetic problems:

PROBLEMS ON MONOHYBRID CROSS

1) In Tomatoes Red fruit color (R) is dominant over yellow (r). A pure red fruited plant is crossed to a yellow fruited one. What will be the appearance of F_1? The F_1 are interbred and produce 320 off springs in the F_2. How many of them will be red and how many yellow? What will be the genotypes of F_2 and in what numbers ?

2) In pea plant, Tallness (T) is dominant over dwarfness (t). A tall pea crossed with dwarf produces offerings of which 50% are tall and 50% are dwarf. What are the genotypes of the parents ?

PROBLEMS ON DI- HYBRID CROSS

1) In garden pea, yellow seed color (Y) is dominant over green (y) and round seed shape (R) is dominant over wrinkled (r). The character pair segregate separately. A pure yellow wrinkled variety is crossed to a pure green round. Give the phenotypes and genotypes of F_1 and phenoypic ratio of F_2 generation.
20

2) A tall red when crossed with dwarf red produces a dwarf white. Give the genotypes of the parents.

PROBLEMS ON INTERACTIN OF FACTORS

1. Two white flowered strains of the sweet pea (*Lathyrus odoratus*) were crossed, producing an F1 with only purple flowers. Random crossing among the F1 produced 96 progeny plants, 53 exhibiting purple flowers and 43 with white flowers.

a) What phenotypic ratio is approximated by the F2 ?
b) What type of interaction is involved ?
c) What were the probable genotype of the parental strains.

PROBLEMS ON 2 POINT TEST CROSSES

1. In tomato, red fruit (R) is dominant over yellow fruit (r) and yellow flowers (W) are dominant over white flowers (w). A cross is made between true breeding plants with red fruit and yellow flowers and plants with yellow fruit and white flowers. The F1 generation plants are then test crossed to plants with yellow fruits and white flowers. The following results are obtained.

333 red fruits/ yellow flowers	64 red fruits/ white flowers
58 yellow fruits/ yellow flowers	350 yellow fruits/ white flowers

Calculate the map distance between the two genes.

2. Two different traits affecting pod characteristics in garden pea plants are enclosed by genes found on chromosome 5. Narrow pod is recessive to normal pod, yellow pod recessive to green pod. A true breeding plant with narrow, green pods was crossed to a true breeding plant with normal yellow pods. The F1 were then test crossed to plants with narrow, yellow pods. The following results were obtained.

144 normal green pods	150 narrow yellow pods
11 normal yellow pods	9 narrow green pods

How far apart are these two genes?

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6th Semester

PLANT PHYSIOLOGY AND PLANT BIOCHEMISTRY

Program Name	**BSc/ BOTANY**	Semester	**VI**
Course Title	**PLANT PHYSIOLOGY AND PLANT BIOCHEMISTRY**		
Course Code:	**BOT C13-T**	No. of Credits	**04**
Contact hours	**04 Hours**	Duration of Exam	**2 hrs. & 30 min.**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Pre-requisite(s):

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO5. Importance of water and the mechanism of transport.
CO6. To understand biosynthesis and breakdown of biomolecules.
CO7. Role of plant hormones in plant development and about secondary metabolites.
CO8. Preliminary understanding of the basic functions and metabolism in a plant body.
CO9. To understand the importance of nutrients in plant metabolism and crop yield.

Contents	**60 Hrs**
UNIT 1	**15 Hrs**
Plant water relations: Importance of Water as a solvent, Diffusion, osmosis, imbibition, osmotic pressure, osmotic potential, turgor pressure, wall pressure, water potential and its components. Mechanism of water absorption, Factors affecting water absorption. **Transpiration.** Types and process. Mechanism of guard cell movement. K+ ion mechanism. Antitranspirants. **Mechanism of ascent of sap:** Vital and physical force theories. **Phloem Transport:** Transport of organic solutes. Path of transport, vein loading and unloading. Transcellular hypothesis, mass flow hypothesis. **Mineral nutrition:** A brief account of Micro and macro nutrients**.**	
UNIT 2	**15 Hrs**
Photosynthesis: Photosynthetic Pigments (Chl a, b, xanthophylls, carotene); Photosystem I and II, reaction center, antenna molecules; Electron transport and mechanism of ATP synthesis; C3, C4 and CAM pathways of carbon fixation reactions; Photorespiration. **Respiration**: Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, Glyoxylate, Oxidative Pentose Phosphate Pathway.	
UNIT 3	**15 Hrs**
Definition and classification of plant growth regulators- Hormones. Site of synthesis, biosynthesis pathway and metabolism and influence on plant growth development of individual group of hormone- Auxins, Gibberlins, cytokinins, ABA, ethylene. Synthetic growth regulators- classification, their effect on plant growth and development. Practical utility of hormones in agriculture and horticulture**.** **Sensory Photobiology**: Biological clocks, photoperiodism, function & structure of phytochromes, phototropin & cryptochromes. Senescence, Aging & Cell Death (PCD and Autophagosis). Plant Movements.	
UNIT 4	**15 Hrs**

Nitrogen metabolism: Biological nitrogen fixation; Nitrate and ammonia assimilation. **Proteins and amino acids**: classification, structure - primary, secondary, tertiary and quaternary. **Enzymes**- classification, kinetics and mechanism of action. **Vitamins** - classification, distribution, structure, production, function. **Lipid Metabolism:** classification, structure, biosynthesis of fatty acids and functions. **Secondary plant products**: structure, biosynthesis and distribution of terpenes, phenolics and nitrogen containing compounds.	

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-15)

Course Outcomes (COs) / Program Outcomes (POs)	**Program Outcomes (POs)**														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Core competency															
Critical thinking															
Analytical reasoning															
Research skill															
Team work															

Pedagogy:

Formative Assessment for Theory PAPER DSC C15 - T

Assessment	**Marks**
C_1 = Test I & II	10 + 10 = 20 Marks
C_2 = Assignment + Seminar + Attendance	10 + 05 +05 =20 Marks

Course Title	**Plant Physiology and Biochemistry**	Practical Credits	**2**
Course Code	**BOT C14-P**	Contact Hours	**4 Hours**
Formative Assessment	**25 Marks**	Summative Assessment	**25 Marks**

Practical Content

1. Experiment to demonstrate the phenomenon of exosmosis and endosmosis.
2. To determine the osmotic pressure of the cell sap by plasmolytic method.
3. To demonstrate root pressure / transpiration pull in plants.
4. To compare the rate of transpiration from dorsiventral leaf by cobalt chloride paper method.
5. To demonstrate that oxygen is liberated in the process of photosynthesis.
6. Separation of photosynthetic pigments by paper chromatography and measure their Rf values.
7. To separate the chloroplast pigments by separating funnel. (Demonstration only)
8. To demonstrate that CO_2 is evolved during anaerobic respiration by gas flow method.
9. Study of Phototrophism.
10. Demonstration of Starch in the leaf.
11. Determination of stomatal index, Area of stomatal aperture and stomatal frequency
12. Biochemical test for Starch, Protein, Reducing Sugars and Lipids.
13. Estimation of diurnal fluctuation using CAM plants.
14. Industrial visit.

Pedagogy:

Formative Assessment for Practical	
Assessment	**Marks**
C_1 = Test I	15 Marks
C_2 = Assignment + Project report / Industrial visit	5 + 5 =10 Marks
Total	**25 Marks**

REFERENCES

1. Fundamentals of Biochemistry 2nd Ed, John Wiley and Sons Inc. Wilson, K. and Walker, J. 1994

2 .JainV K, 2008. Fundamentals of Plant Physiology.S Chand andCo.

3. Kochhar P L, Krishnamoorthy H N. Plant Physiology. Atmaram and sons, Delhi.

4. Kumar and Purohit. Plant Physiology: Fundementals and Applications.Agrobotanical Publishers.

5. Malik CP, 2002. Plant Physiology. Kalyani publishers.

6. Mukherjii S, Ghosh AK, 2005. Plant Physiology. New Central Book Agency, Culcutta.

7. Noggle GR, Fritz GJ, Introductory Plant Physiology.Prentice Hall of India.

8. Pandey SN, Sinha BK, 2006. Plant physiology.Vikas Publishing House, NewDelhi.

9. Salisbury F B, Ross C W, 1992. Plant Physiology. CBS publishers and Distributers, NewDelhi.

10. Sinha A K, 2004. Modern Plant Physilogy. Narosa publishing House, NewDelhi.

11. Srivastava H S, 2004. Plant physiology and Biochemistry. Rasthogi publications.

12. Verma V, 2007.Text Book of Plant Physiology. Ane Books Pvt. Ltd.

Plant Biotechnology

Program Name	**B.Sc. in BOTANY**	Semester	**V**
Course Title	**Plant Biotechnology (Theory)**		
Course Code	**BOT C-15 T**	No. of Credits	**04**
Contact hours	**60 Hours**	Duration of SEA/ Exam	**2 hrs. 30 min.**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Pre-requisites

Course Outcomes (COs): After the successful completion of the course, the student will be able to:.

CO1. Explain the basics of the physiological and molecular processes that occur during plant growth and development and during environmental adaptations

CO2. Understand how biotechnology has been used to develop knowledge of complex processes that occur in the plant

CO3. Use basic biotechnological techniques to explore molecular biology of plants

CO4. Understand the processes involved in the planning, conduct and execution of plant biotechnology experiments

CO5. Explain how biotechnology is used for plant improvement and discuss the ethical implications of that use

Contents	**15hrs**
Unit 1	**15hrs**
Historical perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, haploids, triploids and cybrids; Cryopreservation; Germplasm Conservation).	
Unit 2	**15hrs**
Restriction Endonucleases (History, Types I-IV, biological role and application); Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pUC 18 and pUC19, pBR322, Ti plasmid, BAC); Lambda phage, M13 phagemid, Cosmid, Shuttle vector; Eukaryotic Vectors (YAC and briefly PAC, MAC, HAC).Gene Cloning (Recombinant DNA, Bacterial Transformation and selection of recombinant clones, PCR-mediated gene cloning) Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization; Probes-oligonucleotide, heterologous, PCR;	
Unit 3	**15hrs**
Methods of gene transfer- Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Micro projectile bombardment; Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP). Pest resistant (Bt-cotton); herbicide resistant plants (RoundUp Ready soybean); Transgenic crops with improved quality traits (FlavrSavr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug); edible vaccines; Industrial enzymes (Aspergillase, Protease, Lipase); Biosafety concerns.	
Unit 4	**15hrs**
Introduction to Bioinformatics- Definition, history, scope and applications. Opportunities in Bioinformatics. Introduction to Genomics, Proteomics, Metabolomics and Pharmacogenomics.Biological databases: Nucleotide databases, Protein databases. Genome databases. Organization of data in NCBI, DDBJ, EBI, PDB, SwissPROT and software used.	

Pedagogy: Teaching and learning, Seminar, Assignments, etc.

Formative Assessment for Theory	
Assessment	**Occasion/ type Marks**
Attendance C1	10
Test (Objective type) C2	10
Assignments C1	10
Seminar C2	10
Total	**40 Marks**

REFERENCES
Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms. Vikas Publication House Pvt. Ltd., New Delhi. 5th edition
Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons, U.K. 5th edition
Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A.
Arthur M. Lesk. (2003). Introduction to Bioinformatics, Oxford University Press,Indian edition..
Des Higgins and Willie Taylor. (2000). Bioinformatics, Sequence, structure and databanks. A practical approach. Oxford University Press, Indian edition, Second impression, New Delhi.
ImtiazAlam Khan. (2005). Elementary bioinformatics. Pharma Book Syndicate, Hyderabad.
Krane Dan, E. and Raymer M.L. (2004). Fundamental concepts of Bioinformatics. Pearson education. New Delhi. Second Indian reprint.
Rastogi, S.C., Mediratta, N. and Rastogi. P. (2004). Bioinformatics, methods and applications, genomics, proteomics and drug discovery, Prentice hall of India, pvt. Ltd., New Delhi.
Baxevanis, A. D. and Ouellettee, B. F. F. (2002). Bioinformatics: A Practical Guide to the analysis of Genes and Proteins. (2nd Ed.), New York, John Wiley & Sons, Inc. Publications.
Attwood, T. K. and Parry-Smith, D. J. (2001). Introduction to Bioinformatics Delhi. Pearson Education (Singapore) Ptd. Ltd

GENERAL PATTERN OF THEORY QUESTION PAPER

(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions: 10 marks.

Part-B

2. Question number 07- 11 carries 05 Marks each. Answer any 04 questions: 20 marks.

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions: 30 marks.

(Minimum 1 question from each unit and 10 marks question may have sub-questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight-age shall be given to each unit based on number of hours prescribed.

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.

Course Title	**Plant Biotechnology (Practical)**	Practical Credits	**02**
Course Code	**BOT C-16 P**	Contact Hours	**56 Hours**
Formative Assessment	**25 Marks**	Summative Assessment	**25 Marks**

Practical Content

1. (a) Preparation of MS medium.
   (b) Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of Tobacco/Datura/Brassica etc.
2. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis &
3. Preparation of Artificial/Synthetic seeds.
4. Isolation of protoplasts – Mechanical isolatioin
5. Study and description of binary vectors by using photographs.
6. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene transfer by electroporation, microinjection, micro projectile bombardment.
7. Study of steps of genetic engineering for production of Bt cotton, Golden rice, FlavrSavr tomato through photographs.
8. Isolation of DNA.
9. Isolation and spectrophotometric quantification of DNA.
10. Separation of DNA using agarose gel electrophoresis and gel documentation.
11-12. Study of databases of NCBI, DDBJ, EMBL, PDB
13. Charts/ Photographs related to Biotechnology.
14. Visit to Biotech Labs in nearby places.

Formative Assessment as per NEP guidelines are compulsory

Formative Assessment for Practical	
Assessment Occasion/type	**Marks**
Continuous assesment	05
Test	05
Record	05
Submission	05
Visit to Biotech lab & report	05
Total	**25 Marks**
Formative Assessment as per NEP guidelines are compulsory	

SCHEME OF PRACTICAL EXAMINATION
(Distribution of marks): 25 marks for the Semester end examination

Time =03 hrs **Marks =25**

1. Isolation of plant DNA/ spectrophotometric quantification of DNA(A) 05 marks
2. Preparation of Artificial/SyntheticSeed/ Inoculation using leaf and nodal explants (B) 04 marks
3. Comment on Bt cotton, Golden rice, FlavrSavr tomato, microinjection, micro projectile bombardment, Agarose /PAGE electrophoresis, Transilluminator, PCR (C&D) 06 marks
4. Comment on E (Bioinformatics) 05 marks
4. Viva-voce 05 marks

GENERAL PATTERN OF THEORY QUESTION PAPER
(60 Marks for semester end Examination with 2 hrs. and 30 min. duration)

Part-A

1. Question Number 1-06 carries 2 Marks each. Answer any 05 questions. 10 Marks

Part-B

2. Question Number 07-11 carries 5 Marks each. Answer any 04 questions. 20 Marks

Part-C

3. Question Number 12-15 carries 10 Marks each. Answer any 03 questions. 30 Marks

(Minimum 1 Question from each unit and 10 marks question may have sub-question for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Internship for Graduate Programme

Course title	Internship Discipline specific
No of contact hours	90
No credits	2
Method of evaluation	Presentations/Report submission/Both

Project assessment				
Formative assessment		**Summative assessment**		**Total marks**
Assesment type	**Marks**	**Practical exam**	**Marks**	
Data maintenance	10	Presentation / Report / Both	25	
Assessment	10			
Attendance	05			
Total	**25**		**25**	**50**

- Internship shall be Discipline Specific of 90 hours (2 credits) with duration 4-6 weeks.
- Internship may be full-time/part-time (full-time during semester holidays and part-time in the academic session)
- The student should submit the final internship report (90 hours of Internship) to the mentor for completion of the internship.
- The detailed guidelines and formats shall be formulated by the universities separately as prescribed in accordance to UGC and AICTE guidelines.

EMPLOYBLITY SKILLS PAPERS

1. Floriculture
2. Landscaping and Gardening
3. Mushroom Cultivation Technology
4. Community Forestry

1.FLORICULTURE (Theory)

ProgramName	**B.Sc.inBOTANY**	Semester	**V**
CourseTitle	**Floriculture (Theory)**		
CourseCode:	**BOT V1-A**	No.ofCredits	**03**
Contacthours	**45Hours**	DurationofSEA/Exam	**2hours**
FormativeAssessmentMarks	**40**	SummativeAssessmentMarks	**60**

CoursePre-requisite(s):

CourseOutcomes(COs):Afterthesuccessfulcompletionofthecourse,thestudentwillbeableto:.

CO1: Identify and describe the ornamental flowering plants.
CO2: Practice the methods of preparing soil and water, cultivation and propagation methods.
CO3: Design, prepare and apply appropriate combinations of plants and methods of cultivation for commercial setup.
CO4:Adapt to the job role of Floriculturist (employment/ entrepreneurship)

Contents	**45Hrs**
Unit1:	**15hrs**
Introduction to floriculture, tools and equipments. Study of diversity in shape, size, and colour of flowers (including basic botany, nomenclature, common name and general uses). Identification and preparation of an inventory of herbaceous flowering plants, climbers, shrubs, and trees around the campus. Study the various physico-chemical properties of soil.	
Unit2:	**15hrs**
Methods of preparation of floral beds, soil preparation, greenhouse design and fumigation methods. Methods of seed sowing and raising flowering plants through seeds, bulbs and through vegetative methods in planters, containers and in outdoor environments. Role of light, plant growth regulators and nutrients in blooming and flowering. Bacterial and fungal diseases and pests of ornamental flowers and their management.	
Unit3:	**15hrs**
Interior decoration methods, flower arrangements (Japanese, Western and Indian). Harvesting, methods to increase the shelf life of flowers, post-harvest care and marketing platforms for the floriculture industry. Field visit to nearby nursery/garden to understand basic aspects of Garden design. Five flowering plants that are grown commercially, their share in the global market, methods used for selling the products and importance of the floriculture industry in job creation.	

Pedagogy: Teachingandlearning,Seminar,Assignments,etc

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
Attendance	10
Test(Objectivetype)	10
Assignments	10
Seminar	10
Total	**40Marks**
FormativeAssessmentasperNEPguidelinesarecompulsory	

CourseTitle	**Floriculture(Practical)**	PracticalCredits	**02**
CourseCode	**BOTV2 -BP**	ContactHours	**45Hours**
FormativeAssessment	**25Marks**	SummativeAssessment	**25Marks**

PracticalContent

1. Common garden operations using different implements. Identification & practice Bio-fertilizer.
2. Handling of soils, purpose of nursery bed, potting media, potting etc.
3. Propagation by cutting, budding, greating.
4. Handling of seeds, bulbs, cut flowers, nursery plants, pot plants.
5. Acquaintance with soil types, various manures, fertilizers, Vermi compost, pesticides, growth regulator.
6. Systematic waste disposal keeping environment pollution in view

References

1	Randhawa, G.S., Mukhopadhyay, A. (1986). Floriculture in India. New York, NY: Allied Publishers.
2	Larson, R. A. (Ed.). (2012). Introduction to floriculture. Elsevier
3	Pal, S. L. (2019). Role of plant growth regulators in floriculture: An overview. J. Pharmacogn. Phytochem, 8, 789-796.
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5	Subha Rao, N.S. 2000, Soil Microbiology, Oxford & IBH Publishers, New Delhi.
6	Vayas,S.C, Vayas, S. and Modi, H.A. 1998 Bio-fertilizers and organic Farming AktaPrakashan, Nadiad

1. Landscaping and Gardening

ProgramName	**B.Sc.in BOTANY**	Semester	**V**
CourseTitle	**Landscaping and Gardening (Theory)**		
CourseCode:	**BOT V2-B**	No.ofCredits	**03**
Contacthours	**45 Hours**	DurationofSEA/Exam	**2hours**
FormativeAssessmentMarks	**40**	SummativeAssessmentMarks	**60**

CoursePre-requisite(s):	
CourseOutcomes(COs):Afterthesuccessfulcompletionofthecourse,thestudentwillbeableto:. CO1. Students would be able to identify the ornamental plants, CO2. They will have an understanding of cultivation methods, landscaping and making the flower arrangement. CO3.To understand the concept of different types of gardening practices CO4. Apply the basic principles and components of gardening CO5. Learn to design various types of formal and informal gardens CO6. Establish and maintain special types of gardens for outdoor and indoor landscaping	
Contents	**45Hrs**
Unit1:	**15hrs**
Introduction: History of gardening; Importance and scope of floriculture and landscape gardening. Landscaping Places of Public Importance: Landscaping highways and Educational institutions. Planning and layout (parks and avenues); gardening traditions - Ancient Indian, European, Mughal and Japanese Gardens; Specialized Gardens: Aquatic garden, Rock garden, Kitchen garden, Herb Garden, Butterfly garden, Botanical garden, English garden, Terrace garden	
Unit2:	**15hrs**
Gardening: definition, objectives and scope - different types of gardening - landscape and home gardening - parks and its components - plant materials and design - computer applications in landscaping. Urban forestry; policies and practices. Soil and its characteristics, Potting Mixtures, Essential soil elements, Mineral nutrition and Garden implements.	
Unit3:	**15hrs**
Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting. Sowing/raising of seeds and seedlings - Transplanting of seedlings - Study of cultivation of different vegetables. Propagation Methods: Seeds (Germination, Viability, Dormancy, Storage, Transplantation), Grafting, Cutting, Layering, Division, Budding, Scaling, Scoping, Microgreens. Introduction and methodology of hydroponics.	

Pedagogy: Teachingandlearning,Seminar,Assignments,etc

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
Attendance	10
Test(Objectivetype)	10
Assignments	10
Seminar	10
Total	**40Marks**
FormativeAssessmentasperNEPguidelinesarecompulsory	

References	
1	Nambisan KMP (1992) Design elements of Landscape gardening Oxford and IBH
2	Sudheer K P and Indira V (2007) Post harvest technology of Horticultural crops New India Publication agencies
3	Bose T K., Maiti R G., Duha R S and Das P (1999).Floriculture and LandscapingNaya Prakash
4	Biomass for renewable energy, fuels, and chemicals. D.L. Klass, Academic Press, http://www.sciencedirect.com/science/book/9780124109506
5	Sistemi a biomasse: progettazione e valutazioneeconomica. E. Bocci, A. Caffarelli, M. Villarini, A. D'Amato, MaggioliEditore, http://www.maggiolieditore.it/9788838759697- sistemi-a-biomasse-progettazione-e-valutazioneeconomica.html

2. Mushroom Cultivation Technology

Program Name	**B.Sc.in BOTANY**	Semester	**V**
CourseTitle	**Mushroom Cultivation Technology (Theory)**		
CourseCode:	**BOT V3-C**	No.ofCredits	**03**
Contacthours	**45Hours**	Duration of SEA/Exam	**2hours**
FormativeAssessmentMarks	**40**	SummativeAssessmentMarks	**60**

CoursePre-requisite(s):	
CourseOutcomes(COs):Afterthesuccessfulcompletionofthecourse,thestudentwillbeableto:. CO1: Identify edible types of mushroom CO2: Gain the knowledge of cultivation of different types of edible mushrooms and spawn production CO3: Manage the diseases and pests of mushrooms CO4: Learn a means of self-employment and income generation	
Contents	**45Hrs**
Unit1:	**15hrs**
Mushrooms -Taxonomical rank-History and Scope of mushroom cultivation-Edible and Poisonous Mushrooms-Vegetative characters. Button mushroom (Agaricusbisporus), Milky mushroom (Calocybeindica), Oyster mushroom (Pleurotussajorcaju) and paddy straw mushroom (Volvariellavolvacea).	
Unit2:	**15hrs**
Structure and construction of mushroom house, Sterilization of substrates, Spawn production - culture media preparation- production of pure culture, mother spawn, and multiplication of spawn. Composting technology, mushroom bed preparation, Spawning spawn running, harvesting. Cultivation of oyster and paddy straw mushroom Problems in cultivation - diseases, pests and nematodes, weed moulds and their management strategies.	
Unit3:	**15hrs**
Nutritional and medicinal values of mushrooms, (Medicine mushroom, Shiitake, Ganoderma, Cremini Enoki species) Therapeutic aspects- antitumor effect Preservation of mushrooms - freezing, drying, canning, quality assurance and entrepreneurship, Value added products of mushrooms.	

Pedagogy: Teachingandlearning,Seminar,Assignments,etc

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
Attendance	10
Test(Objectivetype)	10
Assignments	10
Seminar	10
Total	**40Marks**
FormativeAssessmentasperNEPguidelinesarecompulsory	

References	
1	Marimuthu, T. et al. (1991). Oster Mushroom, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore
2	Nita Bhal. (2000), Hand book on Mushrooms, 2nd ed. vol. 1 and 2 Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
3	Pandey R.K, S. K Ghosh, (1996). A Hand Book on Mushroom Cultivation, Emkey Publications
4	Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology, Agrobios, Jodhpur
5	Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation, Mittal Publication, New Delhi.
6	Tripathi, D.P. (2005) Mushroom Cultivation, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi
7	V.N. Pathak, Nagendra Yadav and Maneesha Gaur, Mushroom Production and Processing Technology/ Vedams EBooks Pvt Ltd., New Delhi (2000)

3. Community Forestry

ProgramName	**B.Sc.in BOTANY**	Semester	**V**
CourseTitle	**Community Forestry (Theory)**		
CourseCode:	**BOT V4-D**	No.ofCredits	**03**
Contacthours	**45Hours**	DurationofSEA/Exam	**2hours**
FormativeAssessmentMarks	**40**	SummativeAssessmentMarks	**60**

CoursePre-requisite(s):

CourseOutcomes(COs):Afterthesuccessfulcompletionofthecourse,thestudentwillbeableto:

CO1. To understand socio-economic, cultural and ecological relationship between forests and people.
CO2. Students acquaint with the role of people in forest management through analysis of need dependence and traditional interactions between forests and society.
CO3.Demonstrate ability to identify major forest ecosystems and describe their changes over time, with and without human influence/management.
CO4.Demonstrate knowledge of inter-temporal management and planning at the forest and landscape levels, and the ability to develop alternative management scenarios for forest lands for an array of objectives including forest products, environmental services, social amenities cultural and other resource values.

Contents	**45Hrs**
Unit 1:	**15hrs**
Forests and its importance, forest societies, interactions between forests and people, importance of forests in traditional farming systems, livestock economy and forests, social and cultural factors of forest management, man in ecosystem in relation to eco-philosopy. Afforestation programmes and forest conflicts, wildlife and human conflicts, important forest movements like Chippko/Appiko Movement, Gender dimension of forest management, tribal economy and forests. Pastoralists and their dependence on forests. Forests and livelihood security of tribals.	
Unit 2:	**15hrs**
Management of Commons and Common Property Resources (CPRs) and open access resources, forest management and sustainable livelihood strategies, forests and food security, eco-tourism and local development, land use change and forestry. Case studies of Padmashri Salumarada Timmakka and PadmashriTulasi Gowda.	
Unit 3:	**15hrs**
Forest rights, customary rights of people, community participation, biodiversity and ethnobotany, Joint Forest Management, global environmental change and land use; dams, forests and resettlement of tribals and non-triabals – case study, poverty alleviation and forests, tourism and forest management, role of NGOs and other CBOs community based organization in forest management.	

Pedagogy: Teaching and learning,Seminar, Assignments,etc

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
Attendance	10
Test(Objectivetype)	10
Assignments	10
Seminar	10
Total	**40Marks**
FormativeAssessmentasperNEPguidelinesarecompulsory	

References	
1	Annamalai R. 1999. Participatory Learning Action and Microplanning for JFM. Dean SFRC, Coimbatore
2	FAO. 1978. Forestry for Local Community Development. FAO Publ.
3	Shah SA. 1988. Forestry for People. ICAR.
4	Tiwari KM. 1988. Social Forestry and Rural Development. International Book Distr
5	Vyas GPD. 1999. Community Forestry. Agrobios.
6	Ref related to SalumaradaTimmakka and Tulasi Gowda

Pedagogy: Teachingandlearning,Seminar,Assignments,etc

FormativeAssessmentforTheory	
AssessmentOccasion/type	**Marks**
Attendance	10
Test(Objectivetype)	10
Assignments	10
Seminar	10
Total	**40Marks**
FormativeAssessmentasperNEPguidelinesarecompulsory	