

Syllabus
for
B.Sc. Botany

Department of Botany
Mahatma Gandhi University

Under Choice Based Credit System
2016

Mahatma Gandhi University, Nalgonda
B.Sc Botany CBCS Common Core Syllabus (wef 2016-2017).

PROPOSED SCHEME FOR B.Sc BOTANY PROGRAMME UNDER CHOICE BASED CREDIT SYSTEM				
FIRST YEAR SEMESTER-I				
<i>Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>HPW</i>	<i>Crdeits</i>
BS 101	Environmental Studies	AECC-1	2	2
BS 104	Optional I	DSC I-A	4 T 2 P = 6	4 + 1 = 5
Paper-I Microbial Diversity of Lower Plants				
SEMESTER-II				
<i>Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>HPW</i>	<i>Crdeits</i>
BS204	Optional-I	DSC-1B	4 T + 2P = 6	4 + 1 = 5
Paper-II Bryophytes Pteridophytes, Gymnosperms and Palaeobotany				
SECOND YEAR SEMESTER-III				
<i>Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>HPW</i>	<i>Crdeits</i>
BS304	Optional-I	DSC-IC	4 T + 2 P = 6	4 + 1 = 5
Paper-III Taxonomy of Angiosperms and Medicinal Botany				

SEMESTER-IV				
<i>Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>HPW</i>	<i>Crdeits</i>
BS404	Optional - I	DSC-ID	4 T + 2P = 6	4 + 1 = 5
Paper-IV Plant Anatomy, Embryology and Palynology				
THIRD YEAR SEMESTER-V				
<i>Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>HPW</i>	<i>Crdeits</i>
BS 503	Optional-I	DSC - IE	3 T + 2P = 5	3 + 1 = 4
Paper-V: Cell Biology and Genetics				
BS 506	Optional I A/B	DSE-I#	3T + 2P = 5	3 + 1 = 4
Paper-VI Elective-I Ecology and Biodiversity / Elective II: Horticulture				
SEMESTER-VI				
<i>Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>HPW</i>	<i>Crdeits</i>
BS 603	Optional-I	DSC - 1F	3 T + 2P = 5	3 + 1 = 4
Paper-VII : Plant Physiology				
BS 606	Optional A/B/	DSE - IF	3 T + 2P = 5	3 + 1 = 4
Paper-VIII Elective III Tissue Culture and Biotechnology / Elective-IV: Seed Technology				

AECC: Ability Enhancement Compulsory Course: DSC: Discipline Specific Course:

DSE : Discipline Specific Elective

B.Sc (CBCS) Botany- I year
Semester-I - Paper-I
Microbial Diversity of Lower Plants

DSC - 1A (4 hrs./week)

Theory Syllabus

Credits- 4
(60 hours)

UNIT - I

1. Brief account of Archaeobacteria, Actinomycetes. (4h)
2. Cyanobacteria: General characters, cell structure, thallus organisation and their significance as biofertilizers with special reference to *Oscillatoria*, *Nostoc* and *Anabaena*. (6h)
3. Lichens: Structure and reproduction; ecological and economic importance. (5h)

UNIT- II

4. Viruses: Structure, replication and transmission; plant diseases caused by viruses and their control with reference to Tobacco Mosaic and Rice Tungro. (7h)
- 5.. Bacteria: Structure, nutrition, reproduction and economic importance. An outline of plant diseases of important crop plants caused by bacteria and their control with reference to Angular leaf spot of cotton and Bacterial blight of Rice. (8h)
6. General account of Mycoplasma with reference to Little leaf of brinjal and Papaya leaf curl

UNIT-III

7. General characters, structure, reproduction and classification of algae (Fritsch) and thallus organization in algae. (3h)
8. Structure and reproduction of the following:
Chlorophyceae- *Volvox*, *Oedogonium* and *Chara*. (5h)
Phaeophyceae- *Ectocarpus* (2h)
Rhodophyceae- *Polysiphonia*. (3h)
9. Economic importance of algae in Agriculture and Industry. (2h)

UNIT-IV

10. General characters and classification of fungi (Ainsworth). (3h)
11. Structure and reproduction of the following:
(a) Mastigimycotina- *Albugo*
(b) Zygomycotina- *Mucor*
(c) Ascomycotina- *Saccharomyces* and *Penicillium*.
(d) Basidiomycotina- *Puccinia*
(e) Deuteromycotina- *Cercospora*. (10h)
12. Economic importance of fungi in relation to mycorrhizae and mushrooms. General account of mushroom cultivation (2h)

References:

1. Alexopolous, J. and W. M. Charles. 1988. Introduction to Mycology. Wiley Eastern, New Delhi.
2. Mckane, L. and K. Judy. 1996. Microbiology – Essentials and Applications. McGraw Hill, New York.
3. Pandey, B. P. 2001. College Botany, Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd, New Delhi.
4. Pandey, B. P. 2007. Botany for Degree Students: Diversity of Microbes, Cryptogams, Cell Biology and Genetics. S. Chand & Company Ltd, New Delhi.
5. Sambamurthy, A. V. S. S. 2006. A Textbook of Plant Pathology. I. K. International Pvt. Ltd., New Delhi.
6. Sambamurthy, A. V. S. S. 2006. A Textbook of Algae. I. K. International Pvt. Ltd., New Delhi.
7. Sharma, O. P. 1992. Textbook of Thallophyta. McGraw Hill Publishing Co., New Delhi.
8. Thakur, A. K. and S. K. Bassi. 2008. A Textbook of Botany: Diversity of Microbes and Cryptogams. S. Chand & Company Ltd, New Delhi.
9. Vashishta, B. R., A. K. Sinha and V. P. Singh. 2008. Botany for Degree Students: Algae. S. Chand & Company Ltd, New Delhi.
10. Vashishta, B. R. 1990. Botany for Degree Students: Fungi, S. Chand & Company Ltd, New Delhi.
11. Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.

**B.Sc (CBCS) Botany-I year
Semester-I - Paper-I
Microbial Diversity of Lower Plants**

Theory Model Question Paper

Time : 2 hrs

Max. Marks: 40

Draw well-labeled diagrams wherever necessary.

1. Write short notes on any FOUR of the following: -

4 X 2 = 8M

- a. Heterocyst.
- b. Citrus Canker.
- c. Nucule
- d. Cleistothecium.
- e. Mycoplasma
- f. *Mucor*

II. Essay Questions:

4 X 8 = 32M

1. a. Briefly describe the structure and reproduction of *Oscillatoria*.
(OR)

b. Describe the cyanophycean cell structure.

2. a. Describe the structure and modes of transmission of plant viruses.
(OR)

b. Write an essay on economic importance of Bacteria.

3. a. Describe the life cycle of *Oedogonium* with the help of well-labelled diagram .
(OR)

b. Give an account on thallus organization in algae.

4. a. Describe the life cycle of *Albugo* with the help of well-labelled diagram .
(OR)

b. Give a brief account on Mushroom cultivation.

B.Sc (CBCS) Botany-I year
Semester-I - Paper-I
Microbial Diversity of Lower Plants

Practical Syllabus

(45 hours)

1. Study of viruses and bacteria using electron micrographs (photographs). (3h)
2. Gram staining of Bacteria. (3h)
3. Study of symptoms of plant diseases caused by viruses, bacteria, Mycoplasma and fungi:
Viruses: Tobacco mosaic
Bacteria: Angular leaf spot of cotton and Rice tungro.
Mycoplasma: Little leaf of Brinjal and Leaf curl of papaya (3h)
Fungi: White rust on Crucifers, Rust on wheat & Tikka disease of Groundnut. (6h)
4. Vegetative and reproductive structures of the following taxa:
Algae: *Oscillatoria*, *Nostoc*, *Volvox*, *Oedogonium*, *Chara*, *Ectocarpus*
and *Polysiphonia*. (6 h)
Fungi: *Albugo*, *Mucor*, *Saccharomyces*, *Penicillium*, *Puccinia* and *Cercospora* (6h)
5. Section cutting of diseased material infected by Fungi and identification of pathogens as per theory syllabus. White rust of Crucifers, Rust on wheat & Tikka disease of Groundnut. (9h)
6. Lichens: Different types of thalli and their external morphology (3 h).
7. Examination of important microbial, fungal and algal products:
Biofertilizers, protein capsules, antibiotics, mushrooms, Agar-agar etc. (3h)
8. Field visits to places of algal / microbial / fungal interest (e.g. Mushroom cultivation, water bodies). (3h)

B.Sc (CBCS) Botany- I year
Semester-I - Paper-I
Microbial Diversity of Lower Plants

Practical Model Paper

Time : 2 1/2 hrs

Max. Marks: 25

1. Identify the given components 'A', 'B' & 'C' in the algal mixture .
Describe with neat labeled diagrams & give reasons for the classifications. **3 X 3 = 9M**
2. Classify the given bacterial culture 'D' using Gram – staining technique. **4M**
3. Take a thin transverse section of given diseased material 'E'.
Identify & describe the symptoms caused by the pathogen. **5M**
4. Identify the given specimens 'F', 'G' & 'H' by giving reasons .
(Fungal-1, Bacteria-1 & Viral-1) **3 X 1 = 3M**
5. Comment on the given slides 'I' & 'J' .
(Algae-1 , Fungi-1) **2 X 1 = 2M**
6. Record **2M**

B.Sc (CBCS) Botany- I year
Semester-II - Paper-II
Bryophytes, Pteridophytes, Gymnosperms and Paleobotany

DSC-1B (4 hrs./week)

Theory Syllabus

Credits- 4
(60 hours)

UNIT-I

1. Bryophytes: General characters and classification. (3h)
2. Structure, reproduction, life cycle and systematic position of *Marchantia*, *Anthoceros* and *Polytrichum*. (Development stages are not required). (10h)
3. Evolution of Sporophyte in Bryophytes. (2h)

UNIT-II

4. Pteridophytes: General characters and classification (Sporne's) (3h)
5. Structure, reproduction, life cycle and systematic position of *Rhynia*, *Lycopodium*, *Equisetum* and *Marsilea*. (10h)
6. Stellar evolution, heterospory and seed habit in Pteridophytes. (2h)

UNIT-III

7. Gymnosperms: General characters, structure, reproduction and classification (Sporne's). (4h)
8. Distribution and economic importance of Gymnosperms. (3h)
9. Morphology of vegetative and reproductive parts, systematic position and life cycle of *Pinus* and *Gnetum*. (8 h)

UNIT-IV.

10. Palaeobotany: Introduction, Fossils and fossilization ; Importance of fossils. (8 h)
11. Geological time scale; (4 h)
12. Bennettitales: General account. (3 h)

References:

1. Watson, E. V. 1974. The structure and life of Bryophytes, B. I. Publications, New Delhi.
2. Pandey, B. P. 2006. College Botany, Vol. II: Pteridophyta, Gymnosperms and Paleobotany. S. Chand & Company Ltd, New Delhi.
3. Sporne, K. R. 1965. Morphology of Gymnosperms. Hutchinson Co., Ltd., London.
4. Vashishta, P. C., A. K. Sinha and Anil Kumar. 2006. Botany - Pteridophyta (Vascular Cryptogams). S. Chand & Company Ltd, New Delhi.
5. Pandey, B. P. 2001. College Botany, Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd, New Delhi.
6. Pandey, B. P. 2007. Botany for Degree Students: Diversity of Microbes, Cryptogams, Cell Biology and Genetics. S. Chand & Company Ltd, New Delhi.
7. Thakur, A. K. and S. K. Bassi. 2008. A Textbook of Botany: Diversity of Microbes and Cryptogams. S. Chand & Company Ltd, New Delhi.
8. Vashishta, B. R., A. K. Sinha and Adarsha Kumar. 2008. Botany for Degree Students: Bryophyta. S. Chand & Company Ltd, New Delhi.
9. Vashishta, P. C., A. K. Sinha and Anil Kumar. 2006. Botany for Degree Students: Gymnosperms. Chand & Company Ltd, New Delhi.
10. Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.

**B.Sc (CBCS) Botany- I year
Semester-II - Paper-II
Bryophytes, Pteridophytes, Gymnosperms and Paleobotany**

Theory Model Question Paper

Time : 2 hrs

Max. Marks: 40

Draw well-labeled diagrams wherever necessary.

1 . Write short notes on any FOUR of the following: - **4 X 2 = 8M**

- a. Gemma cup.
- b. Protostele .
- c. *Pinus* pollen grain.
- d. *Ptilophyllum*.
- e. *Anthoceros* thallus
- f. Fossilization

II . Essay Questions: **4 X 8 = 32M**

- 1. a. Write about the structure & evolution of sporophyte in *Anthoceros* .
(OR)
b. Describe the gametophores of *Marchantia* .
- 2. a. Describe the anatomy of *Equisetum* stem & add a note on its ecological adaptations .
(OR)
b. Discuss in detail the internal structure of the sporocarp of *Marsilea* .
- 3. a. Describe the anatomy of *Pinus* needle with a well labeled diagram.
(OR)
b. Give an account of general characters of Gymnosperms.
- 4. a. Describe the general characters of Bennettitales .
(OR)
b. Write about economic importance of Gymnosperms.

B.Sc (CBCS) Botany- I year
Semester-II - Paper-II
Bryophytes, Pteridophytes, Gymnosperms and Paleobotany

(45 hours)

Practical Syllabus – 2016

1. Study of Morphology (vegetative and reproductive structures) and anatomy of the following
Bryophytes: *Marchantia*, *Anthoceros* and *Polytrichum*. (9 h)
2. Study of Morphology (vegetative and reproductive structures) and anatomy of the following
Pteridophytes: *Lycopodium*, *Equisetum* and *Marsilea*. (9 h)
3. Study of Anatomical features of *Lycopodium* stem, *Equisetum* stem and *Marsilea* petiole &
rhizome by preparing double stained permanent mounts. (12h)
4. Study of Morphology (vegetative and reproductive structures) of the following taxa:
Gymnosperms: *Pinus* and *Gnetum*. (6 h)
5. Study of Anatomical features of *Pinus* needle and *Gnetum* stem by preparing double stained
permanent mounts. (6h)
6. Fossil forms using permanent slides / photographs: *Rhynia* and *Cycadeoidea*. (3h)

B.Sc (CBCS) Botany- I year
Semester-II - Paper-II
Bryophytes, Pteridophytes, Gymnosperms and Paleobotany

Practical Model Paper

Time : 2 1/2 hrs

Max. Marks: 25

- 1 . Prepare a double stained permanent mount of the given material ' A ' (Pteridophyte)

Draw diagram & give reasons for identification. **7M**

- 2 . Prepare a double stained permanent mount of the given material ' B ' (Gymnosperms)

Draw diagram & give reasons for identification. **8M**

- 3 . Identify the given specimens C , D , E & F (Bryophyte – 2 , Pteridophyte – 1 & Gymnosperm – 1) **4 X 1 =4M**

- 4 . Identify the given slides G , H , I & J (Bryophyte – 2 , Pteridophyte – 1

& Gymnosperm – 1) **4 X 1 =4M**

- 5 . Record **2M**

B.Sc (CBCS) BOTANY- II YEAR
Semester-III - Paper-III
Taxonomy of Angiosperms and Medicinal Botany

DSC-1C (4 hrs./week)

Theory syllabus

Credits-4
(60 hours)

UNIT - I

1. Introduction: Principles of plant systematics, Types of classification: Artificial, Natural and Phylogenetic; Systems of classification: Salient features and comparative account of Bentham & Hooker and Engler & Prantle. An introduction to Angiosperm Phylogeny Group (APG). (7h)
- 2.. Current concepts in Angiosperm Taxonomy: Embryology in relation to taxonomy, Cytotaxonomy, Chemotaxonomy and Numerical Taxonomy. (4 h)
- 3.. Nomenclature and Taxonomic resources: An introduction to ICBN, Vienna code - a brief account. Herbarium: Concept, techniques and applications. (4 h)

UNIT-II

- 4.. Systematic study and economic importance of plants belonging to the following families:
Polypetalae : Annonaceae, Capparidaceae, Rutaceae, Fabaceae (Faboideae/papilionoideae, Caesalpinioideae, Mimosoideae), Cucurbitaceae
5. Gamopetalae: Apiaceae, Asteraceae, Asclepiadaceae, Lamiaceae
6. Monochalmydeae: Amaranthaceae, Euphorbiaceae, Monocotyledons: Orchidaceae and Poaceae. (15h)

UNIT - III

- 7.. Ethnomedicine: Scope, interdisciplinary nature, distinction of Ethnomedicine from Folklore medicine. (3h)
8. Outlines of Ayurveda, Sidda, Unani and Homeopathic systems of traditional medicine. Role of AYUSH, NMPB, CIMAP and CDRI. (5 h)
- 9.. Plants in primary health care: Common medicinal plants – Tippateega (*Tinospora cordifolia*), tulasi (*Ocimum sanctum*), pippallu (*Piper longum*), Karakaya (*Terminalia chebula*), Kalabanda (*Aloe vera*), Turmeric (*Curcuma longa*).
Evaluation of crude drugs. (7h)

UNIT-IV

10. Traditional medicine vs Modern medicine: Study of selected plant examples used in traditional medicine as resource (active principles, structure, usage and pharmacological action of modern medicine: Aswagandha (*Withania somnifera*), Sarpagandha (*Rauwolfia serpentina*), Nela usiri (*Phyllanthus amarus*), Amla (*Phyllanthus emblica*) and Brahmi (*Bacopa monnieri*). (8h)
11. Pharmacognosy: Introduction and scope. Adulteration of plant crude drugs and methods of identification - some examples. Indian Pharmacopoeia. (4h)
12. Plant crude drugs: Types, methods of collection, processing and storage practices. (3h)

References:

- Pandey, B. P. 2007. Botany for Degree Students: Diversity of Seed Plants and their Systematics, Structure, Development and Reproduction in Flowering Plants. S. Chand & Company Ltd, New Delhi.
- Rastogi, R. R. and B. N. Mehrotra. 1993. Compendium of Indian Medicinal Plants. Vol. I & Vol. II. CSIR, Publication and Information Directorate, New Delhi.
- Sivarajan, V. V. and I. Balasubramanian. 1994. Ayurvedic Drugs and their Plant Sources. Oxford and IBH, New Delhi.
- Stace, C. A. 1989. Plant Taxonomy and Biostatistics (2nd Ed.). Edward Arnold, London.
- Singh, G. 1999. Plant Systematics: Theory and Practice. Oxford and IBH, New Delhi.
- Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.
- Davis, P. H. and V. H. Heywood. 1963. Principles of Angiosperm Taxonomy. Oliver and Boyd, London.
- Heywood, V. H. 1965 . Plant Taxonomy. ELBS , London.
- Heywood, V. H. and D. M. Moore (Eds). 1984. Current Concepts in Plant Taxonomy. Academic Press, London.
- Jain, S. K. and V. Mudgal. 1999. A Handbook of Ethnobotany. Bishen Singh Mahendra Pal Singh, Dehradun.
- Jeffrey, C. 1982. An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge. London.
- Joshi, S. G. 2000. Medicinal Plants. Oxford and IBH, New Delhi.
- Kokate, C. and Gokeale- Pharmacognacy- Nirali Prakashan, NewDelhi.
- Lad, V. 1984. Ayurveda – The Science of Self-healing. Motilal Banarasidass, New Delhi.
- Lewis, W. H. and M. P. F. Elwin Lewis. 1976. Medical Botany. Plants Affecting Man's Health. A Wiley Inter science Publication. John Wiley and Sons, New York.

B.Sc (CBCS) BOTANY- II YEAR
Semester-III - Paper-III
Taxonomy of Angiosperms and Medicinal Botany

Theory Model Question Paper

Time: 2 hrs

Max. Marks: 40

Draw well-labeled diagrams wherever necessary.

1. Write short notes on any FOUR of the following: -

4 X 2 = 8M

- a. Artificial system of classification.
- b. Floral structure of Cucurbitaceae .
- c. Role of AYUSH and CIMAP.
- d. Active principles of *Phyllanthus niruri*.
- e. Herbarium
- f. *Aloe vera*

II. Essay Questions:

4 X 8 = 32M

- 1 a. Discuss in detail the Bentham and Hooker's system of classification and add a note on its merits and de-merits .
(OR)
b. Write an account on Chemotaxonomy.
- 2 a. Write salient features of the sub-family Fabaceae with a note on its economic importance .
(OR)
b. Discuss in detail the important characters of Asteraceae family with a note on its advanced characters.
- 3 a. Discuss the outline of Ayurvedic system of medicine.
(OR)
b. Write in detail organoleptic evaluation of *Ocimum sanctum* and its medicinal importance .
- 4 a. Discuss the morphological aspects of *Rauwolfia serpentina* and Discuss its medicinal importance .
(OR)
b. Write an account on methods of collection, processing and storage practices associated with Crude drugs.

B.Sc (CBCS) BOTANY- II YEAR
Semester-III - Paper-III
Taxonomy of Angiosperms and Medicinal Botany

Practical syllabus

(45 hours)

1. Systematic study of locally available plants belonging to the families prescribed in theory syllabus
(Minimum of one plant representative for each family) (24h)
2. Demonstration of herbarium techniques. (3 h)
3. Identification, medicinal value & active principle present in the following plants : Tulasi (*Ocimum sanctum*), Karakaya (*Terminalia chebula*), Kalabanda (*Aloe vera*). (6 h)
4. Ethnomedicinal value/practice of the following plants :
Aswagandha (*Withania somnifera*), Sarpagandha (*Rauwolfia serpentina*), Amla (*Phyllanthus emblica*) and
Brahmi (*Bacopa monnieri*). (6h)
5. Pharmacognosy:
Powder analysis : Pippalu (*Piper longam*), Nela usiri (*Phyllanthus niruri*),
Study of Organoleptic (sectional study) of the following:
Tippateega (*Tinospora cordifolia*) and Turmeric (*Curcuma longa*). (6h)
6. Candidate have to submit at least 30 herbarium sheets

B.Sc (CBCS) BOTANY- II YEAR
Semester-III - Paper-III
Taxonomy of Angiosperms and Medicinal Botany

Practical Model Paper

Time: 2 1/2 hrs

Max. Marks: 25

- | | |
|---|----|
| 1. Technical description of the given plant twig ' A ' | 9M |
| 2. Identify the given material ' B ' & write its medicinal properties | 3M |
| 3. Identify the specimen ' C ' & write organoleptic evaluation | 3M |
| 4. Identify the given material D ' & discuss the ethno medicinal value of it. | 3M |
| 5. Identify the given material ' E ' . Write the active principle and uses | 3M |
| 6. Herbarium | 2M |
| 7. Record | 2M |

B.SC (CBCS) BOTANY- II YEAR
Semester-IV- Paper IV
Plant Anatomy, Embryology and Palynology

DSC-1D (4 hrs./week)

Theory syllabus

Credits-4
(60 hours)

UNIT - I:

1. Meristems: Types, histological organization of shoot and root apices and theories. (3h)
2. Tissues and Tissue Systems: Simple, complex and special tissues. (6 h)
3. Leaf: Ontogeny, diversity of internal structure; stomata and epidermal outgrowths. (6 h)

UNIT-II

4. Stem and root anatomy: Vascular cambium - Formation and function. (3h)
5. Anomalous secondary growth of Stem - *Achyranthes*, *Boerhaavia*, *Bignonia*, *Dracaena*;
Root- *Beta vulgaris* (5h)
6. Wood structure: General account. Study of local timbers – Teak (*Tectona grandis*),
Rosewood, (*Dalbergia latifolia*), Red sanders, (*Pterocarpus santalinus*) Nallamaddi
(*Terminalia tomentosa*) and Neem (*Azadirachta indica*). (7h)

UNIT - III

7. Introduction: History and importance of Embryology. (2h)
8. Anther structure, Microsporogenesis and development of male gametophyte. (6h)
9. Ovule structure and types; Megasporogenesis; types and development of female gametophyte. (7h)

UNIT-IV

10. Pollination - Types; Pollen - pistil interaction. Fertilization. (4h)
11. Endosperm - Development and types. Embryo - development and types; Polyembryony
and Apomixis - an outline. (5h)
- 12.. Palynology- Pollen morphology, NPC system and application of Palynology. (6h)

References:

Bhattacharya et. al. 2007. A textbook of Palynology, Central, New Delhi.

Bhojwani, S. S. and S. P. Bhatnagar. 2000. The Embryology of Angiosperms (4th Ed.), Vikas Publishing House, Delhi.

M.R.Saxena- A textbook of Palynology.

Vashista- A textbook of Anatomy.

P.K.K.Nair- A textbook of Palynology.

Esau, K. 1971. Anatomy of Seed Plants. John Wiley and Son, USA.

Johri, B. M. 1984. Embryology of Angiosperms. Springer-Verlag, Berlin.

Kapil, R. P. 1986. Pollination Biology. Inter India Publishers, New Delhi.

Maheswari, P. 1971. An Introduction to Embryology of Angiosperms. McGraw Hill Book Co., London.

Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.

B.SC (CBCS) BOTANY- II YEAR
Semester-IV- Paper IV
Plant Anatomy, Embryology and Palynology

Theory Model Question Paper

Time: 2 hrs

Max. Marks: 40

Draw well labeled diagrams wherever necessary.

I. Write short notes on any FOUR of the following: -

4 X 2 = 8M

- a. Types of Stomata.
- b. parenchyma.
- c. Different types of Ovules.
- d. Exine stratification.
- e. Rose Wood
- f. Polyembryony

II . Essay Questions:

4 X 8 = 32M

- 1 a .Classify Meristems ? Discuss in detail the various types of meristems.
(OR)
b. Theories associated with root apices.
- 2 a. Primary and secondary structure of *Boerhaavia diffusa* stem.
(OR)
b . Describe in detail the wood structure of *Pterocarpus santalinus*.
- 3 a . Discuss different Embryo sacs studied by you.
(OR)
b. Describe the development of Male Gametophyte.
- 4 a. Describe in detail various steps in Fertilization.
(OR)
b. Discuss in detail the various applications of Palynology.

B.SC (CBCS) BOTANY- II YEAR
Semester-IV- Paper IV
Plant Anatomy, Embryology and Palynology

Practical syllabus

(45 hours)

Suggested Laboratory Exercises:

1. Demonstration of double staining technique. (3 h)
2. Tissue organization in root and shoot apices using permanent slides (3 h)
3. Preparation of double stained Permanent slides
- Primary structure: Root - *Cicer, Canna*; Stem – *Tridax, Sorghum* (6 h)
- Secondary structure: Root – *Tridax* sp.; Stem – *Pongamia*
- Anomalous secondary structure: Examples as given in theory syllabus. (6 h)
4. Stomatal types using epidermal peels. (3 h)
5. Microscopic study of wood in T.S., T.L.S. and R.L.S. (6 h)
6. Structure of anther and microsporogenesis using permanent slides. (3 h)
7. Structure of pollen grains using whole mounts - *Hibiscus, Acacia* and Grass). (3 h)
8. Pollen viability test using Evans Blue – *Hibiscus* (3 h)
9. Study of ovule types and developmental stages of embryosac. (3 h)
10. Structure of endosperm (nuclear and cellular); Developmental stages of dicot and monocot embryos using permanent slides. (3 h)
11. Isolation and mounting of embryo (using *Cymopsis / Senna / Crotalaria*) (3 h)

B.SC (CBCS) BOTANY- II YEAR
Semester-IV- Paper IV
Plant Anatomy, Embryology and Palynology

Practical Model Paper

Time: 2 1/2 hrs

Max. marks : 25

1. Prepare a double stained permanent mount of transverse section of
given material “ A “. **9M**

2. Prepare a temporary mount of epidermal peel of the given leaf
material “ B “ and identify the stomatal type . **4M**

3. Conduct the pollen viability test “ C “ (OR) Isolate the embryo from
the given material . **4M**

4. Identify and describe the specimens / slides with well labelled diagrams
(a) Embryology – D (b) Palynology – E (c) Anatomy – F **3 X 2 = 6M**

5. Record **2M**

**B.Sc Botany- III Year
Semester-V - Paper-V
Cell Biology and Genetics**

DSC-1E (3 hrs./week)

Theory Syllabus

Credits-3

Unit - I:

45 hours

1. Plant cell envelopes: Ultra structure of cell wall, molecular organization of cell membranes.(4h)
2. Nucleus: Ultra structure, Nucleic acids - Structure of DNA, types and functions of RNA. (4 h)
3. Chromosomes: Morphology, organization of DNA in a chromosome, Euchromatin and Heterochromatin, Karyotype. DNA Replication. Special types of chromosomes: Lampbrush Polytene and B - chromosomes. (7h)
4. Extra nuclear genome: Mitochondrial and plastid DNA, plasmids. (3 h)

Unit - II:

5. Cell division: Cell and its regulation; mitosis, meiosis and their significance (3h)
6. Mendelism: Laws of inheritance. Genetic interactions - Epistasis, Complementary, Supplementary and inhibitory genes. (5h)
7. Linkage: A brief account and theories of Linkage. Crossing over: Mechanism and theories of crossing over. (4 h)
8. Genetic maps: Construction of genetic maps with Two point and Three point test cross data. (3h)

Unit - III:

9. Mutations: Chromosomal aberrations - structural and numerical changes; Gene mutations, Transposable elements. (3 h)
10. Gene Organization- Structure of gene, Genetic code, Method of Replication of DNA in Eukaryotes & Prokaryotes (3h)
11. Mechanism of transcription in Prokaryotes and Eukaryotes, translation (4h)
12. Regulation of gene expression in prokaryotes (Lac and Trp. Operons). (2h)

References:

1. Sharma, A. K. and A. Sharma. 1999. Plant Chromosomes: Analysis, Manipulation and Engineering. Harward Academic Publishers, Australia.
2. Shukla, R. S. and P. S. Chandel. 2007. Cytogenetics, Evolution, Biostatistics and Plant Breeding. S.Chand & Company Ltd., New Delhi.
3. Singh, H. R. 2005. Environmental Biology. S. Chand & Company Ltd., New Delhi.
4. Snustad, D. P. and M. J. Simmons. 2000. Principles of Genetics. John Wiley & Sons, Inc., U S A.
5. Strickberger, M. W. 1990. Genetics (3rd Ed.). Macmillan Publishing Company.
6. Verma, P. S. and V. K. Agrawal. 2004. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Company Ltd., New Delhi.

**B.Sc Botany- III Year
Semester-V - Paper-V
Cell Biology and Genetics**

Theory Model Question Paper

Time : 2 hrs

Max. Marks: 40

Draw well-labeled diagrams wherever necessary.

I. Write short notes on any FOUR of the following: -

4 X 2¹/₂ = 10 M

- a. t-RNA
- b. Crossing over
- c. Transversions
- d. Cistron
- e. Karyotype
- f. Plasmids

II. Essay Questions:

3 X 10 = 30 M

1 a. Give a brief account of Heterochromatin and Euchromatin.

(OR)

b. Explain in detail the membrane model with reference to Fluid mosaic.

2 a. Discuss in detail Mendel's law of Inheritance.

(OR)

b. Explain Mitosis in detail with significance.

3 a. Discuss in brief account of construction of genetic maps.

(OR)

b. What are Mutations? Explain chromosomal aberrations.

**B.Sc (CBCS) Botany- III Year
Semester-V - Paper-V
Cell Biology and Genetics**

Practical Syllabus

(45 hours)

1. Demonstration of cytochemical methods: Fixation of plant material and nuclear staining for mitotic and meiotic studies. (6 h)
2. Study of various stages of mitosis using cytological preparation of Onion root tips. (6 h)
3. Study of various stages of meiosis using cytological preparation of Onion flower buds. (3 h)
5. Solving genetic problems related to monohybrid, dihybrid ratio incomplete dominance and interaction of genes (minimum of six problems in each topic). (12h)
6. Construction of linkage maps; two and three point test cross. (6 h)
7. Study of ultra structure of cell organelles using photographers. (6h)
8. Study of Special types of Chromosomes (6h)

**B.Sc Botany- III Year
Semester-V - Paper-V
Cell Biology and Genetics**

Practical Model Question Paper

Time : 2 1/2 hrs

Max. marks : 25

1. Prepare a cytological slide of given material A and identify & describe any two stages with well labeled diagrams. (8 marks)
2. Solve genetic problems B related to dihybrid ratio or incomplete dominance (6marks)
3. Solve the genetic problem C related to interaction of genes. (5 Marks)
4. Slides C-Cell organelles (2+2=4 marks)
D-Chromosomes
5. Record (2 marks)

B.Sc (CBCS) Botany-III Year
Semester-V - Paper VI
Elective I
Ecology & Biodiversity

DSE-1E (3 hrs./week)

Theory Syllabus

Credits-3
(45 hours)

UNIT - I

1. Concept and components of Ecosystem. Energy flow, food chains, food webs, ecological pyramids, Biogeochemical cycles - Carbon Cycle (4h)
2. Definition of Environment: Atmosphere (Troposphere, Stratosphere, Mesosphere, Ionosphere), Hydrosphere, Lithosphere & Biosphere. (3h)
3. Plants and environment: Ecological factors - Climatic (Light and Temperature), and biotic. Ecological adaptations of plants. (5h)
4. Edaphic Factors: Soil- Formation- Weathering, mode of formation-residual; Transported: Colluvial, Alluvial, Glacial & Eolian. Soil erosion & Conservation. (4h)

UNIT - II

5. Population ecology: Natality, Mortality, Growth curves, Ecotypes & Ecads. (4h)
6. Community ecology: Frequency, density cover, Life forms & Biological spectrum. (4h)
7. Community Dynamics: Succession - Serial stages, Modification of physical environment, Climax formation with reference to Hydrosere and Xerosere. (4h)
8. Production ecology: Concepts of productivity - Primary and Secondary Productivity. (4h)

UNIT- III

9. Biodiversity: Concepts, Convention of Biodiversity - Earth Summit (Copenhagen). (4h)
10. Biodiversity- Levels, threats and value (3h)
11. Hot spots of India - North Eastern Himalayas, Western Ghats; Endemism. (3 h)
IUCN categories, RED data book
12. Principles of conservation – *In situ* and *Ex situ*. Role of organizations in the conservation of Biodiversity - WWF and NBPGR. (3h)

References:

1. Bharucha, E. 2005. Textbook of Environmental Studies for Undergraduate Courses. Universities Press (India) Private Limited, Hyderabad.
2. Khitoliya, R. K. 2007. Environmental Pollution – Management and Control for Sustainable Development. S. Chand & Company Ltd., New Delhi.
3. Michael, S. 1996. Ecology. Oxford University Press, London.
4. Mishra. D. D. 2008. Fundamental Concepts in Environmental Studies. S. Chand & Company Ltd., New Delhi.
5. Odum, E. P. 1983. Basics of Ecology. Saunder's International Students Edition, Philadelphia.
6. Sharma, P. D. 1989. Elements of Ecology. Rastogi Publications, Meerut.
7. Verma, P. S. and V. K. Agrawal. 2006. Genetics. S. Chand & Company Ltd., New Delhi

**B.Sc (CBCS) Botany-III Year
Semester-V - Paper VI
Elective I
Ecology & Biodiversity**

Practical Syllabus

45 hours

1. Study of plant communities by Quadrat Method (9h)
2. Estimation of carbonates and bicarbonates in the given water sample. (6h)
3. Determination of soil texture (composition of clay, sand silt etc.) and pH. (6h)
4. Study of morphological and anatomical characteristics of plant communities using locally available plant species: Hydrophytes (*Eichhornia, Hydrilla, Pistia, Nymphaea, Vallisneria*), Xerophytes: (*Asparagus, Opuntia, Euphorbia spp*), Halophytes (*Rhizophora, Avicennia*). (12h)
5. Value of biodiversity a) Medicinal value: *Catharanthus, Tinospora* and *Emblica* (12h)
b) Timber Value: *Acacia, Tectona* and *Azadirachta*
c) Aesthetic Value: *Mangifera, Ficus, Ocimum*

**B.Sc (CBCS) Botany-III Year
Semester-V - Paper VI
Elective I
Ecology & Biodiversity**

Theory Model Question Paper

Time : 2 hrs

Max. marks : 40

Draw well-labelled diagrams wherever necessary.

I. Write short notes on any FOUR of the following: -

4 X 2¹/₂ = 10 M

- a. Food chain.
- b. Ecad.
- c. Ecesis.
- d. Endemism.
- e. RED data book
- f. Zoo park

II. Essay Questions:

3 X 10= 30 M

1 a. Describe the structure and function of Ecosystem.

(OR)

b. What is Biogeochemical cycle? Explain in detail Nitrogen cycle.

2 a. Explain soil erosion, its types and methods of soil conservation

(OR)

b. Explain Raunkier's life forms.

3 a. Define succession. Explain Hydrarch succession in detail.

(OR)

b. Give a detail account on Productivity.

**B.Sc (CBCS) Botany-III Year
Semester-V - Paper VI
Elective I
Ecology & Biodiversity**

Practical Model Question Paper

Time: 2 1/2 hrs

Max. marks : 25

1. Calculate the frequency and density of the given Quadrats A 8M
2. Estimate the amount of Carbonates/Bicarbonates present in the given water sample B. 5m
3. Comment on the specimens C, D & E (3+2=6m)
4. Identify the given slides F & G (Halophytes, Hydrophytes & Xerophytes) (2+2=4m)
5. Record (2m)

B.Sc (CBCS) BOTANY: III YEAR
Semester-V - Paper VII
Elective II
Horticulture

DSE-1E (3 hrs./week)

Theory Syllabus

Credits-3
(45 hours)

UNIT - I

1. Definition, branches, scope and economic importance of horticultural crops (4h)
2. Classification of horticultural crops based on -Climatic requirements, Season of growth, (6h)
3. Manures: Definition, importance of manures FYM (compost), oil cakes, green manure, Organic manures and vermi-compost. (5h)

UNIT - II

- 4.. Natural Propagation : By seeds, Vegetative Structures like Bulbs, Tubers, Corms, Rhizomes, Root stock, runners, Offsets and suckers . (4h)
- 5.. Artificial Propagation: Cutting, Layering, Grafting and Budding (4h)
6. Application of the following plant growth regulators in horticulture - (4h)
Auxins, Gibberellins, Cytokinins, Ethylene and Brassinosteroids.
7. Green house technology- definition, types, layout, construction, irrigation systems, care and attention, hardening of plants. (3h)

UNIT - III

8. Soil and climatic requirements of horticultural crops, Selection of site, planning, training, pruning and Cropping system; Garden implements and their uses. (5h)
9. Management: Orchard management, Nutrition management, Water management and Weed Management. (4h)
10. Organic Farming; Bonsai techniques. (6h)

References:

1. Bhattacharjee.S.K. 2006. Amenity Horticulture, Biotechnology and Post harvest technology. Pointer publishers. Jaipur
2. Chadha, K.L. 2001, Handbook of Horticulture, ICAR, New Delhi.
3. Chandra, R. and M. Mishra. 2003. Micropropagation of horticultural crops. International Book Distributing Co., Lucknow.
4. Chattopadhyaya, P.K.2001. A text book on Pomology (Fundamentals of fruit growing) Kalyani Publication, New Delhi
5. Christopher, E.P. 2001. Introductory Horticulture, Biotech Books, New Delhi
6. Edmond, J.B. T.L.Senn, F.S. Andrews and P.G.Halfacre, 1975. Fundamentals of Horticulture, Tata MC. Graw Hill Publishing Co.New Delhi
7. George Acquaaah, 2002, Horticulture-principles and practices. Prentice-Hall of India pvt. Ltd., New Delhi.
8. Hartman, H.T. and Kester, D.E. 1986. Plant propagation – Principles and Practices – Prentice Hall of India Ltd., New Delhi.
9. Jacob John. P. 2008. A hand book of post harvest management of fruits and vegetables. Daya publishers.
10. Jitendra Singh. 2006. Basic Horticulture. Kalyani Publishers, New Delhi.
11. Rajan, S. and B.L. Markose. 2007. Propagation of horticultural crops. New India Publishing, New Delhi.
12. Shanmugavelu, K.G., N. Kumar and K.V. Peter. 2005. Production technology of spices and plantation crops. Agrobios, Jodhpur.
13. Singh, D.K. 2008. Hi-tech horticulture. Agrotech publishers, Udaipur
14. Singh, N.P. 2005. Basic concepts of fruit science. International Book Distributing Co., Lucknow.
15. Surendra Prasad and U. Kumar. 1999. Principles of horticulture, Agro-botanica, Bikaner, India.
16. Sureshkumar, P. Sagar and Manish Kanwat. 2009. Post harvest physiology and quality management of fruits and vegetables. Agrotech publishers, Udaipur
17. Utpal Banerjee. 2008. Horticulture. Mangal Deep publishers
18. Vijaikumar UmRao. 2008. Horticulture terms – Definitions and Terminology. IBD publishers, Dehradun
19. Adams, C.R. and M. P. Early. 2004. Principles of horticulture. Butterworth –Heinemam, Oxford University Press.
20. Bansil. P.C. 2008. Horticulture in India. CBS Publishers and Distributors, New Delhi.
21. Kumar, N.1997. Introduction to Horticulture, Rajalakshmi Publication, Nagercoil.

B.Sc (CBCS) BOTANY: III YEAR
Semester-V - Paper VII
Elective II
Horticulture

Practical Syllabus

(45 hours)

1. Garden tools and implements. (3h)
2. Identification and description of any two varieties/hybrids of tropical and subtropical vegetable, fruit, flower and ornamental crops. (3h)
3. Propagation practices by seed, Vegetative propagation (Rhizome, bulb, corm), cutting, layering, budding, grafting with two examples. (9h)
4. Seed propagation- seed treatments, sowing and seedling production. (6h)
5. Nursery practices, transplanting, field preparation, sowing/planting, use of herbicides, top dressing of fertilizers and use of growth regulators. (6h)
6. Nursery containers, media, potting and repotting of plants, hardening of plants in nursery, shade regulation in nursery, plant protection in nursery plants (Demonstration) (6h)
7. Packing nursery plants for local and long distance markets. (Demonstration) (3h)
8. Making of organic-compost. (9h)

B.Sc (CBCS) BOTANY: III YEAR
Semester-V - Paper VII
Elective II
Horticulture

Practical Model Paper

Time: 2 1/2 hrs

Max. marks : 25

1. Major Experiment A (8marks)
Air Layering
(OR)
Grafting
2. Minor Experiment B (6marks)
Nutritive value of vegetable or fruit
(OR)
Making of organic compost
3. Spotters (3x3=9marks)
C. Vegetative propagative organ
D. Horticulture- Garden tools
E. Floriculture- Bonsai
4. Record (2marks)

B.Sc (CBCS) Botany: III Year
Semester-VI - Paper-VIII
Plant Physiology

DSC-1F (3hrs./week)

Theory Syllabus

Credits-3
(45 hours)

UNIT - I

1. Water Relations: Importance of water to plant life, physical properties of water, diffusion, imbibition, osmosis; water, osmotic and pressure potentials; absorption, transport of water, ascent of sap; transpiration; Stomatal structure and movements. (7h)
2. Mineral Nutrition: Essential macro and micro mineral nutrients and their role; symptoms of mineral deficiency. (3h)
3. Stress physiology: concept and plant responses to water, salt and temperature stresses (2h)
4. Translocation of organic substances: Mechanism of phloem transport; source-sink relationships. (2h)

UNIT- II

5. Enzymes: Nomenclature, characteristics, mechanism and regulation of enzyme action, enzyme kinetics, factors regulating enzyme action. (4h)
6. Photosynthesis: Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect; concept of two photosystems; mechanism of photosynthetic electron transport and evolution of oxygen; Factors effecting Photosynthesis, photophosphorylation. (4h)
7. Carbon assimilation pathways: C₃, C₄ and CAM. (4h)
8. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle; electron transport system, mechanism of oxidative phosphorylation, pentose phosphate pathway. (6h)

UNIT - III

9. Nitrogen Metabolism: Biological nitrogen fixation, nitrate reduction, ammonia assimilation, (GS-GOGAT, transamination) (4h)
10. Lipid Metabolism: Structure and function of lipids. (3h)
11. Growth and Development: Physiological effects of phytohormones—Auxins, gibberellins, cytokinins, ABA, ethylene and Brassinosteroids (3h)
12. Physiology of flowering and photoperiodism. Role of Phytochrome in flowering. (3h)

References:

1. Hopkins, W. G. 1995. Introduction to Plant Physiology. John Wiley & Sons Inc., New York, USA
2. Jain, J.L., S. Jain and Nitin Jain. 2008. Fundamentals of Biochemistry. S. Chand & Company Ltd., New Delhi.
3. Pandey, B. P. 2007. Botany for Degree Students: Plant Physiology, Biochemistry, Biotechnology, Ecology and Utilization of Plants. S. Chand & Company Ltd., New Delhi.
4. Salisbury, F. B. and C. W. Ross. 1992. Plant Physiology. 4th edn. (India Edition), Wordsworth, Thomson Learning Inc., USA.
5. Taiz, L. and E. Zeiger. 1998. Plant Physiology (2nd Ed.). Sinauer Associates, Inc., Publishers, Massachusetts, USA.
6. Dutta A.C. 2016. Botany for Degree Students. Oxford University Press.

**B.Sc (CBCS) Botany: III Year
Semester-VI - Paper-VIII
Plant Physiology**

Theory Model Question Paper

Time : 2 hrs

Max. Marks: 40

Draw well labeled diagrams wherever necessary.

I. Write short notes on any FOUR of the following: -

4 X 2¹/₂ = 10 M

- a. Plasmolysis
- b. Role of Zinc
- c. Respiratory quotient
- d. Red drop Effect
- e. Types of stomata
- f. Auxins

II. Essay Questions:

3 X 10 = 30 M

1 a. Write a note on theories of stomatal movement regarding transpiration.

(OR)

b. Describe plant responses to water, salt and temperature.

2 a. Give an account of IUB system of classification, with a note on enzyme action.

(OR)

b. Discuss Calvin cycle.

3 a. Give an account on Kreb's cycle.

(OR)

b. Give a brief account on Nitrogen Fixation.

B.Sc (CBCS) Botany: III Year
Semester-VI - Paper-VIII
Plant Physiology

Practical Syllabus

(45 hours)

1. Determination of osmotic potential of vacuolar sap by Plasmolytic method using leaves of *Rheodiscolor* / *Tradescantia*. (6h)
2. Determination of rate of transpiration using Cobalt chloride method (3h)
3. Determination of stomatal frequency using leaf epidermal peelings / impressions (6h)
4. Determination of catalase activity using potato tubers by titration method (6h)
5. Separation of chloroplast pigments using paper chromatography technique (12h)
6. Estimation of protein by Biurette method (6h)
7. Mineral deficiency- Detail study of Micronutrients and Macro nutrients (3h)
8. Identification of C₃, C₄ and CAM plants (3h)

**B.Sc (CBCS) Botany: III Year
Semester-VI - Paper-VIII
Plant Physiology**

Practical Model paper

Time : 2 ¹/₂ hrs

Max. marks: 25

**I. Major Experiment: A
(9marks)**

1. Determination of Osmotic potential of vascular sap- plasmolytic method.
2. Determination of Catalase activity – Potato, tubers by titration method.
3. Separation of Chloroplast pigments by paper chromatography.
4. Estimation of proteins by Biuret Method.

II. Minor Experiment: B (7marks)

1. Determination of Stomatal frequency using leaf epidermal peel/impressions.
2. Determination of Rate of transpiration by Cobalt chloride method.

III. Identify and Comment on: C, D & E (3x2=6)

Micronutrient Deficiency / Macronutrients Deficiency /C3, C4 and CAM plants.

IV. Record (2marks)

B.Sc (CBCS) Botany-III Year
Semester-VI – Paper-IX
Elective III
Tissue Culture and Biotechnology

DSE-1F (3 hrs./week) Theory Syllabus

Credits-3
(45 hours)

UNIT - I

1. Tissue culture: Introduction, sterilization procedures, explants, culture media – composition and preparation; Micropropagation. (5h)
2. Organ culture: Vegetative Organs-Root, Shoot, Leaf culture (6h)
Reproductive Organs-Anther, Ovary, Ovule, Embryo culture
3. Callus culture, Cell and Protoplast culture (4h)
4. Somatic hybrids and Cybrids. (4h)

UNIT- II

5. Applications of tissue culture: Production of pathogen free plants and somaclonal variants, production of stress resistance plants, secondary metabolites and synthetic seeds. (6h)
6. Production of hairy roots and its applications in production of secondary metabolites. (2h)
7. Biotechnology: Introduction, history, scope and applications. (3h)
8. rDNA technology: Basic aspect of of gene cloning, Enzymes used in gene cloning-Restriction enzymes, Ligases, Polymerases. (4h)

UNIT- III

9. Gene cloning-Vectors – cloning vehicles (Plasmid , Cosmids, Bacteriophages , & Phasmids) application of r DNA technology. (5h)
10. Gene Libraries: Genomic Libraries, cDNA Libraries, Polymerase chain reaction and its applications. (4h)
11. Method of gene transfer in plants (*Agrobacterium* and Microprojectile) (4h)
12. Production of transgenic plants, Bt –application in cotton and brinjal. Application of Transgenic in crop improvement. (3h)

References:

1. Balasubramanian, D., C. F. A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman. 2004.
2. Biotechnology. Universities Press (India) Private Limited, Hyderabad.
3. Channarayappa. 2007. Molecular Biotechnology – Principles and Practices. Universities Press
Private Limited, Hyderabad.
4. (India) Private Limited, Hyderabad.
5. Chawala, H. S. 2002. Introduction to Plant Biotechnology. Oxford & IBH Publishing Company,
New Delhi.
6. New Delhi.
7. Dubey, R. C. 2001. A Textbook of Biotechnology. S. Chand & Company Ltd., New Delhi
8. Edmond, J. B., T. L. Senn, F. S. Adrews and R. J. Halfacre. 1977..
9. Jha, T.B. and B. Ghosh. 2005. Plant Tissue Culture – Basic and Applied. Universities Press
(India)
Private Limited, Hyderabad..
10. Private Limited, Hyderabad..
11. Ramawat, K. G. 2008. Plant Biotechnology. S. Chand & Company Ltd., New Delhi.
12. Salisbury, F. B. and C. W. Ross. 1992. Plant Physiology. 4th edn. (India Edition),
Wordsworth,
13. Thomson Learning Inc., USA..

B.Sc (CBCS) Botany-III Year
Semester-VI – Paper-IX
Elective III
Tissue Culture and Biotechnology

Theory Model Paper

Time: 2 hrs

Max. marks: 40

Draw well labeled diagrams wherever necessary.

I. Write short notes on any FOUR of the following: -

4 X 2¹/₂ = 10 M

- a. Explant.
- b. Somatic cybrid.
- c. Plasmid.
- d. Bt- Cotton
- e. Synthetic seeds
- f. Shoot culture

II. Essay Questions:

3X 10= 30 M

1a. Write a note on Anther culture and its application.

(OR)

b. Give an account on technique in plant Tissue culture.

2 a. Describe the process of protoplast culture and its applications.

(OR)

b. Explain the *invitro* production of secondary metabolites.

3 a. Describe the procedure of r-DNA technology.

(OR)

b. Discuss in detail the various applications of Biotechnology

B.Sc (CBCS) Botany-III Year
Semester-VI – Paper-IX
Elective III
Tissue Culture and Biotechnology

Practical Syllabus

Major Experiments:

1. Estimation of plant DNA. (Tomato) (6h)
2. Production of synthetic seeds /Encapsulation of embryo (3 h)
3. Preparation of plant tissue culture medium. (6h)

Minor Experiments:

4. Callus Micropropagation (3h)
5. Demonstration of Micropropagation/ multiple shoots (6h)
6. Anther culture (3 h)
7. PCR –Demonstration (3h)
8. Study of biotechnology products: Samples of antibiotics and vaccines (6h)
9. Photographs of transgenic plants – Bt Cotton, Bt –Brinjal. (3h)
10. Instruments used in Biotechnology lab- Autoclave, Laminar air flow, Hot air oven and Incubator. (6h)

B.Sc (CBCS) Botany-III Year
Semester-VI – Paper-IX
Elective III
Tissue Culture and Biotechnology

Practical Model Paper

Time: 2 1/2 hrs

Max. marks : 25

- 1.. Major Experiment **A** (9 marks)
Estimation of DNA
(OR)
Production of synthetic seeds /Encapsulation of embryo
- 2.. Minor Experiment **B** (5 marks)
Callus/ Micropropagation/Multiple shoots
3. Spotters (3x3=9 marks)
C. Vaccines
D. Antibiotics
E. Transgenic/ instruments
4. Record (2 marks)

B.Sc (CBCS) BOTANY: III YEAR
Semester-VI – Paper-X
Elective IV
Seed Technology

DSE- 1F (3 hrs./week)

Theory Syllabus

Credits-3
(45 hours)

UNIT- I

1. Seed: Structure and types. Seed dormancy: causes and methods of breaking dormancy. (4h)
2. Seed storage: Long term and short term storage. Orthodox and recalcitrant seeds.
Packing of seeds – Principles, practices, bagging and labelling. (3h)
3. Physico and Bio-chemical changes during seed storage. (2h)
4. Seed viability, factors affecting seed viability and genetic erosion. (3h)

UNIT-II

5. Cultural practices and harvesting of Seed: Isolation, Sowing, Cultural practices, harvesting and threshing of the following crops: (9h)
a) Rice b) Cotton c) Sunflower
6. Seed Treatment to control seed borne disease –General account (3h)
7. Structure of pollen and ovule-Types of ovules, Collection and storage of pollen (3h)
8. Principles of hybrid seed production-Cross pollination, Emasculation, Self pollination, role of pollinators and their management. (6h)

UNIT-III

9. Seed development in cultivated plants, seed quality concept, importance of genetic purity of seed. Hybrid seed production and Heterosis. (4h)
10. Seed production technology; seed testing- Procedures of seed testing, seed testing laboratories and importance of seed testing.
11. Seed certification- History, Seed certification agency, Indian minimum, general and specific seed certification standard. (3h)
12. Seed banks- National, International and Millennium seed banks. (3h)

References:

1. Agrawal, P. K. 1993. Hand Book of Seed Technology. Dept. of Agriculture and Cooperation. National Seed Corporation Ltd., New Delhi
2. Balasubramanian, D., C. F. A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman. 2004. Biotechnology. Universities Press (India) Private Limited, Hyderabad.
3. Bedell, Y. E. Seed Science and Technology. Indian Forest Species. Allied Publishers Limited, New Delhi.
4. Channarayappa. 2007. Molecular Biotechnology – Principles and Practices. Universities Press (India) Private Limited, Hyderabad.
5. Chawala, H. S. 2002. Introduction to Plant Biotechnology. Oxford & IBH Publishing Company, New Delhi.
6. Dubey, R. C. 2001. A Textbook of Biotechnology. S. Chand & Company Ltd., New Delhi
7. Edmond, J. B., T. L. Senn, F. S. Adrews and R. J. Halfacre. 1977..
8. Hartman, H. T. and D. E. Kestler. 1976. Plant Propagation: Principles and Practices. Prentice & Hall of India, New Delhi.
9. Jha, T.B. and B. Ghosh. 2005. Plant Tissue Culture – Basic and Applied. Universities Press (India) Private Limited, Hyderabad..
10. Ramawat, K. G. 2008. Plant Biotechnology. S. Chand & Company Ltd., New Delhi.
11. Salisbury, F. B. and C. W. Ross. 1992. Plant Physiology. 4th edn. (India Edition), Wordsworth, Thomson Learning Inc., USA..
12. Tiwari, G. N. and R. K. Goal. Green House Technology – Fundamentals, Design, Modelling and Application. Narosa Publishing House, New Delhi.
13. Tunwar, N. S. and S. V. Singh. 1988. Indian Minimum Seed Certification Standards. The Central Seed Certification Board, Govt. of India, New Delhi.

B.Sc (CBCS) BOTANY: III YEAR
Semester-VI – Paper-X
Elective IV
Seed Technology

Theory Model Paper

Max. Marks: 40

Note: Answer all questions. Draw well labeled diagrams wherever necessary.

1. Short notes: Answer all questions:

4 X 2¹/₂ = 10 M

- a. Horticulture
- b. Organic farming
- c. Ethylene
- d. Pruning

Essays: Answer all questions:

3 X 10=30 M

1 a. Scope and importance of Horticultural crops

(OR)

b. Give an account on Nutritive Value of any two vegetable crops.

2.a. What is vegetative propagation? Describe briefly the various methods of vegetative propagation.

(OR)

b. Write a note on different types of manures and its application.

3.a. Define phytohormones and discuss the role of auxins and gibberlins as plant growth hormones

(OR)

b. Write an essay on green house, poly house and mist chamber.

B.Sc (CBCS) BOTANY: III YEAR
Semester-VI – Paper-X
Elective IV
Seed Technology

Practical syllabus

(45 hours)

Major Experiment

1. Testing of seed viability using 2, 3, 5-triphenyl tetrazolium chloride (TTC). (3h)
2. Estimation of amylase activity of germinating seeds (Qualitatively). (3h)
3. Demonstration of seed dressing using fungicides to control plant diseases. (3h)
4. Demonstration of seed dressing using Biofertilizers (BGA) to enrich nutrient supply. (3h)

Minor Experiments

5. Emasculation, bagging of flower for hybrid seed production. (6h)
6. Dissection of Dicot embryo (bean) and Monocot embryo (maize). (6h)
7. Pollen viability test using Evan's blue staining. (*Hibiscus*). (3h)
8. Harvesting and Importance of following seeds:
Rice,
Maize,
Cotton,
Groundnut and
Sunflower. (6h)
9. Types of ovules: Orthotropous, Anatropous and Campylotropous. (3h)
10. Structure of pollen grains: *Hibiscus* and grass. (3h)
11. Study visits to research institutes, seed tests and certification laboratories and places seed banks. (6h)

B.Sc (CBCS) BOTANY: III YEAR
Semester-VI – Paper-X
Elective IV
Seed Technology

Practical Model paper

Time: 2 1/2 hrs

Max. marks : 25

1. Major Experiment A. (9marks)
 - a. Estimation of amylase activity in germinating seeds.
(OR)
 - b. Seed viability test by triphenyl tetrazolium chloride (TTC)
2. Minor Experiment B. (5marks)
 - a. Dissection of Dicot/ Monocot embryo.
(OR)
 - b. Emasculation/ bagging of flower.
3. Spotters (3x3=9marks)
 - C. Types of ovules.
 - D. Types of pollen grains.
 - E. Importance of following seeds: rice, cotton and sunflower.
4. Record (2marks)