DETAILED SYLLABUS OF 2nd SEMESTER

Title of the Course : Morphology and Reproduction of Spermatopythes
Course Code : BOTC2
Nature of the Course : MAJOR/CORE COURSE II
Total Credits : 04
Distribution of Marks : 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES:*The objective of this course is to provide knowledge to the students on Gymnosperms and Angiosperms with their morphology, mode of reproduction, patterns of embryo development and economic and ecological importance.*

UNITS	CONTENTS	L	T	P	Total Hours
I 16 MARKS	**Gymnosperms** General characteristics, classification, morphology, anatomy and reproduction of Cycas, Pinus, Ginkgo and Gnetum; Patterns of embryo development in gymnosperms. Ecological and economic importance. **Fossil plants:** Process of fossilization; early land plants; *Rhynia*, *Cycadeoidea*, *Sphenophyllum*; Geological time scale; importance of fossil study.	10	02		14
II 12 MARKS	**Morphology of Angiosperms:** Morphology and types of root, stem, and leaves; phyllotaxy and venation, hairs and trichomes, inflorescence and its types; aestivation. Arrangement and types of reproductive parts of flower, placentation and its types.	09	01		11
III 16 MARKS	**Anther and pollen biology:** Anther wall: structure and functions, microsporogenesis, callose deposition and its significance; microgametogenesis; pollen wall structure, MGU (male germ unit) structure, NPC system; palynology and scope (a brief account); pollen wall proteins; pollen viability, storage and germination. **Ovule:** Structure and types of ovule; female gametophyte–megasporogenesis (monosporic, bisporic and tetrasporic) and megagametogenesis.	10	02	-	07
IV 16 MARKS	**Pollination, fertilization and post fertilization developments:** Pollination types and significance; adaptations for pollination; Double fertilization; Structure and types; general pattern of development of dicot and monocot embryo and endosperm; suspensor: structure and functions; embryo-endosperm relationship; nutrition of embryo;polyembryony, apomixes and parthenocarpy self, incompatibility**.**	10	01		15

Practicals 20 marks	**1.** Study of morphology and reproductive parts of *Cycas, Pinus, Ginkgo*&*Gnetum.* 2. Study of Fossil plants (Photographs/specimen). 3. Study of different types of roots (Morphology only). 4.Types of leaves, venation, hairs and trichomes, phyllotaxy, inflorescence and aestivation**.** 5.Typesof placentation and ovule (Preparation of temporary slides) 6. Study of pollen morphology and pollen tube formation. 7. Study of types of embryos and endosperms (Permanent slides/ photographs)			30	
	Total	**39**	**06**	**30**	**75**

Where, L: Lectures T: Tutorials P: Practicals

MODES OF IN-SEMESTER ASSESSMENT: (20 Marks)

- One Internal Examination - **10 Marks**
- Others (Any one) - **10 Marks**
  - Sessional Examinations
  - Assignment

LEARNING OUTCOMES:

1. Know the classification, morphology, reproduction and economic and ecological importance of Spermatophytes
2. Handling and observation of Spermatophytes

SUGGESTED READINGS:

1. Bhatnagar, S.P. &Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
2. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms, Vikas Publishing House. Delhi. 5th edition.
3. Shivanna, K.R. (2003). Pollen Biology and Biotechnology. Oxford and IBH Publishing Co. Pvt. Ltd. Delhi.
4. Raghavan, V. (2000). Developmental Biology of Flowering plants, Springer, Netherlands.
5. Johri, B.M. l (1984). Embryology of Angiosperms, Springer-Verlag, Netherlands.

Title of the Course : Morphology and Reproduction of Spermatopythes
Course Code : MINBOT2
Nature of the Course : Minor course-II
Total Credits : 04
Distribution of Marks : 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES:*The objective of this course is to provide knowledge to the students on Gymnosperms and Angiosperms with their morphology, mode of reproduction, patterns of embryo development and economic and ecological importance.*

UNITS	CONTENTS	L	T	P	Total Hours
I 16 MARKS	**Gymnosperms** General characteristics, classification, morphology, anatomy and reproduction of Cycas, Pinus, Ginkgo and Gnetum; Patterns of embryo development in gymnosperms. Ecological and economic importance. **Fossil plants:** Process of fossilization; early land plants; *Rhynia*, *Cycadeoidea*, *Sphenophyllum*; Geological time scale; importance of fossil study.	10	02		14
II 12 MARKS	**Morphology of Angiosperms:** Morphology and types of root, stem, and leaves; phyllotaxy and venation, hairs and trichomes, inflorescence and its types; aestivation. Arrangement and types of reproductive parts of flower, placentation and its types.	09	01		11
III 16 MARKS	**Anther and pollen biology:** Anther wall: structure and functions, microsporogenesis, callose deposition and its significance; microgametogenesis; pollen wall structure, MGU (male germ unit) structure, NPC system; palynology and scope (a brief account); pollen wall proteins; pollen viability, storage and germination. **Ovule:** Structure and types of ovule; female gametophyte–megasporogenesis (monosporic, bisporic and tetrasporic) and megagametogenesis.	10	02	-	07
IV 16 MARKS	**Pollination, fertilization and post fertilization developments:** Pollination types and significance; adaptations for pollination; Double fertilization; Structure and types; general pattern of development of dicot and monocot embryo and endosperm; suspensor: structure and functions; embryo-endosperm relationship; nutrition of embryo;polyembryony, apomixes and parthenocarpy self, incompatibility**.**	10	01		15
Practicals 20 marks	**1.** Study of morphology and reproductive parts of *Cycas, Pinus, Ginkgo*&*Gnetum.* 2. Study of Fossil plants (Photographs/specimen). 3. Study of different types of roots (Morphology only). 4.Types of leaves, venation, hairs and trichomes, phyllotaxy, inflorescence and aestivation**.** 5.Typesof placentation and ovule (Preparation of temporary slides) 6. Study of pollen morphology and pollen tube formation. 7. Study of types of embryos and endosperms (Permanent slides/ photographs)			30	
	Total	**39**	**06**	**30**	**75**

Where, ***L: Lectures*** ***T: Tutorials*** ***P: Practicals***

MODES OF IN-SEMESTER ASSESSMENT: **(20 Marks)**

- One Internal Examination - **10 Marks**
- Others (Any one) - **10 Marks**
  - Sessional Examinations
  - Assignment

LEARNING OUTCOMES:

1. Know the classification, morphology, reproduction and economic and ecological importance of Spermatophytes
2. Handling and observation of Spermatophytes

SUGGESTED READINGS:

3. Bhatnagar, S.P. &Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
4. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms, Vikas Publishing House. Delhi. 5th edition.
5. Shivanna, K.R. (2003). Pollen Biology and Biotechnology. Oxford and IBH Publishing Co. Pvt. Ltd. Delhi.
6. Raghavan, V. (2000). Developmental Biology of Flowering plants, Springer, Netherlands.
7. Johri, B.M. l (1984). Embryology of Angiosperms, Springer-Verlag, Netherlands.

Title of the Course : Plant Diversity and Human Welfare
Course Code : GECBOT2
Nature of the Course : Generic Elective Course-II
Total Credits : 03
Distribution of Marks : 80 (End Sem) + 20 (In-Sem)

COURSE OBJECTIVES:*The objective of this course is to provide knowledge to the students on biodiversity and its importance for human welfare.*

UNITS	CONTENTS	L	T	P	Total Hours
I 20 MARKS	Plant diversity and its scope- Genetic diversity, Species diversity, Plant diversity at the ecosystem level, Agrobiodiversity and cultivated plant taxa, wild taxa. Values and uses of Biodiversity: Ethical and aesthetic values, Precautionary principle, Methodologies for valuation, Uses of plants, Uses of microbes.	10	1	-	11
II 20 MARKS	Loss of Biodiversity: Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agrobiodiversity, Projected scenario for biodiversity loss, Management of Plant Biodiversity: Organizations associated with biodiversity management-Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR; Biodiversity legislation and conservations, Biodiversity information management and communication.	10	2	-	12
III 20 MARKS	Conservation of Biodiversity: Conservation of genetic diversity, speciesdiversity and ecosystem diversity, In situ and ex situ conservation, Socialapproaches to conservation, Biodiversity awareness programmes, Sustainable development.	10	1	-	11
IV 20 MARKS	Role of plants in relation to Human Welfare; a) Importance of forestry their utilization and commercial aspects b) Avenue trees, c) Ornamental plants of India. d) Alcoholic beverages through ages. Fruits and nuts: Important fruit crops their commercial importance. Wood and its uses.	10	01	-	11
	Total	**45**	**05**	**-**	**45**

Where, L: Lectures T: Tutorials P: Practicals

MODES OF IN-SEMESTER ASSESSMENT: (20 Marks)

- One Internal Examination - **10 Marks**
- Others (Any one) - **10 Marks**
  - Sessional Examinations
  - Assignment

LEARNING OUTCOMES:

1. Know the scope, dimension and importance and threats to plant diversity.
2. Conservation ways of biodiversity and its Sustainable utilization.
3. Acquire knowledge of biodiversity for human welfare.

SUGGESTED READINGS:

1. Krishnamurthy, K.V. (2004). An Advanced Text Book of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.

Title of the Course : Biofertilizers
Course Code : SEC218
Nature of the Course :Skill Enhancement Coursel-II
Total Credits : 03
Distribution of Marks : 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES:*The objective of this course is to provide knowledge to the students on biofertilizers, its importance and its production from different biological sources..*

UNITS	CONTENTS	L	T	P	Total Hours
I 15 marks	Factors affecting plant growth; essential nutrients; microbes used as biofertilizer (nitrogen fixers, phosphate solubilizers, PGPR) biocontrol agents.	08	-	-	08
II 15 marks	Cyanobacteria (blue green algae), *Azolla* and *Anabaena azo*llae association, process of nitrogen fixation, blue green algae and *Azolla*in rice cultivation.	08	-	-	08
III 15 marks	Mycorrhizal association, types of mycorrhizal association; colonization of AM – isolation and inoculum production of AM, and its influence on growth and yield of crop plants.	08	1	-	09
IV 15 marks	Organic farming – Green manuring and organic fertilizers, Recycling of bio-degradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.	12	1		13
Practical (20 MARKS)	Demonstration/field visit to biofertilizer producing units, identification of some common biofertilizers.			22	22
	Total	**36**	**02**	**22**	**60**

Where, L: Lectures T: Tutorials P: Practicals

MODES OF IN-SEMESTER ASSESSMENT: (20 Marks)

- One Internal Examination - **10 Marks**
- Others (Any one) - **10 Marks**
  - Sessional Examinations
  - Assignment

LEARNING OUTCOMES:

After the completion of this course, the learner will be able to:

1. Learn about the biofertilizers, its manufacturing processes.
2. Know about the role different organisms and bioresources in production of biofertilizers.
3. Able to identify the common biofertilizers.

SUGGESTED READINGS:

1. Dubey, R.C., 2005 A Text book of Biotechnology S.Chand& Co, New Delhi.
2. Kumaresan, V. 2005, Biotechnology, Saras Publications, New Delhi.
3. John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay Publication, New Delhi.
4. Sathe, T.V. 2004 Vermiculture and Organic Farming. Daya publishers.
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