

COPY FOR NAAC

**GOVERNMENT COLLEGE FOR WOMEN,
PARADE GROUND, JAMMU
(An Autonomous College)**

**BOTANY SYLLABUS
B.Sc. SEMESTER I-IV
UNDER
CHOICE BASED CREDIT SYSTEM (CBCS)**

AND

B.Sc. SEMESTER ^{Ist}~~I~~-VI

verified
SUN
24/7/2018

BOTANY (Semester-I)

(For examinations to be held in the years 2016, 2017, 2018)

Title: Diversity of Microbes & Cryptogams (Theory)

Duration of Exam: 3hrs

Maximum Marks: 100

Credits: 04

External Examination: 80 Marks

Internal Assessment: 20 Marks

UBOTC 101
Objectives: The course is designed to familiarize the students with microbes and cryptogams. These plant groups are of great human use in agriculture, horticulture, medical and biotechnology based industries. Therefore, students need to know about their structural diversity, biology and utilization.

Unit-I Microbes and Microbiology

- 1.1 General account of plant viruses (TMV), transmission and control; concept of viroids and prions.
- 1.2 Bacteria-Ultrastructure, nutrition and reproduction, general account of Mycoplasma and Cyanobacteria.
- 1.3 Genetic recombination in bacteria (transformation, transduction and conjugation).
- 1.4 Economic importance of bacteria and plant viruses.

Unit-II Algae

- 2.1 General characteristics and classification of algae (Parker, 1982) up to class level.
- 2.2 Important features of Chlorophyceae and Xanthophyceae; life histories of *Volvox*, *Oedogonium*, *Chara* and *Vaucheria*.
- 2.3 Important features of Phaeophyceae and Rhodophyceae; Life histories of *Ectocarpus* and *Polysiphonia*.
- 2.4 Economic importance of algae (as food and feed; algal blooms and toxins).

Unit-III Fungi

- 3.1 General characteristics and classification of fungi (Ainsworth 1971), Economic importance of fungi, General account of Lichens.
- 3.2 Important features of Mastigomycotina; Life histories of *Pythium* and *Allomyces*.
- 3.3 Important characteristics of Zygomycotina and Ascomycotina; Life histories of *Rhizopus*, *Eurotium* and *Morchella*.
- 3.4 Important characteristics of Basidiomycotina and Deuteromycotina; Life histories of *Puccinia*, *Agaricus*, *Colletotrichum* and *Cercospora*.

Unit-IV Bryophytes

4.1 Bryophytes as the earliest land dwellers; general characteristics, classification (Smith, 1955) and alternation of generations.

4.2 Structure and reproduction in Hepaticae with reference to *Marchantia*.

4.3 Structure and reproduction in Anthocerotae and Musci with reference to *Anthoceros* and *Funaria*.

4.4 Evolution of sporophyte in bryophytes; importance of bryophytes in preventing soil erosion; monitoring and controlling pollution; geobotanical prospecting; in horticulture and as source of antibiotics.

Unit-V Pteridophytes

5.1 General characteristics, classification (Sporne, 1975) and origin of pteridophytes (the first vascular plants); stelar system and alternation of generations.

5.2 Important characteristics of Psilopsida and Lycopsidea; Structure and reproduction in *Psilotum*, *Lycopodium* and *Selaginella* (excluding development).

5.3 Important characteristics of Sphenopsida; structure and reproduction in *Equisetum* (excluding development).

5.4 Important characteristics of Pteropsida; structure and reproduction in *Pteris* and *Marsilea* (excluding development).

Note for paper setters

External End Semester Examination (Total marks: 80) Time duration: 3 hours

The question paper will have 3 sections. **Section I:** Five (5) short answer questions representing all units i.e at least one from each unit (without detailed explanation having 70-80 words) of 3 marks each = 15 marks (All compulsory). **Section II:** Five (5) medium answer questions (with explanation having 250-300 words) of 7 marks each = 35 marks (All compulsory). **Section III:** Five (5) long answer questions (with detailed explanation/ of 500-600 words) covering all the units. The candidate will be required to answer only two questions of 15 marks each = 30 marks.

Internal Assessment (Total Marks: 20)

Time duration: 1 hr.

Suggested Readings

1. Bilgrami, K.S. and Saha L.C. 1992. A Textbook of Algae. CBS Publishers and Distributors, Delhi.
2. Dube, H.C. 1990. An Introduction to Fungi. Vikas Publishing House Pvt. Ltd., Delhi.
3. Parihar, N. S. 1996. The Biology and Morphology of Pteridophytes. Central Book Distributors, Allahabad.

4. 4. Puri, P. 1980. **Bryophyta: Broad prospectives.** Atma Ram & Sons, Delhi.
5. 5. Rashid A. 1976. **An Introduction to Pteridophytes- Diversity and Differentiation.** Vikas Publishing House.
6. 6. Smith, G.M. 1971. **Cryptogamic Botany. Vol-I: Algae & Fungi.** Tata McGraw Hill Publishing Co., New Delhi.
7. 7. Smith, G.M. 1971. **Cryptogamic Botany. Vol. II; Bryophytes & Pteridophytes.** Tata McGraw Hill Publishing Co., New Delhi.
8. 8. Sporne, K. R. 1970. **The Morphology of Pteridophytes.** Hutchinson Univ. Library, London.
9. 9. Sumbali, G. and Mehrotra, R. S. 2009. **Principles of Microbiology.** The McGraw Hill Education Pvt. Ltd. New Delhi.
10. 10. Sumbali G. 2010. **The Fungi. 2nd Edn.** Narosa Publishing House, New Delhi.

BOTANY (Semester-I)

(For examinations to be held in the years 2016, 2017, 2018)

Title: Diversity of Microbes & Cryptogams (Practical)

Duration of Exam: 3hrs.

Maximum Marks: 100 Credits: 02

External Examination: 50 Marks

Internal Assessment: 50 Marks

UBOTC-102
Suggested Laboratory Exercises

- 1. Study of the genera included under algae and fungi.**
- 2. Study of morphology, reproductive structures and anatomy of the examples cited in theory under Bryophyta and Pteridophyta.**
- 3. Observation of disease symptoms in hosts infected by fungi, viruses and mycoplasma. Section cutting of diseased materials and identification of the pathogens as per the theory syllabus.**
- 4. Gram staining of bacteria.**
- 5. Study of crustose, foliose and other types of lichen thalli.**

Note for distribution of 50 Marks in Practical Examination:

I. Internal Assessment

- 1. Day to Day performance in the laboratory: 12 Marks**
- 2. Test: 8 Marks**
- 3. Regularity of Attendance: 5 Marks**

II. External Assessment : 25 Marks

BOTANY (Semester-II)

(For examination to be held in the years 2016, 2017, 2018)

Title: Characteristics and Systematics of seed plants (Theory)

Duration of Exam: 3hrs

Maximum Marks: 100 Credits: 04

External Examination: 80 Marks

Internal Assessment: 20 Marks

UBOTC-201
Objectives: Gymnosperms and angiosperms represent the important botanical groups exhibiting great diversity. The course, therefore, is designed to study these groups for structural aspects and analyse these in a scientific manner for establishing their grouping.

UNIT-I: Seed Plants-Origin, Evolution and Characteristics

1.1 Fossilization –Processes and types, age of fossils and their importance.

1.2 Fossil gymnosperms - a general account; Bennettiales (Cycadeoidales)- history and distribution.

1.3 Characteristic features, morphology, anatomy and reproduction in Williamsonia and Cycadeoidea.

1.4 Fossil angiosperms – a general account.

UNIT-II Classification, Morphology and Reproduction in Gymnosperms

2.1 General characters of gymnosperms; classification of gymnosperms as proposed by Sporne (1965).

2.2 Morphology, anatomy, reproduction and life cycle of *Cycas*

2.3 Morphology, anatomy, reproduction and life cycle of *Pinus*.

2.4 Morphology, anatomy, reproduction and life cycle of *Ephedra*.

UNIT-III Angiosperm-Origin and Nomenclature

3.1 Origin of angiosperms, characteristics of some primitive angiosperms with special reference to Magnolia.

3.2 History of angiosperm taxonomy - classical and modern, species concept and speciation.

3.3 Taxonomic identification: taxonomic keys and literature (floras, monographs and reviews).

3.4 Botanical nomenclature- principles and rules, taxonomic ranks, type concept and principle of priority.

UNIT-IV Classification and Tools in Angiosperm Taxonomy

4.1 Salient features of the classification of Bentham and Hooker; merits and demerits.

4.2 Salient features of the classification of Engler and Prantl; merits and demerits.

4.3. Contribution of anatomy and embryology to taxonomy.

4.4 Contribution of cytology and phytochemistry to taxonomy.

UNIT-V Diversity of Angiosperms

5.1 Morphological diversity of families: Ranunculaceae, Brassicaceae, Malvaceae and Asteraceae.

5.2 Morphological diversity of families: Fabaceae, Rosaceae, Apiaceae and Acanthaceae.

5.3 Morphological diversity of families: Apocyanaceae, Solanaceae, Lamiaceae and Euphorbiaceae.

5.4 Morphological diversity of families: Liliaceae, Amaryllidaceae and Poaceae.

Note for paper setters

External End Semester Examination (Total marks: 80) Time duration: 3hours

The question paper will have 3 sections. Section I: Five (5) short answer questions representing all units i.e at least one from each unit (without detailed explanation having 70-80 words) of 3 marks each = 15 marks (All compulsory). **Section II:** Five (5) medium answer questions (with explanation having 250-300 words) of 7 marks each = 35 marks (All compulsory). **Section III:** Five (5) long answer questions (with detailed explanation/ of 500-600 words) covering all the units. The candidate will be required to answer only two questions of 15 marks each = 30 marks.

Internal Assessment (Total Marks: 20)

Time duration: 1 hr.

Suggested readings:

1. Bhatnagar, S.P. and Moitra, A. 1996. Gymnosperms. New Age International Limited, New Delhi. 2. Davis, P.H. and Heywood, V.H. 1963. Principles of Angiosperm Taxonomy. Oliver and Boyd, London.

3. Gifford, E.M. and Foster, A.S. 1988. Morphology and Evolution of Vascular Plants. W.H. Freeman and company, New York.

4. Jeffery, C. 1982. An Introduction to Plant Taxonomy. Cambridge University Press, London.

5. Jones, S.B. and Luchsinger, A.E. 1986. **Plant Systematics**. 2nd Edn. Mc Graw Hill Book Co., New York.
6. Radford, A.E. 1986. **Fundamentals of Plant Systematics**. Harper and Row, New York.
7. Singh, G. 1999. **Plant Systematics: Theory and Practice**. Oxford and IBH Pvt. Ltd., New Delhi.
8. Sporne, K.R. 1965. **The Morphology of Gymnosperms**. Hutchinson and Co. Ltd., London.
9. Stace, C.A. 1989. **Plant Taxonomy and Biosystematics**. 2nd Edn., Edward Arnold, London.
10. Stewart, W.M. 1983. **Paleobotany and the Evolution of Plants**. Cambridge University Press, Cambridge.

BOTANY (Semester-II)

(For examinations to be held in the years 2016, 2017, 2018)

Title: Characteristics and Systematics of seed plants. (Practical)

Duration of Exam: 3hrs

Maximum Marks: 100

Credits: 02 External Examination: 50 Marks Internal Assessment: 50 Marks

Course Code: UBOTC - 202

ANGIOSPERMS Locally available genera/species of following families should be included. This list is only indicative. Teachers may select plants available in their locality.

1. Ranunculaceae: *Ranunculus*, *Delphinium*
2. Brassicaceae: *Brassica*, *Alyssum*, *Iberis*, *Coronopus*
3. Malvaceae: *Hibiscus*, *Abutilon*
4. Asteraceae: *Tagetes*, *Ageratum*
5. Fabaceae: Faboideae: *Lathyrus*, *Cajanus*, *Melilotus*, *Trigonella*, Caesalpinioideae; *Cassia*, *Caesalpinia*, Mimosoideae: *Prosopis*, *Mimosa*, *Acacia*.
6. Apiaceae: *Coriandrum*, *Foeniculum*, *Anethum*
7. Acanthaceae: *Adhatoda*, *Peristrophe*
8. Apocynaceae: *Vinca*, *Thevetia*, *Nerium*
9. Asclepiadiaceae: *Calotropis*
10. Solanaceae: *Solanum*, *Withania*, *Datura*, *Petunia*
11. Euphorbiaceae: *Euphorbia*, *Phyllanthus*
12. Lamiaceae: *Ocimum*, *Salvia*
13. Chenopodiaceae: *Chenopodium*, *Beta*
14. Lilliacae: *Asphodelus*, *Asparagus*, *Allium*
15. Poaceae: *Zea mays*, *Triticum aestivum*, *Oryza sativa*

GYMNOSPERMS CYCAS

i. Habit, armour of leaf bases on the stem (if specimen is not available show photograph), very young (circinate venation) and old foliage leaves, scale leaves, bulbils, male cone (specimen), microsporophyll, megasporophyll, mature seed.

ii. Study through permanent slides-normal root (T.S), stem (T.S) (if sections are not available show photographs) and ovule (L.S.) iii. Study through hand sections or dissections- coralloid root (T.S), rachis (T.S), leaflet (V. S.) and Pollen grains (W.M).

PINUS

1. Habit, long and dwarf shoots showing cataphylls and scale leaves, T.S. Wood showing growth rings, male cones of 1st year, 2nd year and 3rd year, female cones, winged seeds.

2. Study through permanent slides-root (T.S), female cone (L.S), ovule (L.S) and embryo (WM) showing polycotyledonous conditions.

3. Study through hand sections or dissections-young stem (T.S), old stem (Wood) (T.L.S and R.L.S), needle (T.S), male cone (L.S and T.S) and Pollen grains (W.M.).

EPHEDRA

1. Habit and structure of whole male and female cones

2. Permanent slides-female cone (L.S)

3. Hand sections, dissections-node (L.S), internode (T.S), macerated stem to see vessel structure, epidermal peel mount of vegetative parts to study stomata; male cone (T.S and L.S) and pollen grains (W.M.)

In addition to laboratory exercises, study of plant diversity in nature is required, for which a field trip should be organized.

Note for distribution of 50Marks in Practical Examination:

I. Internal Assessment

1. Day to Day performance in the laboratory: 12 Marks

2. Test: 8 Marks

3. Regularity of Attendance: 5 Marks

II. External Assessment : 25 Marks

BOTANY (Semester-III)

(For examinations to be held in the years Dec 2017, 2018, 2019)

Title: Plant Anatomy, Embryology and Ecology (Theory)

Duration of Exam: 3.0 hrs

Maximum Marks: 100

Credits: 04

External Examination: 80 Marks

Internal Assessment: 20 Marks

Course Code: UB0TC-301

Objectives: Seed bearing plants represent the most advanced groups of plant kingdom. Proper knowledge about their structure, functions, mechanisms of multiplication and their interactions with the biotic and abiotic components of the ecosystems will assist in manipulating these for better human utility. This course will create awareness among students about proper utilization of important plant parts.

UNIT-I: Plant, Structure and Organization.

1.1 Meristems: concept and types; structure and organization of RAM and SAM

1.2 Anatomy of primary root and primary stem (both monocots and dicots)

1.3 Vascularisation of primary shoot in monocotyledons and dicotyledons, leaf traces and leaf gaps; branch traces and branch gaps.

1.4 Epidermal modifications in monocots and dicots (trichomes and stomata), their structural organization and systematic value.

UNIT-II: Primary and Secondary Structures

2.1 Vascular and cork cambium: structure and derivatives; lenticels

2.2 Structure of secondary xylem and secondary phloem

2.3 Secondary growth – a general account; growth rings; heartwood, sapwood

2.4 Leaf : origin, development and vascularisation; Internal structure of monocot and dicot leaf, concept of senescence and abscission.

UNIT-III Embryology

3.1 Flower structure and functions; Structure of anther, male gametophyte and microsporogenesis; Structure of pistil, ovule, female gametophyte and megasporogenesis.

3.2 Pollination: Types, attractants and rewards for pollinators; pollen-pistil interaction; self-incompatibility.

3.3 Double fertilization, embryo and endosperm development, types, cytology and functions of endosperm; formation of fruit.

3.4 Seed formation and seed dispersal strategies.

Unit-IV Plants and Environment

4.1 Atmosphere- Stratification and gaseous composition; Carbon and hydrological cycle and their significance, greenhouse gases and climate change.

4.2 Soil structure, soil profiles and development; soil types in India.

4.3 Concept of ecology, ecosystem: structure, abiotic and biotic components, food chain, food web, ecological pyramids and energy flow.

4.4 Community ecology: Community characteristics, frequency, density cover, life forms, biological spectrum.

Unit-V Population, community and natural resources

5.1 Ecological succession: Concept, process and its types; climax communities.

5.2 Population ecology, growth curves; Ecotypes and ecads.

5.3 Ecotone and edge effect-concept and types.

5.4 Phytogeographical regions of India

Note for paper setters

External End Semester Examination (Total marks: 80) Time duration: 3hours

The question paper will have 3 sections. Section I: Five (5) short answer questions representing all units i.e at least one from each unit (without detailed explanation having 70-80 words) of 3 marks each = 15 marks (All compulsory). **Section II:** Five (5) medium answer questions (with explanation having 250-300 words) of 7 marks each = 35 marks (All compulsory). **Section III:** Five (5) long answer questions (with detailed explanation/ of 500-600 words) covering all the units. The candidate will be required to answer only two questions of 15 marks each = 30 marks.

Internal Assessment (Total Marks: 20)

Time duration: 1 hr.

SUGGESTED READING 1. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms. 4th Edn. Vikas Publishing House, Delhi.

2. Cutter, E.G. 1969. Plant Anatomy: Experiment and Interpretation. Part-I: Cells and Tissues. Edward Arnold, London

3. Cutter, E.G. 1970. Plant Anatomy: Experiment and Interpretation. Part-II: Organs. Edward Arnold London.

4. Esau, K. 1977. Anatomy of Seed Plants. 2nd Edn. John Wiley and Sons, New York.

- 5 Chapman, J.L. and Reiss, M.J. 2000. Ecology: Principles and Applications. 2nd Edn., Cambridge University Press , U.K.
6. Kebs, C.J. 1989. Ecological Methodology. Harper and Row, New York, USA.
7. Kormondy, E.J. 1996. Concepts of Ecology. Prentice- Hall of India Pvt. Ltd. New Delhi.
8. Ludwist. J.A. and Reynolds, J.F. 1988. Statistical Ecology. Wiley, New York.
9. Misra, R. 1988. Ecology Work Book. Oxford and IBH, New Delhi.
10. Moore. P.W. and Chapman, S.B. 1986. Methods in Plant Ecology. Blackwell Scientific Publications.
11. Odum, E.P. 1983. Basic Ecology. Saunders, Philadelphia.
12. Sharma, P. D. 2010. Ecology and Environment. 10th Edn. Rastogi Publications, Merut. India
13. Townsend, C.R., Begon, M. and Harper, J.L. 2008. Essentials of Ecology. 3rd Edn. Blackwell publishing. U.K.
14. Underwood, A.J. 1977. Experiments in Ecology: Their logical design and interpretation using analysis of variance. Cambridge University Press.
15. APHA-Standard methods for the examination of water and waste water, American Public Health Association, Washington.
16. Faegri, K and Vander Pijl. 1979. The Principles of Pollination Ecology. 2nd Edn. Pergamon Press, Oxford.
17. Fahn, A. 1974. Plant Anatomy. 2nd Edn. Pergamon Press.
18. Kind, J. 1997. Reaching for the sun: How Plants work. Cambridge University Press, Cambridge, U.K.
19. Mauseth, J.D. 1988. Plant Anatomy. The Benjamin Cummings Publishing Company, Menio Park, California, USA.
20. Proctor, M and Yeo, P. 1973. The Pollination of Flowers. William Collins Sons, London.
21. Raven, P.H., Evert, R.F. and Eichhorn, S.E. 1999. Biology of Plants, 5th Edn. W.H. Freeman and Co. Worth Publishers, New York.
22. Thomas, P. 2000. Trees: Their Natural History. Cambridge University Press, Cambridge.

BOTANY (Semester-III)

(For examinations to be held in the years Dec 2017, 2018, 2019)

Title: Plant Anatomy, Embryology and Ecology (Practical)

Duration of Exam: 3 hrs

Maximum Marks: 50

Credits: 02 External Examination: 25 Marks

Internal Assessment: 25 Marks

Course Code: 302

1. To study shoot and root tip with emphasis on cyto-histological zonation.
 2. Anatomy of primary and secondary growth in monocots and dicots using hand sections and prepared slides. Structure of secondary phloem and xylem. Growth rings in wood, Microscopic study of wood in T.S., T.L.S., and R.L.S.
 3. Study of diversity in leaf shape, size, thickness, surface properties; internal structure of leaf, structure and type of stomata and trichomes (using epidermal peels of leaf).
 4. Anatomy of the root; primary and secondary structure.
 5. Examination of wide range of flowers available in the locality and methods of their pollination.
 6. Structure of anther, microsporogenesis (using slides) and pollen grains (using whole mounts). Pollen viability using in vitro pollen germination.
 7. Structure and types of ovule.
 8. Endosperm and embryo development in monocots and dicots (using slides and dissections).
 9. To determine the minimum requisite size of the quadrat for phytosociological studies.
 10. To determine the frequency, density, abundance, basal area and importance value index of herbaceous and tree flora.
1. To determine the different life forms of the plant species of the grassland ecosystem and prepare a biological spectrum by comparing with Raunkiaer's normal spectrum.
 2. To study the various soil horizons for drawing the soil profile diagram.
 3. To determine the bulk density, water holding capacity and porosity of forest and grassland ecosystems.
 4. To measure pH and dissolved oxygen contents in different water ecosystems.

Internal Assessment

1. Day to Day performance in the laboratory: 12 Marks

2. Test: 8 Marks

3. Regularity of Attendance: 5 Marks

II. External Assessment : 25 Marks

BOTANY
(Semester-III)
(For examinations to be held in the years Dec 2018, 2019, 2020)
SKILL ENHANCEMENT COURSE

Course No: UBOTS303	Title: MUSHROOM CULTIVATION TECHNOLOGY (Theory)
Duration of Exam: 3 hrs	Maximum Marks: 100
Credits: 04	End Semester Examination: 80 Marks
	Assessment Test : 20 Marks

UNIT-1. INTRODUCTION AND TYPES OF MUSHROOMS.

- 1.1 Introduction to the world mushrooms, history. Characteristics of mushrooms. Types of edible mushrooms available in India- *Volvariella volvacea*, *Pleurotus citrinopileatus*, *Calocybe indica*. *Agaricus bisporus*.
- 1.2 Structure and life cycle of mushrooms with special reference to *Agaricus* and *Morchella*.
- 1.3 Nutritional and Pharmaceutical value of mushrooms
- 1.4 Poisonous mushrooms with famous poisoning mushroom.

UNIT-2. CULTIVATION TECHNOLOGY.

- 2.1 Infrastructure: Substrates (locally available) Polythene bag, vessels, inoculation hook, inoculation loop, low cost stove, sieves, culture rack.
- 2.2 Spawn Production Technology: Mushroom Unit (Thatched house) water sprayer, tray, small polythene bags, Pure culture: Medium, sterilization, preparation of span, multiplication.
- 2.3 Mushroom bed preparation- paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation.
- 2.4 Composting technology in mushroom production (A low cost technology).

UNIT-3. CULTIVATION, STORAGE AND DISEASES.

- 3.1 Cultivation of *Volvariella volvacea*, *Pleurotus citrinopileatus*.
- 3.2 Cultivation of *Calocybe indica*. *Agaricus bisporus*.
- 3.3 Shelf life of mushrooms, Short-term storage (Refrigeration – upto 24 hours), Long term storage (canning, pickles, papads), drying, storage in salt solutions.
- 3.4 Diseases, infections and pests of mushrooms (Pre and Post harvest).

UNIT-4. NUTRITIONAL VALUE, FOOD PREPARATION AND PROSPECTS.

- 4.1 Composition and Nutritional value- elemental nutrition and Proximate value- Proteins, amino acids, carbohydrates, Fats, crude fibre content, vitamins.

- 4.2 Types of foods prepared from mushroom.
- 4.3 Cost benefit ratio – marketing in India and abroad, Export value.
- 4.4 Prospects of round the year cultivation of mushrooms.

UNIT-5. RESEARCH, FUTURE PROSPECTIVE SAND CHALLENGES.

- 5.1 Research Centres- National level and Regional level.
- 5.2 Scope of mushroom cultivation for rural upliftment.
- 5.3 Educational objective for designing mushroom training programmes.
- 5.4 Challenges to mushroom cultivation Technology.

External End Semester Examination (Total marks: 80) Time duration: 3 hours

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Internal Assessment (Total Marks: 20)

Time duration: 1 hr.

Suggested readings:

1. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. Jayarajan. R (1991) Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
2. Swaminathan, M. (1990) Food and nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No.88, Mysore Road, Bangalore- 560018.
3. Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.
4. Nita Bahi (1984-1988) Hand Book of Mushrooms, II Edition, Vol. I & Vol. II

Sw
19/5/2018

BOTANY (Semester-IV)

(For examinations to be held in the years May 2018, 2019, 2020)

Title: Plant Physiology and Metabolism (Theory)

Duration of Exam: 3.0 hrs

Maximum Marks: 100

Credits: 04

External Examination: 80 Marks

Internal Assessment: 20 Marks

Course code : UBOTG401

Objectives: The course is designed to make students appreciate the various mechanisms underlying the important activities of plants as absorption of water and minerals, solute transport, transpiration, flowering, nitrogen metabolism etc. Another aim is to impart students knowledge regarding the stresses that plants face and methods adopted by them to tackle/overcome these stresses.

Unit-I Enzymes and water relations in plants

1.1 Discovery and nomenclature of enzymes, characteristics of enzymes, concept of holoenzyme, apoenzyme, co-enzyme and co-factors.

1.2 Regulation of enzyme activity; mechanism of enzyme action.

1.3 Diffusion of water, osmosis, water potential, absorption and transport of water through xylem.

1.4 Types and mechanism of transpiration and mechanism of opening and closing of stomata.

Unit-II Mineral nutrition and phloem translocation

1.3 Concept of macro-and micro-elements and mineral uptake; Importance of Ca, N, P, K, Mg to the plants and their deficiency symptoms.

1.4 Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps.

1.5 Translocation in phloem; composition of phloem sap; girdling experiment, pressure flow model, phloem loading and unloading.

1.6 Source-Sink relationship, factors affecting phloem translocation.

Unit-III Photosynthesis and Respiration

3.1 Photosynthesis – a general account of photosynthetic pigments, red drop and enhancement effect; concept of photosystems, PSI and PSII; cyclic and non cyclic photophosphorylation.

3.2 Carbon fixation- Calvin cycle, C4, Crassulacean Acid Metabolism and photorespiratory pathways and their significance.

3.3 Respiration- Glycolytic pathway, Kreb's cycle, Pentose phosphate pathway.

3.4 Electron transport mechanism and oxidative phosphorylation, mechanism of synthesis of ATP (Chemi-osmotic theory).

Unit-IV Nitrogen fixation, secondary metabolism and abiotic stress

4.1 Biological nitrogen fixation-symbiotic and asymbiotic nitrogen fixation; nitrate and ammonium assimilation.

4.2 Biosynthesis and functions of phospholipids; β -oxidation pathway.

4.3 Secondary metabolism, concept and role; Phenylpropanoid pathway, Shikimic acid pathway. 4.4 Abiotic stress – types of stresses (drought, heavy metal, pH and salinity); reactive oxygen species (production and management); physiological responses to drought, heavy metal and salinity stress.

Unit-V Physiology of growth and flowering

5.1 Plant growth and development - phases and kinetics of growth; seed dormancy and germination - general account, factors affecting seed dormancy and germination.

5.2 Physiology of flowering - florigen concept, photoperiodism, vernalization.

5.3 Phytochromes - their discovery, physiological role and mechanism of action.

5.4 Plant hormones - auxins, gibberellins, cytokinins, abscissic acid and ethylene, their role and mode of action

External End Semester Examination (Total marks: 80)

Time duration: 3 hours

The question paper will have 3 sections. Section I: Five (5) short answer questions representing all units i.e at least one from each unit (without detailed explanation having 70-80 words) of 3 marks each = 15 marks (All compulsory). **Section II:** Five (5) medium answer questions (with explanation having 250-300 words) of 7 marks each = 35 marks (All compulsory). **Section III:** Five (5) long answer questions (with detailed explanation/ of 500-600 words) covering all the units. The candidate will be required to answer only two questions of 15 marks each = 30 marks.

Internal Assessment (Total Marks: 20)

Time duration: 1 hr.

Suggested Reading

- 1. Buchanan, B.B., Gruissen, W. and James, R.L. 2000. Biochemistry and Molecular Biology of Plants. I.K. International Pvt. Ltd. New Delhi.**
- 2. Galston, A.W. 1989. Life Process in Plants. Scientific American Library, Springer-Verlag, New York, USA.**

3. Hopkins, W.G. 2008. *Introduction to Plant Physiology*. John Wiley and Sons, Inc. New York, USA. 4. Taiz, L. and Zeiger, E. 2006. *Plant Physiology*. 4th Edn., Sinauer Associates, Inc Publishers, Massachusetts, USA.

BOTANY (Semester-IV)

(For examinations to be held in the years May 2018, 2019, 2020)

Title: Plant Physiology and Metabolism (Practical)

Duration of Exam: 3 hrs Maximum Marks: 50 Credits:
02 External Examination: 25 Marks Internal Assessment: 25 Marks

Course Code : UBOPC-402

1. Estimation of inorganic phosphate in plant tissue.
2. To study the permeability of plasma membrane using different concentrations of organic solvents.
3. To study the effect of temperature on permeability of plasma membrane.
4. To prepare the standard curve of protein and determine the protein content in unknown samples by Lowry's and methods.
5. To study the enzyme activity of catalase and peroxidase as influenced by pH and temperature.
6. Comparison of the rate of respiration in germinating seeds.
7. Separation of chloroplast pigments by solvent partitioning/paper chromatography/TLC methods.
8. Determining the osmotic potential of vacuolar sap by plasmolytic method.
9. Determining the water potential of potato tubers.
10. Separation of amino acids in a mixture by paper chromatography and their identification by comparison with standards.
11. Demonstration of rate of transpiration by cobalt chloride method.
12. Demonstration of stomatal movements.
13. Demonstration of osmosis by using potato tuber.
14. Demonstration of plasmolysis and deplasmolysis.

Internal Assessment

1. Day to Day performance in the laboratory: 12 Marks
 2. Test: 8 Marks
 3. Regularity of Attendance: 5 Marks
- II. External Assessment : 25 Marks

BOTANY

(Semester-~~IV~~)

(For examinations to be held in the years Dec 2017, 2018, 2019)

SKILL ENHANCEMENT COURSE

Course No: UBOTS403 Title: NURSERY, GARDENING AND FLORICULTURE (Theory)
Duration of Exam: 30hrs Maximum Marks: 100

Credits: 04 End Semester Examination: 80 Marks
Assessment test: 20 Marks

UNIT-I INTRODUCTION TO NURSERY AND GARDENING:

- 1.1 Definition and types of Nurseries. Physical resources for nurseries.
- 1.2 Selection of Nursery Site, Ecological Facts, Equipments and Implements used in nurseries and gardening, important nursery operations.
- 1.3 Definition and components of gardens, types of gardening (landscape and home gardening), gardening operations (soil laying, manuring and watering).
- 1.4 Scope and objective of gardening. Some famous gardens with specific reference to Kew Botanical garden and BSI, Kolkata.

UNIT-II PLANT PROPAGATION METHODS:

- 2.1 Sowing/raising of seeds and seedlings, transplanting of seedlings, causes and methods of breaking seed dormancy; seed germination, types and factors affecting it.
- 2.2 Vegetative propagation, artificial and natural methods; concept of hydroponics and aeroponics.
- 2.3 Concept of micro-propagation, hardening of nursery plants. Scope and importance of plant propagation in nurseries.
- 2.4 Packing, transport and marketing of nursery plants.

UNIT-III PLANT NUTRITION AND PLANT PROTECTION IN NURSERIES AND GARDENS:

- 3.1 Plant nutrition, micro and macronutrients. Role and deficiency symptoms of N, P and K.
- 3.2 Inorganic fertilizers, manures, Biofertilizers.
- 3.3 Pest management, pesticides, biopesticides, advantages and disadvantages.
- 3.4 Cultural and chemical methods of controlling fungal disease and weeds.

UNIT-IV MANAGEMENT PROCEDURES IN NURSERIES AND GARDENS.

- 4.1 Water management, irrigation system, types.
- 4.2 Sanitation, drainage and its types, trimming, pruning and thinning.
- 4.3 Potting, Repotting, Depotting and mulching.
- 4.4 Plant growth regulators; Definition, types, Role and auxins methods of application in plant propagation.

UNIT-V FLORICULTURE

- 5.1 Concept and scope of floriculture, factors affecting flower production, packaging of cutflowers; methods to prolong vase life of flowers.
- 5.2 Botany of some ornamental perennial plants- *Cycas*, Areca Palm Raphis palm and *Crysalidocarpus* palm, *Dracaena*, *Nolina*, *Thuja*, *Phoenix*.

- 5.3 Botanical names and methods of propagation of important flowers (Dahlia, Chrysanthemum, Rose, Gladiolus, Marigold, Carnation and Gerbera).
- 5.4 Botanical names and methods of propagation of some common ornamental Cacti and Succulents, concept of Bonsai.

External End Semester Examination (Total marks: 80) Time duration: 3 hours

The question paper will have 3 sections. Section I: Five (5) short answer questions representing all units i.e at least one from each unit (without detailed explanation having 70-80 words) of 3 marks each = 15 marks (All compulsory). **Section II:** Five (5) medium answer questions (with explanation having 250-300 words) of 7 marks each = 35 marks (All compulsory). **Section III:** Five (5) long answer questions (with detailed explanation/ of 500-600 words) covering all the units. The candidate will be required to answer only two questions of 15 marks each = 30 marks.

Internal Assessment (Total Marks: 20)

Time duration: 1 hr.

References:

Floriculture in India by G.S. Randhava and Amitabha Mukhopadhyay Allied Publishers, PVT. Ltd. 1986.

Plant Propagation Principles and Practices by Hartman H.T. Prentice-Hall International: London, 1959.

Encyclopedia of Gardening by Christopher Brakell. Dorling Kindersley, Ltd. 2007.

Propagation Hand Book; basic Techniques for Gardeners Mechanicsburg, Pas; stackpok Books, 1995.

Horticulture, Principles and Practices by George Acquah. 4th edition, Pearson Publisher, Prentice Hall, 2009.

Gardening in India by Bose, T.K and Mukerjee, D. New Delhi Oxford & IBH Pub. Co. Pvt. Ltd, 1977.

Textbook of Horticulture by Mani Bhushan Rao. Macmillan India Ltd. 2005 (2nd edition).

Introduction to Horticulture by Kumar, N. 7th edition, Oxford & IBH Publishing Company Pvt. Ltd. 2010.

Introduction to ornamental Horticulture by J.S. Arora, 1999. Kalyani Publishers, Ludhiana, India.

Plant propagation by Sandhu M.K. New Age International Publishers Ltd. 1989.

Ornamental plants and Garden design in Tropics and Subtropics (Vol 1 & 2) by T.K. Bose, L.J. Singh, M.K. Sandhu and T.K Maity. Publisher: Daya Publishing House; A division of Astral International Pvt. Ltd. 2015.

BOTANY

(Semester-V)

(For examinations to be held in the years May 2019,

2020, 2021)

SKILL ENHANCEMENT COURSE

Course No: UBOTS 603

Duration of Exam: 3 hours

Semester Examination: 80 Marks

Internal Assessment: 20 Marks

Title: BIOFERTILIZERS (Theory) ✓

Maximum Marks: 100 Credits: 04 End

Unit-I

- 1.1 Biofertilizers: definition, different sources and importance.
- 1.2 Biological nitrogen fixation, symbiotic and asymbiotic.
- 1.3 General account of the microbes commonly used as biofertilizers.
- 1.3 Rhizobium- infection and nodulation, isolation and mass multiplication.

Unit-II

- 2.1 Azospirillum: isolation, important characteristics and mass multiplication.
- 2.2 Azotobacter: Isolation, important characteristics and mass multiplication.
- 2.3 Manures: definition, types and their importance.
- 2.4 Preparations of green manure, its features and importance.

Unit-III

- 3.1 Cyanobacteria: cell structure and characteristic features.
- 3.2 Forms of cyanobacteria: unicellular, filamentous; heterocystous and non- heterocystous forms.
- 3.3 Site of nitrogen fixation: heterocyst and importance of Nitrogenase.
- 3.4 Importance of Cyanobacteria and Azolla in rice cultivation.

Unit-IV

- 4.1 Mycorrhizae and its types.
- 4.2 Ectomycorrhizae-host diversity and importance.
- 4.3 Endomycorrhizae-host diversity and importance.
- 4.4 General application of VAM in agriculture.

Unit-V

- 5.1 Concept, types and importance of vermin-composting.
- 5.2 Methods of vermi-compositing; General layout of vermi-compost unit.
- 5.3 Recycling of bio-degradable municipal, agricultural and Industrial wastes.
- 5.4 Bio-compost preparation: methods, compositions, sources and applications.

Pattern of examination

Internalassessment (marks: 20)

Time duration: 3hrs

End Semester Examination (marks: 80)

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The question paper will have 3 sections.

Section I: Five (5) short answer questions representing all units i.e at least one from each unit (without detailed explanation having 70-80 words) of 3 marks each = 15 marks (All compulsory)

Section II: Five (5) medium answer questions (with explanation having 250-300 words) of 7 marks each = 35 marks (All compulsory)

Section III: Five (5) long answer questions (with detailed explanation/ of 500-600 words) covering all the units. The candidate will be required to answer only two questions of 15 marks each = 30 marks.

II. Assessment Test (Total Marks: 20) Time duration: 1 hr. The internal assessment under CBCS shall comprise of two parts

Part A: Total weightage to this part shall be 10 marks. It will have eight short answer questions, selecting at least three from each of the two/three units/50% of the syllabus covered. A candidate has to attempt any five questions of two marks each.

Part B: Total weightage to this part shall be 5 marks. It will have two long answer questions, selecting at one each from first two/three units/50% of the syllabus covered. A candidate has to attempt any one question of 5 marks.

Attendance : 5 marks

Suggested Readings

**Robert L Tate (2012). Soil Microbiology. Wiley India Pvt Ltd; Second edition PP 532
AtlasBartha (1998) Microbial Ecology: Fundamentals and applications. Benjamin/Cummings, (4th edition)**

D.K.Das (2002). Introduction to Soil Science. Kalyani Publisher 3rd edition.

E. Russel (2010) Soil Conditions and Plant Growth Nabu Press Publisher

S.K.Mukerjee. (2006) An Introduction to Soil Science. Tata Mcgraw Hills

ICAR. Handbook of Manures and Fertilizers. Atlantic Publisher (2007)

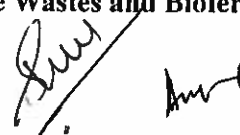
L.F. Diaz, M. de Bertoldi, W. Bidlingmaier (Eds.) (2007). Compost Science and Technology, Elsevier, New York

W.S. SubbhaRao (1982). Biofertilizers in Agriculture and Forestry. Oxford and IBH Publishing Co., New Delhi.

SubhaRao, N.S. (2000). Soil Microbiology, Oxford & IBH Publishers, New Delhi NIIR Board (2012). The Complete Technology Book on Biofertilizer and Organic Farming (2nd Revised Edition).

NIIR Project Consultancy Services (2012)

H.L.S. Tandon. Fertilizers, Organic Manures, Recyclable Wastes and Biofertilizers.



A.C. Gaur (1990) Phosphate Solubilities, Micro-organisms and Biofertilizers..Oxford and IBH Publishing Co. New Delhi.

N. Mukerjee and T.K.Ghosh (1998) Agricultural Microbiology,.Kalyani Publisher, New Delhi.

Sathe, T.V. (2004).Vermiculture and organic Farming.Daya Publishers,

NadiadVayas, S.C. Vayas, S. and Modi, H.A.Biofertilizers and organic Farming AktaPrakashan

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BOTANY

(Semester-V)

(For examinations to be held in the years Dec 2018, 2019, 2020)

DISCIPLINE SPECIFIC ELECTIVE

Course No: UBOTE501

Course Title: Cell Biology and Genetics (Theory)

Duration of Exam: 3hrs

Maximum Marks: 100 Credits: 04

External Examination: 80 Marks

Internal Assessment: 20 Marks

Objectives: The course has been devised to acquaint the students with the structural and functional aspects of cell, chromosomes and genes and alterations generally found in these.

Unit-I Cell Structure.

- 1.1 Cell wall; Primary cell wall, its structure, formation and function.
- 1.2 Plasma membrane; the lipid bilayer structure, fluid mosaic model; functions of plasma membrane.
- 1.3 Cell organelles; structure and functions of endoplasmic reticulum, golgi bodies, chloroplasts, mitochondria and ribosomes.
- 1.4 Ultrastructure of nuclear membrane, organization and function of nucleolus.

Unit-II Chromosome structure and multiplication.

- 2.1 Physical and chemical structure of chromosome; structure and importance of centromere and telomere; concept of sex chromosomes.
- 2.2 Reductional and equational divisions: Various stages; detailed structure of pairing and crossing over.
- 2.3 DNA: structure and replication; satellite and repetitive DNA.
- 2.4 Extranuclear genome: structure and function of mitochondrial and plastid DNA; Plasmids.

Unit-III Genome Organization and function/Gene to protein.

- 3.1 Organization of DNA in prokaryotic and eukaryotic genomes, role of proteins; nucleosome model.
- 3.2 Concept of gene; genetic code; structure and functions of mRNA and tRNA.
- 3.3 Protein synthesis; transcription; regulation of gene expression in prokaryotes and eukaryotes.
- 3.4 Protein synthesis: translation; primary, secondary and tertiary structure of proteins.



Unit-IV Alterations of the genome.

- 4.1 Structural alterations; types, effect and detection of intra-chromosomal alterations (deletions, duplications and inversions).
- 4.2 Mechanism, effect and detection of inter-chromosomal alterations (translocations).
- 4.3 Euploidy-types, origin and effect with suitable examples (wheat and cotton).
- 4.4 Aneuploidy-types, origin and effect with suitable examples.

Unit-V Alterations in the basic unit of inheritance and inheritance patterns.

- 5.1 Mutations-types, sources (spontaneous and induced), uses and mechanisms of induction.
- 5.2 Concept and salient features of transposable elements in prokaryotes (IS and Tn) and eukaryotes (Ac-Ds). DNA damage and repair mechanisms.
- 5.3 Mendelism, laws of segregation and independent assortment; allelic and nonallelic interactions.
- 5.4 Linkage and recombination, role of linkage in mapping of genes.

Note for paper setters

External End Semester Examination (Total marks: 80) Time duration: 3hours

The question paper will have 3 sections.

Section I: Five (5) short answer questions representing all units i.e at least one from each unit (without detailed explanation having 70-80 words) of 3 marks each = 15 marks (All compulsory)

Section II: Five (5) medium answer questions (with explanation having 250-300 words) of 7 marks each = 35 marks (All compulsory)

Section III: Five (5) long answer questions (with detailed explanation/ of 500-600 words) covering all the units. The candidate will be required to answer only two questions of 15 marks each = 30 marks.

Internal Assessment (Total Marks: 20)

Time duration: 1 hr.

The internal assessment under CBCS shall comprise of two parts

Part A: Total weightage to this part shall be 10marks. It will have eight short answer questions, selecting at least two from each of the two/three units/50% of the syllabus covered. A candidate has to attempt any five questions of one mark each.

Part B: Total weightage to this part shall be 5 marks. It will have two long answer questions, selecting at one each from first two/three units/50% of the syllabus covered.

Attendance : 5 marks



Suggested Readings:

1. Albert B., Bray, D., Raff, M., Roberts, K and Watson J.D. 2004. Molecular Biology of Cell.3rd Edn. Garland Science. New York, USA.
2. Atherly, A.G., Girton, J.R. and Mc.Donald, J.F. 1999. The Science of Genetics. Diane Publishing. Co. Fort Worth, USA.
3. Gupta, PK. 1999. A Text Book of Cell and Molecular Biology.Rastogi Publications, Meerut, India.
4. Kleinsmith, L J. And Kish, V. M. 1995.Principles of Cell and Molecular Biology.2nd Edn.Harper Collins College Publishers, New York, USA.
5. Lodish, H., Berk, A., Zipursky, S.L., Matsudaria P., Baltimore, D and Darnell, J. 2000. Molecular Cell Biology.5th Edn. W.H. Freeman & Co. New York, USA.
6. Russell, P J. 1998. Genetics. The Benjamin Cummings Publishing Co. Inc., USA.
7. Snustad, D.P. and Simmons, M.J. 2000. Principles of Genetics.John Wiley & sons, Inc. USA.
8. Wolfe, S.L. 1993. Molecular and Cell biology. Wadsworth Publishing Co. California, USA.

Sum

Sum

BOTANY (Semester-V)

(For examinations to be held in the years Dec 2018, 2019, 2020)

Course No: UBOPE502

Title: Cell Biology and Genetics (Practical)

Duration of Exam: 3 hrs

Maximum Marks: 50 Credits: 02

External Examination: 25 Marks

Internal Assessment: 25 Marks

1. To study cell structure from onion leaf peels and demonstrate staining and mounting methods.
2. Comparative study of cell structure in onion cells, Hydrilla and Spirogyra. Study of cyclosis in Tradescantia petal cells.
3. Study of plastids to examine pigment distribution in plants (e.g. Cassia, Tomato and Capsicum).
4. Examination of electron micrographs of eukaryotic cells with special reference to organelles.
5. Study of electron micrographs of viruses, bacteria, cyanobacteria and eukaryotic cells for comparative cellular organization.
6. Examination of various stages of mitosis and meiosis using appropriate plant material (e.g. onion root tips, onion flower buds).
7. Preparation of karyotypes from dividing root tip cells and pollen grains.
8. Cytological examination of special types of chromosomes; barr body, lampbrush and polytene chromosomes.
9. Working out the laws of inheritance (monohybrid, dihybrid, gene interactions) using seed mixtures.
10. Working out the mode of inheritance of linked genes from test cross and / or F2 data.

Note for distribution of 50 Marks in Practical Examination (50% internal and 50% external)

I. Internal Assessment

- | | |
|--|----------|
| 1. Attendance: | 5 Marks |
| 2. Practical Test: | 8 Marks |
| 3. Daily performance based on practical work done: | 12 Marks |

II. External Assessment

External practical examination : 25 Marks



BOTANY (Semester-V1)

(For examinations to be held in the years May 2018, 2019, 2020)

SKILL ENHANCEMENT COURSE

Course No: UBOTS 403
Duration of Exam: 3 hrs
Credits: 04

Title: ~~ETHNOBOTANY~~
Maximum Marks: 100
End Semester Examination: 80 Marks
Internal Assessment : 20 Marks

UNIT-I ETHNOBOTANY AND RELATED ISSUES

- 1.1 Concept of ethnobotany
- 1.2 Ethnobotany as an interdisciplinary Science and its importance.
- 1.3 Major ethnic groups or tribals of India with special reference to Jammu & Kashmir.
- 1.4 Major issues related to ethnobotany (Ethical, Cultural, Social etc.)

UNIT-II METHODOLOGY OF ETHNOBOTANICAL STUDIES

- 2.1 Field work and collection of data.
- 2.2 Herbarium preparation and identification of plants.
- 2.3 Source of data and methods of study: Fossils, archaeological resources and ancient literature.
- 2.4 Temples and sacred places as sources of data and plant conservation.

UNIT-III ROLE OF ETHNOBOTANY IN MODERN MEDICINE

- 3.1 Medico-ethnobotanical sources of India, a general account.
- 3.2 Significance of the following plants in ethnobotanical practices (along with their habitat and morphology) (a) Azadiractaindica (b) Ocimum sanctum (c) Vitexnegundo (d) Gloriosasuperba (e) Tribulusterrestris (f) Pongamiapinnata.
- 3.3 Role of ethnobotany in modern medicine with special reference to Rauwolfiaserpentina, Artemisia and Withania,
- 3.4 Role of ethnic groups and sacred grooves in conservation of plant genetic resources.

UNIT-IV LEGAL ASPECTS IN ETHNOBOTANY

- 4.1 Concept of RET taxa.
- 4.2 Role of IUCN and BSI in conservation.
- 4.3 Biopiracy, Intellectual Property Rights and Traditional Knowledge. Biodiversity laws in India.

Pattern of examination

~~End Semester Examination (marks: 80)~~

End Semester Examination (marks: 80)

Time duration: 3hrs

The question paper will have 3 sections.

Section I: Five (5) short answer questions representing all units i.e at least one from each unit (without detailed explanation having 70-80 words) of 3 marks each = 15 marks (All compulsory)

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Section II: Five (5) medium answer questions (with explanation having 250-300 words) of 7 marks each = 35 marks (All compulsory)

Section III: Five (5) long answer questions (with detailed explanation/ of 500-600 words) covering all the units. The candidate will be required to answer only two questions of 15 marks each = 30 marks.

II. Assessment Test (Total Marks: 20) Time duration: 1 hr. The internal assessment under CBCS shall comprise of two parts

Part A: Total weightage to this part shall be 10 marks. It will have eight short answer questions, selecting at least three from each of the two/three units/50% of the syllabus covered. A candidate has to attempt any five questions of two marks each.

Part B: Total weightage to this part shall be 5 marks. It will have two long answer questions, selecting at one each from first two/three units/50% of the syllabus covered. A candidate has to attempt any one question of 5 marks.

Attendance : 5 marks

Suggested Readings:

S.K. Jain, (1995) Manual of Ethnobotany, Scientific Publishers, Jodhpur.

S.K. Jain (ed.) (1981). Glimpses of Indian- Ethnobotany, Oxford and IBH, New Delhi. S.K. Jain and V. Mudgal, (1999). A Handbook of Ethnobotany, BSMPS, Dehradun

S.K. Jain (ed.) 1989. Methods and approaches in ethnobotany. Society of ethnobotanists, Lucknow, India.

S.K. Jain , 1990. Contributions of Indian- ethnobotany. Scientific publishers, Jodhpur. Colton C.M. 1997. Ethnobotany- Principles and applications. John Wiley and sons- Chichester. Rama Rao, N and A.N. Henry (1996). The Ethnobotany of Eastern Ghats in Andhra Pradesh, India. Botanical Survey of India.

Howrah. Rajiv K. Sinha, (1996). Ethnobotany the Renaissance of Traditional Herbal Medicine- INASHREE Publishers, Jaipur-1996.

S.K. Jain

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BOTANY (Semester-VI)

(For examinations to be held in the years May 2019, 2020, 2021)

DISCIPLINE SPECIFIC ELECTIVE

Course No: UBOTE601 Title: Economic Botany and Biotechnology (Theory)
Duration of Exam: 3hrs Maximum Marks: 100 Credits: 04
External Examination: 80 Marks
Internal Assessment: 20 Marks

Objectives: *The course is designed to make students aware of the conventional use of biological diversity in terms of the proper utilization of plant parts. An attempt is being made to impart students the training of using tissue culture tools and biotechnological techniques in the utilization as well as improvement of crops.*

Unit-I Utilization of Plants

- 1.1 Food plants: Origin of wheat, maize and rice and their cultivation in India.
- 1.2 Fibres: Cultivation and processing of cotton and jute.
- 1.3 Non-alcoholic beverages: Botany and processing of tea and coffee.
- 1.4 Spices and condiments: Botany and utility of asafoetida, cumin, fennel, coriander, cloves, cinnamon, ginger, turmeric and cardamom.

Unit-II Utilization of Plants- Oil crops, timber yielding and medicinal plants

- 2.1 Vegetable oils: Botany, cultivation and utilization of groundnut, mustard and coconut.
- 2.2 Major firewood and timber yielding plants of J&K state and their utilization.
- 2.3 Medicinal plants of J&K state: a general account.
- 2.4 Sources, extraction and processing of commercial rubber.

Unit-III Utilization of plants-Pulses, fruits and vegetables

- 3.1 Pulses (rajmash, pea and urd) - their cultivation and utilization.
- 3.2 Vegetables (cauliflower, bottle gourd, fenugreek, ladyfinger and spinach) – their cultivation and utilization.
- 3.3 Fruits (apple, mango, peach, walnut, apricot and almond) - their cultivation and utilization.
- 3.4 Indoor and outdoor ornamentals; their cultivation and maintenance.

Unit-IV Plant Tissue Culture

- 4.1 Basic concepts of plant tissue culture, cellular totipotency, differentiation and morphogenesis, protoplast fusion.
- 4.2 Micropropagation- concept and techniques; haploid production through androgenesis and gynogenesis.
- 4.3 Somatic embryogenesis; Methods of formation of somatic embryos and factors affecting their production; synthetic seeds.
- 4.4 Somaclonal variations and factors underlying their generation; advantages of somaclonal variants.



Unit-V Plant Biotechnology

- 5.1 Concept of biotechnology, recombinant DNA technology and gene cloning; restriction endonucleases, Agarose gel electrophoresis, Southern blotting; genomic and cDNA libraries.
- 5.2 Salient features of cloning vectors – plasmids, bacteriophages and cosmids; Biology of Agrobacterium vectors for gene delivery.
- 5.3 Polymerase chain reaction; Mechanism and applications.
- 5.4 Salient achievements in crop biotechnology; transgenic plants – a general account.

Note for paper setters

External End Semester Examination (Total marks: 80) Time duration: 3 hrs

The question paper will have 3 sections.

Section I: Five (5) short answer questions representing all units i.e at least one from each unit (without detailed explanation having 70-80 words) of 3 marks each = 15 marks (All compulsory)

Section II: Five (5) medium answer questions (with explanation having 250-300 words) of 7 marks each = 35 marks (All compulsory)

Section III: Five (5) long answer questions (with detailed explanation/ of 500-600 words) covering all the units. The candidate will be required to answer only two questions of 15 marks each = 30 marks.

Internal Assessment (Total Marks: 20)

Time duration: 1 hr.

The internal assessment under CBCS shall comprise of two parts

Part A: Total weightage to this part shall be 10marks. It will have eight short answer questions, selecting at least two from each of the two/three units/50% of the syllabus covered. A candidate has to attempt any five questions of one mark each.

Part B: Total weightage to this part shall be 5 marks. It will have two long answer questions, selecting at one each from first two/three units/50% of the syllabus covered.

Attendance : 5 marks

Suggested Readings

1. Bhojwani, S.S. 1990. Plant Tissue Culture: Applications and Limitations. Elsevier Science Publishers, New York, USA.
2. Bhojwani, S.S. and Razdan, M.K. 2005. Plant Tissue Culture: Theory and Practice. Revised Edn. Elsevier Science Publication, The Netherlands.
3. Hartmann, H.T. and Kestler, D.E. 1976. Plant Propagation: Principles and Practices. 3rd Edn., Prentice Hall of India Pvt. Ltd. New Delhi.
4. Brown, T.A. 2010. Genomes. John Wiley and Sons (Asia) Pvt. Ltd.

5. Primrose, S. B. 1995. Principles of Genome Analysis. Blackwell Scientific Publishers, Oxford UK.
6. Glick, B.R., Pasternak J.J. and Patten, C.L. 2010. Molecular Biotechnology: Principles and Applications of Recombinant DNA. 4th Edn. ASM Press Washington, DC.
7. Old, R.W. and Primrose, S.B. 1989. Principles of Gene Manipulation. Blackwell Scientific Publications, Oxford, UK.
8. Vasil, I.K. and Thorpe, T.A. 1994. Plant Cell and Tissue Culture. Kluwer Academic Publishers. The Netherlands.
9. Raghvan, V. 1986. Embryogenesis in Angiosperms: A Developmental and Experimental Study. Cambridge University Press, New York, USA
10. Raghvan, V. 1997. Molecular Biology of Flowering Plants. Cambridge University Press, New York, USA.
11. Collin H.A. and Edwards, S. 1998. Plant Cell Culture: Introduction to Biotechniques. BIOS Scientific Publishers Ltd. UK.
12. Das, H.K. 2007. Textbook of Biotechnology. 3rd Edn. Wiley India Pvt. Ltd. U.P., India.
13. Razdan, M.K. 2000. An Introduction to Plant Tissue Culture. Oxford and IBH
- Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology. Wadsworth Publication Co. California, USA.
14. Sambamurthy, A.V. S.S. and Subramanyam, N.S. 1989. A textbook of Economic Botany. Wiley Eastern Ltd. New Delhi.
15. Sharma, O.P. 1996. Hills Economic Botany. (Late Dr. A.F. Hill, Adapted by Dr.O.P.Sharma), Tata McGraw Hill Co. Ltd. New Delhi.
16. Simpson, B.B. and Conner Ogorzaly, M. 1986. Economic Botany- Plants in Our World, McGraw Hill, New York.
17. Kochar, S. L. 1998. Economic Botany in Tropics. 2nd edition. Macmillan India Ltd. New Delhi.

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BOTANY (Semester-VI)

(For examinations to be held in the years May 2019, 2020, 2021)

Course No: UBOTE602 Title: Economic Botany and Biotechnology (Practical) Duration
of Exam: 3 hrs Maximum Marks: 50 Credits: 02 External
Examination: 25 Marks
Internal Assessment: 25 Marks

1. Study of the morphology, structure and simple microchemical tests of the food storing tissues in rice, wheat, maize, potato and sugarcane. Microscopic examination of starch in these plants (except sugarcane).
2. Study of cotton flowers, sectioning of the cotton ovules/developing seeds to trace the origin and development of cotton fibres. Microscopic study of cotton and test for cellulose. Sectioning and staining of Jute stem to show the location and development of fibres, Microscopic structure. Tests for ligno-cellulose.
3. Study of hand sections of groundnut, mustard and coconut and staining of oil droplets by Sudan III and Sudan Black.
4. To study sources of firewood yielding trees (10) and bamboos. A list to be prepared mentioning special features.
5. Examine black pepper, cloves, cinnamon (hand sections) and opened fruits of cardamom and describe them briefly.
6. Preparation of an illustrated Inventory of 10 wild and locally available medicinal plants used in indigenous systems of medicine or allopathy. Write their botanical and common names, parts used and diseases/disorders for which they are prescribed.
7. Section various pulses and from temporary mounts work out the various cellular inclusions.
8. Study the structure and types of various fruits and vegetables.
9. Demonstrate media preparation for culturing plant tissues.
10. Demonstration of the technique of micropropagation by using different explants e.g. axillary buds, shoot meristems.
11. Demonstration of the technique of anther culture.

Note for distribution of 50 Marks in Practical Examination (50% internal and 50% external)

I. Internal Assessment

- | | |
|--|----------|
| 1. Attendance: | 5 Marks |
| 2. Practical Test: | 8 Marks |
| 3. Daily performance based on practical work done: | 12 Marks |

II. External Examination:

25 marks



BOTANY Semester V

(For examinations to be held in the years May ~~2019, 2020, 2021~~)

To Be Introduced As *Optional SEC*

SKILL ENHANCEMENT COURSE

Course Title: Plant

Diversity and Human Welfare (Theory)

Duration of Exam: 3 hrs

Maximum Marks: 100

Credits: 04

End Semester Examination: 80 Marks

Internal Assessment: 20 Marks

Unit 1: Plant diversity and its scope

- 1.1 Genetic diversity, Species diversity and Plant diversity at the ecosystem level.
- 1.2 Agrobiodiversity and cultivated plant taxa, wild taxa.
- 1.3 Values and uses of Biodiversity: Ethical and aesthetic values, Precautionary principle
- 1.4 Methodologies for valuation.

Unit 2: Loss of Biodiversity

- 2.1 Loss of genetic diversity and species diversity.
- 2.2 Loss of ecosystem diversity.
- 2.3 Loss of agrobiodiversity.
- 2.4 Projected scenario for biodiversity loss.

Unit 3: Management of Plant Biodiversity

- 3.1 Organizations associated with biodiversity management.
- 3.2 Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR.
- 3.3 Biodiversity legislation and conservations
- 3.4 Biodiversity information management and communication.

Unit 4: Conservation of Biodiversity

- 4.1 Conservation of genetic diversity, species diversity and ecosystem diversity.
- 4.2 In situ and ex situ conservation
- 4.3 Social approaches to conservation
- 4.4 Biodiversity awareness programmes and Sustainable development.

Unit 5: Role of plants in relation to Human Welfare;

- 5.1 Importance of forestry their utilization and commercial aspects
- 5.2 Avenue trees and Ornamental plants of India.
- 5.3 Alcoholic beverages
- 5.4 Important fruit crops their commercial importance. Wood and its uses.

Sum

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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

Pattern of examination

Internal assessment (marks: 20)

End Semester Examination (marks: 80)

Time duration: 3hrs

The question paper will have 3 sections.

Section I: Five (5) short answer questions representing all units i.e at least one from each unit (without detailed explanation having 70-80 words) of 3 marks each = 15 marks (All compulsory)

Section II: Five (5) medium answer questions (with explanation having 250-300 words) of 7 marks each = 35 marks (All compulsory)

Section III: Five (5) long answer questions (with detailed explanation/ of 500-600 words) covering all the units. The candidate will be required to answer only two questions of 15 marks each = 30 marks.

II. Assessment Test (Total Marks: 20) Time duration: 1 hr. The internal assessment under CBCS shall comprise of two parts

Part A: Total weightage to this part shall be 10 marks. It will have eight short answer questions, selecting at least three from each of the two/three units/50% of the syllabus covered. A candidate has to attempt any five questions of two marks each.

Part B: Total weightage to this part shall be 5 marks. It will have two long answer questions, selecting at one each from first two/three units/50% of the syllabus covered. A candidate has to attempt any one question of 5 marks.

Attendance : 5 marks

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BOTANY (Semester V)

(For examinations to be held in the years ~~May 2018, 2019, 2020~~)

SKILL ENHANCEMENT COURSE

Title:

Floriculture

To be introduced as optional SE

(Theory)

Duration of Exam: 3 hrs Maximum Marks: 100

Credits: 04 End

Semester

Examination: 80 Marks

Internal Assessment: 20 Marks

Unit 1: Introduction

- 1.1 History of gardening
- 1.2 Importance and scope of floriculture and landscape gardening.
- 1.3 Landscaping Places of Public Importance
- 1.4 Landscaping highways and Educational institutions.

Unit 2: Nursery Management and Routine Garden Operations

- 2.1 Sexual and vegetative methods of propagation
- 2.2 Soil sterilization; Seed sowing; Pricking;
- 2.3 Planting and transplanting; Shading; Stopping or pinching; Defoliation; Wintering; Mulching; Topiary
- 2.4 Role of plant growth regulators.

Unit 3: Ornamental Plants

- 3.1 Flowering annuals; Herbaceous perennials
- 3.2 Climbing vines; Shade and ornamental trees; Ornamental bulbous and foliage plants
- 3.3 Ferns and Selaginellas; Cacti and succulents; Palms and Cycads
- 3.4 Cultivation of plants in pots; Indoor gardening; Bonsai.

Unit 4: Principles of Garden Designs

- 4.1 English, Italian, French, Persian, Mughal and Japanese gardens
- 4.2 Features of a garden (Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flower beds, Shrubbery, Borders)
- 4.3 Water garden.
- 4.4 Some Famous gardens of India.

Unit 5: Commercial Floriculture

- 5.1 Factors affecting flower production
- 5.2 Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life;
- 5.3 Cultivation of Important cut flowers (Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolous, Marigold, Rose, Liliium, Orchids).
- 5.4 Diseases and Pests of Ornamental Plants.

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Suggested Readings

1. Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India. Allied Publishers.

Pattern of examination

Internal assessment (marks: 20) End Semester Examination (marks:80)
Time duration: 3hrs

The question paper will have 3 sections.

Section I: Five (5) short answer questions representing all units i.e at least one from each unit (without detailed explanation having 70-80 words) of 3 marks each = 15 marks (All compulsory)

Section II: Five (5) medium answer questions (with explanation having 250-300 words) of 7 marks each = 35 marks (All compulsory)

Section III: Five (5) long answer questions (with detailed explanation/ of 500-600 words) covering all the units. The candidate will be required to answer only two questions of 15 marks each = 30 marks.

II. Assessment Test (Total Marks: 20) Time duration: 1 hr. The internal assessment under CBCS shall comprise of two parts

Part A: Total weightage to this part shall be 10 marks. It will have eight short answer questions, selecting at least three from each of the two/three units/50% of the syllabus covered. A candidate has to attempt any five questions of two marks each.

Part B: Total weightage to this part shall be 5 marks. It will have two long answer questions, selecting at one each from first two/three units/50% of the syllabus covered. A candidate has to attempt any one question of 5 marks.

Attendance : 5 marks

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