



GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS)

KUMBAKONAM – 612 001

Affiliated to Bharathidasan University

DST - CURIE Sponsored Institution

IV Cycle of Accreditation

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DEPARTMENT OF BOTANY

Employability

Entrepreneurship

Skill development

Programme Code: USBO

CORE COURSE-I

BACTERIA, VIRUSES, ALGAE, FUNGI AND LICHENS

**Theory Hours : 6 Course code: U21BOC101 Practical Hours :- Credit:5 Exam Hours : 3
Marks:100**

Unit: I Bacteria

Bacteria – Discovery, General characteristics and cell structure; Nutritional types of bacteria (based on carbon, nitrogen and energy sources); Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); techniques in sterilization, bacterial culture and staining (simple and differential); Economic importance.

Unit: II Viruses

Viruses – Discovery, general structure, Symptoms of virus infection in plants; transmission of plant viruses; genome organization, replication of plant virus (tobacco mosaic virus); techniques in plant viruses – purification; structure and multiplication of bacteriophages; structure and multiplication of viroids. Economic importance.


Unit: III Algae

General characteristics of various divisions; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae (F. E. Fritsch); Morphology and life-cycles of the following: *Nostoc*, *Chlamydomonas*, *Oedogonium*, *Vaucheria*, *Diatoms*, *Ectocarpus*, *Dictyota*, *Polysiphonia*. Economic importance of algae.

Unit:IV Fungi

General characteristics, ecology and significance, range of thallus organization, cell wall




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composition, nutrition, reproduction and classification (Alexopolous); True Fungi – General characteristics, ecology and significance, life cycle of *Rhizopus* (Zygomycota) *Penicillium*, *Alternaria* (Ascomycota), *Puccinia*, *Agaricus* (Basidiomycota); Economic importance.

Unit :V Lichens

Symbiotic Associations – Lichens: General account, occurrence, thallus organization, classification, structure, physiology, reproduction, and role in environmental pollution and uses; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.

U.G Question pattern (SEM: 75 mark +CIA: 25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

CORE COURSE-III

PLANT PATHOLOGY AND PLANT PROTECTION

**Theory Hours : 6 Course code: U21BOC203 Practical Hours :- Credit:5 Exam Hours : 3
Marks:100**

Unit: I


Plant Pathology: History, losses due to pathogens, importance of study of Plant pathology; Classification of plant diseases based on; (a) Major causal agents - biotic and abiotic, (b) General Symptoms. Process of infection and pathogenesis:(a) Penetration and entry of pathogen into host tissue – mechanical, physiological and enzymatic. (b) Host-parasite interaction, enzymes and toxins in pathogenesis.

Unit: II Plant Disease Management

Chemical means of disease control: Fungicides - Definition, classification, characters of an ideal fungicide; antibiotics and nematicides. Biological Control of Plant Diseases– Definition, Importance, Biological control agents and their role in plant disease control.

Unit: III Common Plant Diseases




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Study of plant diseases with respect to symptoms, causal organism, disease cycle and their management: (a) Cereals: Rice – blast disease; (b) Vegetables: Brinjal – Little leaf; (c) Fruits: Banana – bacterial leaf blight, Citrus – bacterial canker; (d) Oil seeds: Groundnut – Tikka disease; (e) Sugar yielding: Sugarcane - red rot.

Research in Plant Pathology- Contribution of Indian Plant Pathologists: Rangasami, G. Mahadevan, A., Bilgrami, K. S., and Mehrotra, R. S.), Contribution of Research institutes – IARI (Indian Agricultural Research Institute), ICRISAT (International Crop Research Institute for Semi-Arid Tropics)

Unit: IV Plant Protection

Scope, Importance, equipments used in plant protection -Sprayers - dusters - soil injector - seed dressing drum; Seed treatment: objectives of seed treatment, Traditional and modern methods of seed treatment. Soil sterilization: Objectives, Traditional and modern methods of soil sterilization. Role of soil sterilization in Polyhouse farming.

Unit :V Methods of Plant Protection

a) Cultural – Tillage, sowing and planting dates, crop hygiene, crop rotation, trap crops, fertilizer.
b) Mechanical – Field sanitation: For diseases – collection and destruction of diseased plant debris; For pests – hand picking and destruction of egg masses; shaking of plants, rope dragging, netting, bagging, physical barriers, use of sticky bands, tin-bands and light traps.c) Physical – Heat and soil solarizations.

d) Chemical– Brief account and uses of Bactericides, Fungicides, Insecticides, Nematicides, Acaricides, Molluscicides, Rodenticides and Herbicides.

e) Biological– Introduction, biological control of Insect pests and diseases

f) Legal (Plant Introduction, domestic quarantine, need of plant quarantine) quarantine in India

U.G Question pattern (SEM: 75 mark +CIA: 25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

**NON-MAJOR ELECTIVE I
BIOFERTILIZERS AND BIOPESTICIDES**

Theory Hours :2 Course code: U21BO3NME1:1 Practical Hours :- Credi:2 Exam Hours : 3 Marks:100



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Unit I

Biofertilizers – Definition, kinds of microbes as biofertilizers, Rhizobium-legume Symbiotic association – mass cultivation and carrier materials.

Unit II

Cultural method of *Azospirillum*, *Azotobacter*, *Azolla* and *Anabaena*, carrier materials.

Unit III

Mycorrhiza– VAM association, types, isolation and inoculum production.

Unit IV

Pesticides – Introduction – Biological Magnification concept. Biopesticides – Viral origin, fungal origin.

Unit V

Biopesticides – Bacterial origin, *Bacillus thuringiensis* mechanism of action and application. Advantages of biopesticides and commercialization.

Books:

1. SubbaRao, N.S. (2000). *Soil Microbiology*. Oxford and IBH Publishing Co. Ltd., New Delhi.
2. Varma, A. and Hock, B. (1995). *Mycorrhiza*. Springer-Verlag, Berlin.
3. Wicklow, D.T. and Soderstrom, B.E. (1997). *Environmental and Microbial Relationships*. Springer-Verlag, Berlin.
4. YaacoVokan (1994). *Azospirillum/Plant Associations*. CRC Press, Boca Raton, FL.

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Five Question (Two Question from each unit –Either or type)

5×15=75 marks

NON-MAJOR ELECTIVE - II HORTICULTURE

Theory Hours : 2 Course code: U21BO4NME2:1 Practical Hours :- Credit:2 Exam Hours : 3 Marks:100


Unit I

Horticulture: Importance and scope of Horticulture, Classification of horticultural crops – fruits, vegetables crops, climate, soil, water, nutrition needs of horticultural crops,

Unit II Plant propagation methods, cutting, layering, grafting, budding, stock-scion relationship. Use of plant regulators in horticulture.

Unit III Garden designs, types of gardens – formal, informal and kitchen garden, units of garden, hedge, border, popiary arches and lawn maintenance.




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Unit IV Floriculture, cultivation of commercial flowers – rose and jasmines. Cultivation of important fruit trees – Mangoes and Banana.

Unit V Green house, Indoor gardening – Bonsai – flower arrangements – nursery management and maintenance.

Books:

1. Bose, T.K. and Mukherjee, D. (1972). *Gardening in India*. Oxford & IBH Publishing Co., Kolkatta.
2. Edmond, J.B., Musser, A.M. and Andrews, F.S. (1951). *Fundamentals of Horticulture*. McGraw-Hill Book Company, Inc., New York.
3. Jitendra Singh. (2014). *Basic Horticulture*. Kalyani Publishers, Chennai.
4. Kumar, N. (1997). *Introduction to Horticulture*. Rajalakshmi Publications, Nagercoil.
5. LexLauries and Victor, H.R. (1950). *Floriculture – Fundamental and Practices*. McGraw Hill Publishers, New York.
6. Naik, K.C. (1963). *South Indian Fruits and Their Culture*. Vardhachary & Co., Madras.
7. Randhawa, G.C. (1973). *Ornamental Horticulture in India*. Today & Tomorrow Publishers, New Delhi.
8. Sandhu, M.K. (1989). *Plant Propagation*. Wiley Eastern Ltd., New Delhi.
9. Sundararajan, J.S., Muthuswamy, J., Shanmugavelu, K.G. and Balakrishnan, R. *A Guide to Horticulture*. Thiruvankadam Printers, Coimbatore.

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Five Question (Two Question from each unit –Either or type)

5×15=75 marks

CORE COURSE –XI

MORPHOLOGY, TAXONOMY OF ANGIOSPERM AND ECONOMIC BOTANY

Theory Hours : 5 Course code: U21BOC511 Practical Hours :- Credit:5 Exam Hours : 3 Marks:100


Unit I

Morphology: vegetative, floral and fruit parts – Inflorescence – Types – racemose, cymose, mixed and special types. Fruit - simple, fleshy, dry dehiscent and dry indehiscent, aggregate and multiple fruits.

Unit II

Binomial nomenclature – ICBN rules – taxonomic types. Systems of Classification – Bentham and Hooker classification – Merits and demerits. Phylogenetic classification – anatomical, embryological, biochemical and palynological evidence for taxonomy, numerical taxonomy,




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Herbarium techniques.

Unit III

A detailed study of the following families with their economic importance – Annonaceae, Capparidaceae, Tiliaceae, Rutaceae, Anacardiaceae, Leguminosae (Papilionaceae, Cesalpinaceae and Mimosaceae) and Cucurbitaceae.

Unit IV

A detailed study of the following families with their economic importance – Rubiaceae, Asteraceae, Apocynaceae, Asclepiadaceae, Solanaceae, Verbenaceae, Euphorbiaceae, Orchidaceae and Poaceae.

Unit V

Economic Botany: A brief study of the following economically important plants:

Food – Cereals (*Oryza sativa*, *Eleusinecoracana*); Pulses – Black gram (*Phaseolusmungo*), Edible – Gingelly oil (*Sesamumindicum*); Root tubers – Tapioca (*Manihotesculenta*); Sugar – Sugarcane (*Saccharumofficinarum*).

Fibres – Textiles (*Gossypium*); Others– *Crotalaria*, *Agave*.

Medicinal Plants – *Ocimum*, *Phyllanthus*, *Solanum*.

Forest Products – Timber: Teak (*Tectonagrandis*), Jack (*Artocarpusheterophyllus*). Tannins, Gums, Resins, Turpentine.

Unit VI (Not for Semester Examination)


Current trends in plant taxonomy, floristic studies, evidences for plant taxonomic classification, palynology and systematics, Economic products and forest products of India

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

**MAJOR-BASED ELECTIVE- I
BIO-RESOURCES AND HUMAN WELFARE**




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Theory Hours : 5 Course code: U21BO5MBE1:1 Practical Hours :- Credit:4 Exam Hours : 3 Marks:100

Useful products from microorganisms – Single cell proteins from fungi (yeast), algae (Spirulina), antioxidants from Dunaliellasalina, Vitamins, enzymes, organic acids, antibiotics and alcohol (With one example each)

Unit II

Useful products from Gymnosperms – Wood (Pine), Drugs (Turpentine, taxol, Ephedrine)

Unit III

Study of plants for the source and application of the following products, beverage (coffee), narcotics (poppy) fiber (Cotton), oil-seeds (sesame), latex (rubber), start up for plant based industries in Tamilnadu

Unit IV

Importance and application areas: biomass production - food (single cell proteins); bio-fertilizers. Environmental Biotechnology: Waste treatment – solid (compost), Liquid (industrial effluents), sewage treatment (domestic sewage).

Unit V

Traditional and economically important wood plant species of India. Acacia, Albizia, Bambusa, Dalbergia, Tectonagrandis, Terminalia

References:

1. Sambamurthy, A.V.V.S. and Subrahmanyam, N.S. 1989. A Textbook of Economic Botany Wiley Eastern Ltd., New Delhi, Bangalore, Bombay, Calcutta, Guwahati Hyderabad, Lucknow, Madras, Pune.
2. Pandey, B.P. 2000. Economic Botany, S. Chand & Co., New Delhi.
3. Verma, V. 1974. A Text Book of Economic Botany, Emkay Publications, New Delhi 4. Hill, A.W, 1952. Economic Botany, McGraw Hill Book Co., New York. 5. Gupta, S.K and Kaushik, M.P., 1973. An Introduction to Economic Botany, K. Nath & Co., Meerut, India.

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks



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SEMESTER-IV

SELF STUDY COURSE: HERBAL TECHNOLOGY

**Theory Hours : 6 Course code: SBHT Practical Hours :- Credit:5 Exam Hours : 3
Marks:100**

Unit:I

History, and Development of gardening. Principles of designing a garden, Importance of gardening.

Unit:II

Garden-Types of Garden-Terrace garden, Rock garden, Hydroponics, Terrarium, Arches, Pergolas, Bonsai and lawn.

Unit:III

Home garden-Interior decoration-Decorating the home with the plants-(Foliage plants and Flowering plants-Window sill, balcony and roof garden.

Unit:IV

General aspects of cultivation of commercial flowers in India. Scope and importance of flowers. Cut flowers and their maintenance.

Unit:V

Flower arrangement commercial Floriculture, Cultural practices of rose, Jasmine, Chrysanthemum, Crossandra and Polyanthus.

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)


Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

MAJOR-BASED ELECTIVE II

PRESERVATION OF FRUITS AND VEGETABLES

**Theory Hours : 6 Course code: U21BO6MBE2:2 Practical Hours :3 Credit:5 Exam Hours :
3 Marks:100**




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Unit I: Principles of preservation, Methods of preservation - refrigeration, freezing, canning, drying and dehydration, chemical preservatives.

Unit II: Food spoilage causes and factors. Causes physical, chemical and biological factors pH, temperature, available moisture.

Unit III : Canning of Fruits: mango, apple and banana. Canning of vegetables: bean, carrot and tomato.

Unit IV: Processing methods of the following fruits. Banana, dates, grape, fig and mango Preparation of jam, jelly juice squash, pickles, marmelods.

Unit V: Asepsis- packing and packing materials, metal, glass, papers, plastics and films, laminates, Edible films and wooden packaging.

Books for Reference:

1. Siddappa, G.S. and Tandon, G.L., (1998). Preservation of Fruits and Vegetables S Lal G., Indian Council of Agricultural Research, New Delhi. 2006. M/s. IRD
2. Preservation and Canning of Fruits and Vegetable (EIRI), Publishers, New Delhi. 3. Frazier, w.C. and West Holf, D.C., (1995). Food Microbiology. Tata McGraw Hill Publishing Col. Ltd., New Delhi.
4. Kulshrestha, S.K., (1994). Food Preservation, Vikas Publishing House, New Delhi. 5. Swaminathan, M., (1992). Handbook of food Science and Experimental foods, the Bangalore printing and Publishing Col. Ltd., Bangalore

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

**MAJOR-BASED ELECTIVE- II
BIOTECHNOLOGY**

Theory Hour : 6 Course code: U21BO6MBE2:3 Practical Hours :3 Credit:5 Exam Hours : 3 Marks:100



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Unit I : Scope and importance of biotechnology. Basic of genetic engineering foreign DNA preparation, insertion of DNA into vectors. Enzymes of genetic engineering: restriction endonucleases & ligases Gene cloning vectors plasmids (pBR322) and cosmids (PLFR5).

Unit II : Selection of recombinants - using antibiotic markers, radio labeling replica plating Transgenic plants for herbicide resistant - applications of genetic engineering.

Unit III : Biological nitrogen fixation- mechanism, use of Azotobacter, Anabaena and Rhizobium as biofertilizer organisms.

Unit IV : Biological waste treatments sewage and reuse of wastes, primary and secondary

Unit V : Fermentation: Types of fermentor, media - Production of enzymes; (protease), alcohol (ethanol) and antibiotics (Penicillin).

Books for Reference:

1. Dubey, R.C. and Maheswari, D.K., (2003). A text book of Microbiology. S.Chand and Campus, New Delhi.
2. Kumaresan, V., (2001). Biotechnology Saras Publication, Nagarcoil.
3. Ratledge and Kristenson, (2001). Basic Biotechnology, Oxford University Press.

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

CORE COURSE-III

PLANT PATHOLOGY AND PLANT PROTECTION

Theory Hours : 6 Course code: U21BOC203 Practical Hours :- Credit:5 Exam Hours : 3 Marks:100

Unit: I



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Plant Pathology: History, losses due to pathogens, importance of study of Plant pathology; Classification of plant diseases based on; (a) Major causal agents - biotic and abiotic, (b) General Symptoms. Process of infection and pathogenesis:(a) Penetration and entry of pathogen into host tissue – mechanical, physiological and enzymatic. (b) Host-parasite interaction, enzymes and toxins in pathogenesis.

Unit: II Plant Disease Management

Chemical means of disease control: Fungicides - Definition, classification, characters of an ideal fungicide; antibiotics and nematicides. Biological Control of Plant Diseases– Definition, Importance, Biological control agents and their role in plant disease control.

Unit: III Common Plant Diseases

Study of plant diseases with respect to symptoms, causal organism, disease cycle and their management:(a) Cereals: Rice – blast disease; (b) Vegetables: Brinjal – Little leaf; (c) Fruits: Banana – bacterial leaf blight, Citrus – bacterial canker; (d) Oil seeds: Groundnut – Tikka disease; (e) Sugar yielding: Sugarcane - red rot.

Research in Plant Pathology- Contribution of Indian Plant Pathologists: Rangasami, G. Mahadevan, A., Bilgrami, K. S., and Mehrotra, R. S.), Contribution of Research institutes – IARI (Indian Agricultural Research Institute), ICRISAT (International Crop Research Institute for Semi-Arid Tropics)

Unit: IV Plant Protection

Scope, Importance, equipments used in plant protection -Sprayers - dusters - soil injector - seed dressing drum; Seed treatment: objectives of seed treatment, Traditional and modern methods of seed treatment. Soil sterilization: Objectives, Traditional and modern methods of soil sterilization. Role of soil sterilization in Polyhouse farming.

Unit :V Methods of Plant Protection

- g) Cultural – Tillage, sowing and planting dates, crop hygiene, crop rotation, trap crops, fertilizer.
- h) Mechanical – Field sanitation: For diseases – collection and destruction of diseased plant debris; For pests – hand picking and destruction of egg masses; shaking of plants, rope dragging, netting, bagging, physical barriers, use of sticky bands, tin-bands and light traps.i) Physical – Heat and soil solarizations.
- j) Chemical– Brief account and uses of Bactericides, Fungicides, Insecticides, Nematicides, Acaricides, Molluscicides, Rodenticides and Herbicides.
- k) Biological– Introduction, biological control of Insect pests and diseases





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1) Legal (Plant Introduction, domestic quarantine, need of plant quarantine) quarantine in

India U.G Question pattern (SEM: 75 mark +CIA: 25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

CORE COURSE- V

BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY

Theory Hours : 6 Course code:U21BOC305 Practical Hours :- Credit:5 Exam Hours : 3
Marks:100

Unit I

Bryophytes-General Characteristics, Classification – Liverworts (Stotler *et al.*, 2009), hornworts (Renzaglia *et al.*, 2009) and Mosses (Goffinet *et al.*, 2009); Morphology, Structure, Reproduction and life history of the following genera: *Riccia*, *Marchantia*, *Anthoceros*, *Polytrichum* and *Funaria*.

Unit II

Pteridophytes– General characteristics and classification by Smith; Morphology, Structure, Reproduction and life-history of the following genera: *Psilotum*, *Lycopodium*, *Selaginella* and *Equisetum*.

Unit III

Morphology, structure, Reproduction and life-history of *Adiantum*, *Marsilea*; Stellar evolution in Pteridophytes; Heterospory and origin of seed habit.

Unit IV

Gymnosperms– General characteristics and classification of Gymnosperms by Sporne; Morphology, structure, mode of reproduction and life-history of the following genera: *Cycas*, *Pinus* and *Gnetum*.

Unit V

Paleobotany– fossils and methods of fossilization – Geological time–scale – an elementary




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knowledge of the computation of the age of fossils – Radio-Carbon dating technique.

a) *Rhynia*, b) *Lepidodendron*, c) *Pentoxylon* and d) *Williamsonia*.

Unit VI (Not for Semester Examination)

Current trends in plant diversity, evolution of wood in gymnosperm, fossil evidences in Tamilnadu and India and keeladi paleontological study, Autoradiography, carbon dating, geological studies related to botany.

U.G Question pattern (SEM: 75 mark +CIA: 25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

ANATOMY, EMBRYOLOGY AND MICROTECHNIQUE

**Theory Hours :6 Course code :U21BOC407 Practical Hours :- Credit:3 Exam Hours : 3
Marks:100**

Unit I

Anatomy: Plant tissue– classification, Meristems, definition, differentiation, redifferentiation and dedifferentiation. Classification of meristems- apical meristems and lateral meristems intercalary meristem, various Concepts of apical meristem theories, apical cell theory, Tunica – Corpus and Histogen theory.

Unit II

Epidermal tissue system, stomatal types. Permanent tissue – simple – Parenchyma, collenchyma and sclerenchyma. Complex Permanent Tissues: Xylem – Components, Ontogeny and Phylogeny; Phloem – Components, Ontogeny and Phylogeny. Laticifer types.

Unit III

Primary structure of root, stem and leaf in dicots and monocots. Normal Secondary growth in




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stem and root-annual rings – heart Wood, sapwood. Periderm formation.

Anomalous secondary growth in dicot stems: *Nyctanthes* and *Boerhaavia* and monocot stem *Dracaena*. Nodal anatomy – uni and trilacunar types.

Unit IV

Embryology – Structure and development of anther. Microsporogenesis; Microgametogenesis; Ultrastructure of pollen wall – structure, development and types of ovules, megasporogenesis, Megagametogenesis (*Polygonum* type of embryosac development), Fertilization. Endosperm types, Development of embryo – dicot and Monocot. Basic concepts of apomixis, apospory, Polyembryony and Parthenogenesis.

Unit V Microtechniques

Micrometry, Fixation, dehydration, embedding, hand sectioning, microtome sectioning, stain types, staining and mounting. Preparation of double staining using saffranin and fast green. whole mounts, temporary mounts, maceration and epidermal peeling.

Unit VI (Not for Semester Examination)

Current trends in histological studies, Microphotography, measuring cell size, leaf thickness, advances in microscopic techniques, anatomy in relation to plant taxonomy, advances and disadvantages of parthenocarpy

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks


NON-MAJOR ELECTIVE I BIOFERTILIZERS AND BIOPESTICIDES

**Theory Hours :2 Course code: U21BO3NME1:1 Practical Hours :- Credi:2 Exam Hours :
3 Marks:100**

Unit I

Biofertilizers – Definition, kinds of microbes as biofertilizers, Rhizobium-legume Symbiotic




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association – mass cultivation and carrier materials.

Unit II

Cultural method of *Azospirillum*, *Azotobacter*, *Azolla* and *Anabaena*, carrier materials.

Unit III

Mycorrhiza– VAM association, types, isolation and inoculum production.

Unit IV

Pesticides – Introduction – Biological Magnification concept. Biopesticides – Viral origin, fungal origin.

Unit V

Biopesticides – Bacterial origin, *Bacillus thuringiensis* mechanism of action and application. Advantages of biopesticides and commercialization.

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Five Question (Two Question from each unit –Either or type)

5×15=75 marks

NON-MAJOR ELECTIVE - II

HORTICULTURE

Theory Hours : 2 Course code: U21BO4NME2:1 Practical Hours :- Credit:2 Exam Hours : 3 Marks:100

Unit I

Horticulture: Importance and scope of Horticulture, Classification of horticultural crops – fruits, vegetables crops, climate, soil, water, nutrition needs of horticultural crops.

Unit II Plant propagation methods, cutting, layering, grafting, budding, stock-scion relationship. Use of plant regulators in horticulture.

Unit III Garden designs, types of gardens – formal, informal and kitchen garden, units of garden, hedge, border, popiary arches and lawn maintenance.

Unit IV Floriculture, cultivation of commercial flowers – rose and jasmines. Cultivation of important fruit trees – Mangoes and Banana.


Unit V Green house, Indoor gardening – Bonsai – flower arrangements – nursery management and maintenance.

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Five Question (Two Question from each unit –Either or type)

5×15=75 marks




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CELL AND MOLECULAR BIOLOGY

**Theory Hours : 5 Course code: U21BOC509 Practical Hours :- Credit:5 Exam Hours : 3
Marks:100**

Unit I

Basic principles of microscopy. Differentiating features of Prokaryotic and Eukaryotic cells – Ultra structure and functions of plasma membrane – Ultra structure of cell organelles – Plastids, Mitochondria, Golgi bodies, Endoplasmic Reticulum, Lysosomes, Cell Inclusions.

Unit II

Nucleus – Nucleolus - Structure of euchromatin and heterochromatin – Special types of chromosomes – Lamp brush chromosomes and polytene chromosomes. Cell cycle, Cell Division: Mitosis and meiosis.

Unit III

Nucleic acids – DNA and RNA – Differentiating features – Griffith Experiment -Structure, properties (C-Value Paradox) & replication of DNA- Hershey and Chase experiment – RNA – Structure and functions of rRNA, mRNA and tRNA.

Unit IV

Gene regulation in Prokaryotes (*Lac* operon concept) and Eukaryotes – Initiation, Elongation and termination of Transcription and Translation. Gene regulation in prokaryotes and eukaryotes – Differences.

Unit V

Chloroplast and mitochondrial genome organization – Microbial genetics – PCR, Basic mechanism of signal transduction – principles of cell communication - Programmed Cell Death (PCD).


Unit VI (Not for Semester Examination)

Current trends in molecular biology, cell communication, cell signaling, mechanism and significance of mutation, post translation changes, gene mapping and sequencing, genetic variation in plants **Course**

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks




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**CORE COURSE - X
GENETICS, BIostatISTICS AND EVOLUTION**

**Theory Hours : 5 Course code: U21BOC510 Practical Hours :- Credit:5 Exam Hours : 3
Marks:100**

Unit I

Genetics: Mendel's laws, monohybrid, dihybrid, back cross and test cross. Allelic interactions: Incomplete dominance and co-dominance – complementary factor hypothesis, epistasis (Dominant and recessive), Non-allelic interaction – Lethal factor, Multiple factor hypothesis

Unit II

Recombination – Linkage & crossing over in *Lathyrus odoratus*, eye colour in *Drosophila* and colour blindness in man. Cytoplasmic inheritance. Sex determination in plants and *Drosophila*.

Functional units of gene – cistron, recon, muton, codon and operon concept (lac). Mutation – classification, types, mechanism (physical and chemical mutagens) and application (role of mutation in evolution)

Unit III

Biostatistics: Definition and scope. Sampling techniques: Sample, population, Random and non-random sampling techniques. Data – Types of data. Presentation of data – Graphical methods: Histogram, Bar and Pie diagrams.


Unit IV

Measures of central tendency – Mean, median and mode. Measures of dispersion – range, variance, Standard Deviation and Standard Error. Chi Square analysis. Correlation and its types: Probability Distribution – normal, binomial and Poisson distribution.

Unit V

Evolution – Evolutionary concepts – Theories of Lamarck, Charles Darwin and the modern synthetic theories. Population genetics – gene pool, gene frequency and Hardy-Weinberg law. Factors affecting gene frequencies.




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Unit VI (Not for Semester Examination)

Current trends in modern genetics, genetic disorder, non mendalian genetics, role of statistics in botany, physical and chemical means of mutation, modern trends of evolution **Course**

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	10×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

**SKILLENHANCEMENT -II (SBS II)
MEDICINAL AND APPLIED BOTANY**

Theory Hours :1 Course code: U215BOSE2 Practical Hours :- Credit:1 Exam Hours : 2
Marks:60

Unit I Medical Botany: Importance and relevance of herbal drugs in Indian Systems of Medicine. Pharmacognosy – aim, scope and branches. Phytochemicals – reserve materials, secretory materials and excretory materials.

Unit II Cultivation and marketing of Medicinal plants: *Aloe vera*, *Cassia senna*, *Catharanthus roseus*, *Gloriosa superba* and *Withania somnifera*.

Poisonous plants – action and treatments for different types of plant poisons, rejuvenating herbs and medicinal uses of non-flowering plants

Unit III Adulteration and substitution of crude drugs – methods, types and identification; botanical description and active principles in the drugs of roots, rhizomes, woods and bark, leaves, flowers and seeds (two examples each/plant part).

Unit IV Biofertilizer Technology: biofertilizers – types and importance. Mass cultivation of *Azospirillum*, *Azolla* and *Anabaena*. Rhizobium-legume symbiotic association – mass cultivation and carrier materials. Mycorrhiza – types and importance.

Biopesticides – importance; bacterial (*Bacillus thuringiensis*); Viral (NPV); Fungal (*Trichoderma*).




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Unit V Microbial Technology: Analysis of Drinking water for coliforms – MPN test – Sewage treatment – Primary, Secondary and Tertiary treatments – Bioremediation and Biomagnifications.
U.G Question pattern (SEM: 20 mark + SEM Pract:20 mark CIA:40 mark =Total:100 marks)

MAJOR-BASED ELECTIVE- I

BIO-RESOURCES AND HUMAN WELFARE

**Theory Hours : 5 Course code: U21BO5MBE1:1 Practical Hours :- Credit:4 Exam Hours : 3
Marks:100**

Unit I

Useful products from microorganisms – Single cell proteins from fungi (yeast), algae (Spirulina), antioxidants from Dunaliella salina, Vitamins, enzymes, organic acids, antibiotics and alcohol (With one example each)

Unit II

Useful products from Gymnosperms – Wood (Pine), Drugs (Turpentine, taxol, Ephedrine)

Unit III

Study of plants for the source and application of the following products, beverage (coffee), narcotics (poppy) fiber (Cotton), oil-seeds (sesame), latex (rubber), start up for plant based industries in Tamilnadu

Unit IV

Importance and application areas: biomass production - food (single cell proteins); bio-fertilizers. Environmental Biotechnology: Waste treatment – solid (compost), Liquid (industrial effluents), sewage treatment (domestic sewage).

Unit V

Traditional and economically important wood plant species of India. Acacia, Albizzia, Bambusa, Dalbergia, Tectonagrandis, Terminalia


References:

1. Sambamurthy, A.V.V.S. and Subrahmanyam, N.S. 1989. A Textbook of Economic Botany Wiley Eastern Ltd., New Delhi, Bangalore, Bombay, Calcutta, Guwahati Hyderabad, Lucknow, Madras, Pune.
2. Pandey, B.P. 2000. Economic Botany, S. Chand & Co., New Delhi.
3. Verma, V. 1974. A Text Book of Economic Botany, Emkay Publications, New Delhi
4. Hill, A.W, 1952. Economic Botany, McGraw Hill Book Co., New York.
5. Gupta, S.K and Kaushik, M.P., 1973. An Introduction to Economic Botany, K. Nath & Co., Meerut, India.

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
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Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

PLANT PHYSIOLOGY ,BIOPHYSICS AND BIOCHEMISTRY

**Theory Hours :6 Course code: U21BOC613 Practical Hours :- Credit:5 Exam Hours : 3
Marks:100**

Unit I

Plant - Water relationship: structure and properties and significance of water - osmotic and non-osmotic uptake of water. Ascent of sap-cohesion theory: root pressure, transpiration, physiology of stomatal action, Translocation of solutes and assimilates. Mass flow, Membrane permeability mineral uptake: Passive and active. Role of major and Minor elements, mineral deficiency symptoms.

Unit II

Photosynthesis: Absorption spectrum, Action spectrum, role of pigments, enhancement effect, photosystems I & II, Photophosphorylation, Carbon Assimilation: Calvin cycle, Hatch& Slack pathway, CAM pathway. photorespiration.

Respiration: Aerobic and anaerobic. Glycolysis, Kreb’s Cycle and oxidative phosphorylation, energetics of respiration.

Unit III


Plant Growth regulatory substances; auxins, gibberellins, cytokinins, ethylene and abscissic acid - their chemical nature, physiological effects and function. Role of hormones in flowering, senescence and abscission- Photoperiodism, vernalization and seed dormancy. Nitrogen cycle, nitrogen fixation.

Unit IV

Biochemistry: Enzymes - Nature and properties. Mechanism of enzyme action-factors affecting Enzyme action, substrate concentration – inhibitors, cofactors. Structure, classification and functions of carbohydrates, lipids and Proteins. Secondary metabolites – alkaloids, flavonoids, terpenoids and anthocyanins.

Unit V




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Biophysics-physical forces and chemical bonds, biological effect of ionising radiations, basic principles of spectroscopy, Laws of Thermodynamics and entropy-electron transfer processes-a) Definition of pH -its determination; b) Buffers and electrolytes and their functions. c) Fractionation of biomolecules by paper chromatography, d) Centrifugation. Bioenergetics – free energy, chloroplast and mitochondrial bioenergetics

Unit VI (Not for Semester Examination)

Current trends in plant function, thermodynamic principles, nature of solar radiation, biophysics of bioluminescence, determination of basic physiological parameters, circadian rhythm, biological clock

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit – Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

**CORE COURSE- XIV
PLANT ECOLOGY AND CONSERVATION**

**Theory Hours : 6 Course code: U21BOC614 Practical Hours :- Credit:5 Exam Hours : 3
Marks:100**

Unit I

General Ecology – Approaches to the study of Ecology, Autecology – Synecology, Plant environment – climatic, edaphic and Biotic factors (interference on Plant habitat by animals – Grazing and browsing, by humans – deforestation, Agriculture), Allelopathy.


Unit II

Ecosystem concept – components abiotic-biotic-autotrophic producers & heterotrophic consumers, biomass-ecological pyramids, Productivity – primary, secondary & gross; food chain – food web & energy flow – pond ecosystem.

Unit III

Vegetation – Units of vegetation – formation, association, consociation, society – Development of vegetation: Migration – colonization, ecesis, Methods of study of vegetation (Quadrat &




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transect). Plant succession – Hydrosere & xerosere. Ecological classification of Plants; Morphological and anatomical features of plants and their correlation to the habitat. Floristic studies – IVI, Shannon index, vegetation analysis

Unit IV

Pollution and its control: Air pollution, Radiation pollution, Noise pollution, Thermal pollution, Soil pollution: Industrial, agrochemicals (insecticides, pesticides, fungicides, herbicides). Water pollution – Industrial effluents. Marine pollution.

Unit V

Phytogeography-Approaches to Phytogeography – Climate of India & its climatic zones, Botanical regions (provinces) of India – Vegetational types of Tamil Nadu: Evergreen, deciduous, scrub & Mangrove, Continuous and discontinuous distribution. Endemism. *In situ* and *ex situ* conservation. Application of remote sensing in conservation.

Unit VI (Not for Semester Examination)

Current trends in biodiversity, ecophysiology of halophytes, global warming, zero day, GPRS, spectral vegetation studies, biodiversity hot spots, conservation methods.


10. Identify the types of distribution, endemism and conservation.

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

LABORATORY TECHNIQUES




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**Theory Hours :2 Course code: U21BO3NME1:2 Practical Hours :- Credit:2 Exam Hours :
3 Marks:100**

Unit I : Preservation of plant materials Fixation, Stains, preparation of medium for culture, PDA, MS Media.

Unit II : Sectioning of plant material Hand sectioning, microtome sectioning. Double staining, Permanent and semi permanent mounts.

Unit III : Extraction and purification methods Batch extraction, solvent extraction, filtration

Unit IV : Cytochemical test for identification of proteins, lipid, starch & sugar in plant tissues. Suspension culture, callus culture use of rotary shakers.

Unit V : Biostatistics Mean, Median, Mode, Standard deviation, Standard error, Student test and Chi square test.

U.G Question pattern (SEM: 75 mark +CIA: 25 mark =Total:100 marks)

Five Question (Two Question from each unit –Either or type)

5×15=75 marks

**NON-MAJOR ELECTIVE - II
SEED PATHOLOGY**

**Theory Hours : 2 Course code: U21BO4NME2:2 Practical Hours :- Credit:2 Exam Hours :
3 Marks:100**

Unit I :History of Seed Pathology-Importance in agriculture -losses caused by seed borne diseases. Seed health testing for fungi, bacteria and viruses: Principles and methods.




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Unit II: Seed borne fungi, bacteria and viruses and diseases caused by fungi blast of paddy, red rot of sugarcane; bacteria Blight of paddy, black arm of cotton; viruses: leaf roll of potato, bean, Mosaic virus.

Unit III: Seed infection and establishment avenues, factors and its establishment location in seed -Epiphytotics due to seed borne inoculums.

Unit IV : Controls of seed-borne diseases physical, chemical and biological treatment; post- entry control. Storage fungi and mode of seed deterioration. Mycotoxins, plant variety protection act, legal protection of crop varieties and seed legislation in developing countries.

Unit V: Seed Quarantine, history and importance, principles and regulations of plant quarantine in India. Seed certification history, scheme, eligibility procedure (Organization, Economic Co-operation and Development) Changing concepts, Applying quarantine provisions for seed.

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Five Question (Two Question from each unit –Either or type)

5×15=75 marks

MAJOR-BASED ELECTIVE I


APPLIED MICROBIOLOGY

Theory Hours : 5 Course code: U21BO5MBE1:2 Practical Hours :- Credit:4 Exam Hours : 3 Marks:100

Unit I : Introduction - general information on microbe based industries - Substrate for industrial

Unit II : Food and Dairy Industries: Single Cell Protein (SCP) advantages Microbes as source of SCP (Algae, Fungi, Bacteria) - Mass production of SCP (Spirulina, Bacterial SCP) - Yogurt and Cheese production.




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Unit III :Pharmaceutical and related industries - Antibiotics - Sources and types - production of Penicillin and Streptomycin; Recombinant drugs and vaccines - insulin and Hep B Vaccine; advantages of vaccine, Vitamins - Vitamins B12.

Unit IV:Alcohol and organic acid industries-Industrial production of Alcohol (Ethanol) Organic acids: Citric acid and Acetic acid production - Vinegar production. Lactic acid production, Glutamic acid.

Unit V :Microbial Enzymes - Amylase, Protease, Microbes used for amino acid production - production of Hormones. Commercial production of L- Glutamic acids and Application of enzymes.

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

MAJOR-BASED ELECTIVE BIOLOGICAL CONTROL

Theory Hours : 5 Course code: U21BO5MBE1:3 Practical Hours :- Credit:4 Exam Hours : 3 Marks:100

Unit I :Role of Biological control in plant pathology. Inoculum, Historical back ground, phyllophere phylloplane, rhizosphere, Rhizoplane regions. Tests with individual antagonist.

Unit II :Interactions between microorganisms - Definition - Factors involved in Biological control - The host, The pathogen or parasite, physical environment, The antagonists

Unit: III :Biological control of pathogens of aerial parts - Microorganism on aerial parts pathogens on aerial parts Infection through unbroken plants surfaces or Natural opening- wounds dead plants parts - latent infection.

Unit: IV :Role of antagonist in biological control- kinds of antagonists-Bacteria, Fungi, Actinomycetes, Viruses - Forms of Antagonism-Antagonism, Ammensalism, competition predation and Parasitism, mycoparasitism and nematophage and mycophage.



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Unit: V : Role of the host in Biological control- Root dynamics structure, Root hairs, mycorrhizal, relationship, uses Root exudation and the rhizosphere effect -Microbial pesticides Bacterial, Viral, Fungle-Insect as biocontrol agent.

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

MAJOR–BASED ELECTIVE - III

ENVIRONMENTAL BIOTECHNOLOGY

Theory Hours :5 Course code: U21BO6MBE3:2 Practical Hours :- Credit:4 Exam Hours : 3 Marks:100

Unit I: Introduction The environment - soil, water and air. Pollution and its causes (Outline only) Nonconventional energy sources biogas production, methane and hydrogen production. Recycling of solid waste products composting and silaging.

Unit II: Source and treatment of polluted water and effluents Biological treatment of sewage characteristics of sewage and objectives in sewage treatment Activated sludge process - trickling filters Anaerobic digestion. Treatment of industrial effluents using bioreactors.

Unit III: Soil and air pollution and their treatment Soil pollution by Xenobiotics. Degradation of Xenobiotics pathways of phenol, penta chlorophenol and poly chlorinated biphenyl degradation. Purification of polluted air.

Unit IV: Introduction to bioremediation, ex situ and in situ bioremediation. Types of reactors used in bioremediation.

Unit V: Biomineralization- bioleaching - Metal transformation biofilms and biocorrosion. Pollution by radionuclides uptake of radionuclides from polluted sites. Future prospects.

• **U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)**




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Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks s
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks

**MAJOR-BASED ELECTIVE - III
PLANT TISSUE CULTURE**

**Theory Hours :5 Course code: U21BO6MBE3:3 Practical Hours :- Credit:4 Exam Hours : 3
Marks:100**

Unit I:Introduction - History, Scope and Concepts of basic techniques in plant tissue culture.Laboratory requirements. Sterilization, Media preparation - inorganic nutrients, organic supplements, carbon source, gelling agents, growth regulators and composition of MS medium. **Unit II:** Cell, tissue and organ culture Explants and organs for culture - cell suspension cultures - batch, continuous, chemostat culture.

Unit III;Organogenesis - formation of shoots and roots Role of growth regulators Somatic embryogenesis factors affecting somaclonal and gametoclonal variations embryogenesis. **Unit**


IV:Haploid production anther culture - Utilization of haploids in plant breeding. In vitro pollination ovule and embryo culture- and its importance.

Unit V:Protoplast culture: Isolation of protoplasts culture of protoplasts viability. Protoplast fusion Spontaneous, mechanical, induced electrofusion - importance.

Books for Reference :

1. Bhojwani, S. S. and Razdan, M. K. (1983). Plant Tissue Culture: Theory and Practice. Elsevier Science Publishers, Netherlands.
2. Dodds, J. H. and Roberts, I. W. (1985). Experiments in Plant Tissue Culture. Cambridge University Press, UK.
3. Hammond, J., McGarvey, P. and Yusibov, V. (2000). Plant Biotechnology. Springer Verlag, New York.
4. Johri, B. M. (1982).Experimental Embryology of Vascular Plants. Narosha Publishing House, New Delhi.
5. Ramawat, K. G. (2000). Plant Biotechnology. S. Chand & Co., New Delhi. 6. Reinert, J. and Bajaj, Y. P. S. (1977). Plant Cell Tissue and Organ Culture: A Laboratory Manual,




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Narosa Publishing House, New Delhi. K.Karthikeyan. C. Chandran and S.Kulothungan plant Biotechnology.

U.G Question pattern (SEM: 75 mark +CIA:25 mark =Total:100 marks)

Section-A	Twenty multiple choice question (Four Question from each unit)	20×1=20marks
Section-B	Five Question (Two Question from each unit –Either or type)	5×5=25 marks
Section-C	Three Question (Out of five one question from each unit)	3×10=30marks




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