MAHARAJA KRISHNAKUMARSINHJI BHAVNAGAR UNIVERSITY

(With effect from Academic Year 2019-20)

M.Sc. Botany

Core

Faculty : Science
PG Department : Department of Life Sciences
Semester **: III**

Sr. No.	Paper No.	Semester	Course Title	Eligibility	Remarks
1.	IX	III	Taxonomy, Conservation and Utility of Plants	Students of M.Sc. Life Sciences Who have cleared SEM - I	
2.	X	III	Plant Physiology and Metabolism		
3.	XI	III	Plant Development and Reproductio		
4.	XII	III	Practicals		

Name of the Subject: (M.Sc.) Botany

Sr. No.	Paper No.	Semester	Name of the Paper	Total Marks (Ext + Int = Total)	Passing standard (Ext + Int = Total)	Total Teaching Hours	Exam Hours	Credits
1.	IX	III	Taxonomy, Conservation and Utility of Plants	70 + 30 = 100	28 + 12 = 40			
2.	X	III	Plant Physiology and metabolism	70 + 30 = 100	28 + 12 = 40			
3.	XI	III	Plant Development and Reproduction	70 + 30 = 100	28 + 12 = 40			
4.	XII	III	Practicals	70 + 30 = 100	28 + 12 = 40			

Break up of Continuous Internal Evaluation:
Internal Test : 15 Marks
Assignment : 10 Marks
Attendance : 05 Marks
Total Marks : 30 Marks

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SEMESTER - III **M.Sc. Botany** **Paper No: IX**

Title of the Paper: Taxonomy, Conservation and Utility of Plants **Marks: 100**

Credits: 04

Marks: Semester End Examination : 70

Continuous Internal Evaluation : 30

Unit	Detailed Syllabus	Teaching Hours	Marks / Weight
1	**Principles of Taxonomy:** The species concept – taxonomic hierarchy, species, genus, family and other categories. International code of Botanical Nomenclature; **Taxonomic tools:** Method of field studies, Herbarium, Floras, Contributation of cytology, Palenology, Phytochemistry and ecology in Taxonomy, Computers and GIS.	15	18
2	**Systems of Angiosperm Classification:** Bentham and Hooker. Bessey, Huchinson, Englar and prantal: their comparative merits and demerits. Current trends in angiosperms taxonomy based on Cytotaxonomy, Chemotaxonomy and Numerical taxonomy.	15	18
3	**Conservation:** Principles, Extinctions, Environmental status of plants. ***In situ* conservation**: International efforts (IUCN, UNEP, UNESCO, WWF, ICSU, FAO, CAB International, WCMC, ISBI): **Ex situ conservation** : Germplasm collection, Botanical gardens, Seed banks, 'Test Tube' gene bank, Pollen banks, Field gene banks, DNA banks; Activities of BSI, NBPGR, ICAR, CSIR, DBT.	15	17
4	**Protected areas:** Sanctuaries, National parks, Biosphere Reserves, Coral reefs. **Origin, evolution, botany, cultivation and uses of** (i) Food, Forage And Fodder crops, (ii) Fiber crops, (iii) Medicinal and Aeromatics plants, (iv) Oil- yielding crops, (v) Paper making.	15	17

Break up of Continuous Internal Evaluation:

Internal Test : 15 Marks

Assignment : 10 Marks

Attendance : 05 Marks

Total Marks : 30 Marks

Reference Books:

1. Taxonomy of Angiosperms - S.N.Pandey & S.P.Mishra
2. Systematic Botany – R. N. Sutariya
3. Plant Systematic- Gurucharan sinh
4. Angiosperm Taxonomy – D.C. Bhatt and K.D. Mitaliya
5. Economic Botany- B. P. Pandey
6. Textbook of Economic Botany – V. Verma
7. Economic Botany – S.L. Kochhar

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SEMESTER III **M.Sc. Botany** **Paper No: X**

Title of the Paper: Plant Physiology and Metabolism **Marks: 100**

Credits: 04

Marks: Semester End Examination : 70
Continuous Internal Evaluation : 30

Unit	Detailed Syllabus	Teaching Hours	Marks / Weight
1	**Membrane transport and Translocation of Water and Solute:** Plant –water relations, mechanism of water transport through xylem, Transpiration, Comparison of xylem and phloem transport, Phloem loading and unloading, Passive and Active solute transport, Membrane transport proteins. **Mineral nutrition:** Criteria of essentiality of elements, Macro and Micro nutrients, Role of Essential elements, Mineral deficiency symptoms and plant disorders	15	18
2	**Photosynthesis:** General concept and historical background, Photosynthetic Pigments and Light Harvesting Complexes. Photo oxidation of water, Mechanism of electron and proton transport, Carbon assimilation – C3 & C4 cycle, the CAM pathway, biosynthesis of Starch and Sucrose, Physiological and Ecological considerations. **Respiration:** Overview of plant Respiration. Glycolysis, the TCA cycle, Electron transport and ATP synthesis. Pentose phosphate pathways, glyoxylate cycle, alternative oxidase system.	15	18
3	**Nitrogen fixation, Nitrogen and Sulfur metabolism:** Nodule formation and nod factors, mechanism of nitrate uptake and reduction, ammonium assimilation. Sulfate uptake, transport and assimilation. **Lipid metabolism:** Structure and function of lipids, Fatty acids biosynthesis. Synthesis of membrane lipids, structural lipids and storage lipids and their catabolism.	15	17
4	**The flowering process:** Photoperiodism and it significance. Endogenous Clock and its regulation, floral induction and development – genetic and molecular analysis, role of vernalization. **Stress physiology:** Plant response to Biotic and Abiotic stress. Mechanism of Biotic and Abiotic stress tolerance, HR and SAR, Water deficit and drought resistance, Oxidative stress.	15	17

Break up of Continuous Internal Evaluation:

Internal Test: 15 Marks
Assignment : 10 Marks
Attendance : 05 Marks
Total Marks : 30 Marks

Reference Books:

1. Plant Physiology – C.P. Malik
2. Plant Physiology - Devlin & Witham
3. Plant Physiology – Mukherji, A. K. Ghosh
4. Collage Botany by Das, Datta, Ganguly
5. Plant Physiology – Taiz and Zeiger
6. Plant Physiology – Salisbury and Ross

SEMESTER III **M.Sc. Botany** **Paper No: XI**

Title of the Paper: Plant Development and Reproduction **Marks: 100**

Credits: 04

Marks: Semester End Examination: 70
Continuous Internal Evaluation: 30

Unit	Detailed Syllabus	Teaching Hours	Marks / Weight
1	**Introduction:** unique features of plant development; differences between animal and plant development. **Cell wall:** gross structure; chemical composition; formation; electron microscopic structure. **Shoot and root development:** organization of the shoot and root apical meristem (SAM and RAM); control of cell division and cell to cell communication, cell fates and lineages; vascular tissue differentiation; lateral roots; root hairs; root microbes interactions.	15	18
2	**Tissue differentiation:** especially xylem and phloem: secretory ducts and laticifers; wood development in relation to environmental factors. **Leaf growth and differentiation:** determination; phyllotaxy; control of leaf form; differentiation of epidermis (with special reference to stomata and trichomes) and mesophyll. **Vegetative propagation:** natural vegetative propagation (by root, stem, and leaf) artificial method of vegetative propagation (layering, cutting and grafting)	15	18
3	**Male gametophytes**: structure of anthers: microsporogenesis, role of tapetum; pollen development and gene expression; male sterility; sperm dimorphism and hybrid seed production; pollen germination, pollen tube growth and guidance; pollen storage; pollen allergy; pollen embryos. **Female gametophytes:** ovule development; megasporogenesis; organization of the embryos sac, structure of the embryo sac cells.	15	17
4	**Seed development and fruit growth:** endosperm development during early, maturation and desiccation stages, embryo genesis, ultra structure and nuclear cytology; cell lineages during late embryo development; storage protein of endosperm and embryo; polyembryony; apomixes; embryo culture; dynamics of fruit growth; biochemistry and molecular biology of fruit maturation. **Latent life dormancy:** importance and types of dormancy; seed dormancy, overcoming seed dormancy; bud dormancy.	15	17

Break up of Continuous Internal Evaluation:

Internal Test: 15 Marks
Assignment: 10 Marks
Attendance : 05 Marks
Total Marks : 30 Marks

Reference Books:

1. Plant Anatomy – K. Easu
2. Plant Anatomy - A.Fahn
3. Plant Anatomy - B. P. Pandey
4. An Introduction to the Embryology of Angiosperms – P. Maheshwari
5. Flowering Plant Embryology – Nels R. Lerstern
6. Plant Embryology – H. P. Sharma

SEMESTER III **M.Sc. Botany** **Paper No: XII**
Title of the Paper: Practicals (Botany) **Marks: 100**
Credits : 15

Practical exercised based on Theory paper IX to XI

M.Sc. Botany

Core
Faculty : Science
PG Department : Department of Life Sciences
Semester : **IV**

Sr. No.	Paper No.	Semester	Course Title	Eligibility	Remarks
1.	XIII	IV	Plant ecology	Students of M.Sc. Life Sciences Who have cleared SEM - I	
2.	XIV	IV	Biotechnology and biodiversity of plants		
3.	XV	IV	Marine botany		
4.	XVI	IV	Practicals		

Name of the Subject: (M.Sc.) Botany

Sr. No.	Paper No.	Semester	Name of the Paper	Total Marks (Ext + Int = Total)	Passing standard (Ext + Int = Total)	Total Teaching Hours	Exam Hours	Credits
1.	XIII	IV	Plant ecology	70 + 30 = 100	28 + 12 = 40			
2.	XIV	IV	Biotechnology and biodiversity of plants	70 + 30 = 100	28 + 12 = 40			
3.	XV	IV	Marine botany	70 + 30 = 100	28 + 12 = 40			
4.	XVI	IV	Practicals	70 + 30 = 100	28 + 12 = 40			

Break up of Continuous Internal Evaluation:
Internal Test : 15 Marks
Assignment : 10 Marks
Attendance : 05 Marks
Total Marks : 30 Marks

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SEMESTER IV **M.Sc. Botany** **Paper No: XIII**

Title of the Paper: Plant ecology **Marks: 100**

Credits: 04

Marks: Semester End Examination : 70

Continuous Internal Evaluation : 30

Unit	Detailed Syllabus	Teaching Hours	Marks / Weight
Unit 1	**Vegetation organization**: Phytosociological characters of plant communities and methods of their study, biological spectrum, autecological approach and ecological indicators. **Population ecology:** Population growth curves, biotic potential, death rates, age structures, fluctuations and equilibrium.	15	18
Unit 2	**Edaphic factor**: definition and composition of soils, origin and formation of soil, soil profile, soil classification, properties of soils, soil erosion, soil conservation.	15	18
Unit 3	**Ecosystem organization:** biosphere, biotic and abiotic components, ecological balance, food chain, ecological pyramids, energy flow and biogeochemical cycles, homeostasis **Ecosystem:** Types, terrestrial and fresh water ecosystems.	15	17
Unit 4	**Climate change**: Greenhouse gasses (CO_2, CH_4, N_2O, CFCs), Ozone hole, consequences of climate change(CO_2 fertilization, global warming, sea level rises, acid rain, UV radiation), Phytoremediation	15	17

Break up of Continuous Internal Evaluation:

Internal Test : 15 Marks

Assignment : 10 Marks

Attendance : 05 Marks

Total Marks : 30 Marks

Reference Books:

1. Ecology – Odum
2. Plant Ecology – P. D. Sharma
3. Plant Ecology by Vasishtha.
4. Phytogeography and Plant Ecology by S.Kumarasen.

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SEMESTER IV **M.Sc. Botany** **Paper No: XIV**

Title of the Paper: Biotechnology and Biodiversity of Plants **Marks: 100**

Credits: 04

Marks: Semester End Examination : 70

Continuous Internal Evaluation : 30

Unit	Detailed Syllabus	Teaching Hours	Marks / Weight
1	**Plant cell and tissue culture**: General introduction, history. Scopes, Concept of cellular differentiation, Totypotency. **Organogenesis and adventives embryogenesis:** Fundamental aspect of Morphogenesis; Somatic embryogenesis and Androgenesis, mechanisms techniques and utility.	15	18
2	**Somatic hybridization:** protoplast isolation, fusion and culture, hybrid selection and regeneration, possibilities, achievement and limitation of protoplast research. **Application of plant tissue culture:** Clonal propagation, Artificial seed, Production of hybrids and Somaclones, Production of seed, Production of Secondary metabolites / Natural products, Cryopreservation and Germplasm storage.	15	18
3	**Biodiversity:** Concept, Scope, Constraints of Plant Biodiversity. **Values and uses of biodiversity**: Biodiversity values, Ethical and Aesthetic values, Methodologies for valuation.	15	17
4	**Genetic diversity:** Nature, Measurement, Determinants. **Species diversity:** Species inventory, Diversity of Major groups, Indices for Measurement; Alpha, Beta and Gamma diversity. **Ecosystems diversity:** Classification, Measurement, Major types.	15	17

Break up of Continuous Internal Evaluation:

Internal Test : 15 Marks

Assignment : 10 Marks

Attendance : 05 Marks

Total Marks : 30 Marks

Reference Books:

1. Introduction to Plant Tissue culture – M. K. Razdan
2. Plant Tissue culture: Techniques and Experiments – Roberta H Smith
3. Plant tissue culture - Bhojvani and Rajdhan
4. Textbook of Biodiversity – K. V. Krishnamurthy
5. Concepts and Values in Biodiversity – Lanzerath and Friele

SEMESTER IV **M.Sc. Botany** **Paper No: XV**

Title of the Paper: Marine Botany **Marks: 100**

Credits: 04

Marks: Semester End Examination : 70
Continuous Internal Evaluation : 30

Unit	Detailed Syllabus	Teaching Hours	Marks / Weight
1	**Marine environment:** History of Oceanography; oceans of the world. Continental drift; Sea as a biological environment, main division and Zones of marine environment. **Physical factors:** Temperature , Light, Pressure, Sound velocity, Sedimentation, dynamic factors, Waves, Tides, Currents, their effects on marine Flora , Fauna, and Microorganisms.	15	18
2	**Chemistry of sea water:** chemical composition, chlorinity, salinity, pH, dissolved gases, minerals, nutrients and organic matter. **Pollution:** major pollutant (sewage, agricultural discharges, industrial wastes, dredging, oils, radioactive, elements) and their effects on marine biota, bioremediation.	15	18
3	**Marine phytoplankton:** types, distribution, biomass, productivity, and factors affecting productivity. **Marine algae:** salient features (morphology, structures, reproduction, And classification) of marine *Chlorophyta, Phaeophyta*, and *Rhodophyta:* algal floras of India. **Economic utility:** uses of marine aglae, algal products and of mangroves.	15	17
4	**Marine angiosperm:** sea grasses, halophytes, mangroves, coastal floras of India. **Physiology of Marine angiosperm:** seed germination, salt uptake and translocation, nitrogen metabolism and photosynthesis.	15	17

Break up of Continuous Internal Evaluation:
Internal Test : 15 Marks
Assignment : 10 Marks
Attendance : 05 Marks
Total Marks : 30 Marks

Reference Books:

1. Glimpses of the Indian Ocean- S. Z. Qasim.
2. Physiology and management of Mangroves – H. J. Teas
3. Marine Algae – Peleira and Neto

SEMESTER IV **M.Sc. Botany** **Paper No: XVI**

Title of the Paper: Practicals (Botany) **Marks: 100**
Credits : 15

Practical exercised based on Theory Paper XIII to XV