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SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

Outcome based Curriculum for

Postgraduate Degree Courses in MSc -BOTANY

Outcome Based Curriculum

Programme : Master of Science (BOTANY)

Vision of the Botany Department :

Our vision is to conduct innovative research, teaching and outreach on the patterns and processes of life with a focus on plants and their environments.

Mission of the Department:

Mission is to foster an environment of excellence by attracting and upporting the outstanding students, faculty and staff needed to sustain our vision.

We focus on the patterns and processes that enable predictive understanding of plants and their environments at local, regional, and global scales, leading to strengths in the areas of ecology, evolution, and systematics.

These topics are investigated using such tools as spatial data analysis, remote sensing, genomics, computational science, stable isotopes, microscopy, biogeochemical and physiological approaches and field and laboratory experiments.

Programme Educational Objectives:

PEO1: To motivate the student in self-employment through bio-fertilizer preparation.
PEO 2: 'Earn while learn' can be done with the acquirement of basic knowledge in growing medicinal plants.
PEO 3: To motivate and promote knowledge in nutritive value of food to maintain 'Health Care Problems'.
PEO 4: To expose the recent trends in Botany, participating in Seminars, Conferences, and guest lectures and field visits.

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Programme Objectives (POs)

- The M.Sc. - Botany programme is designed to equip students with essential knowledge and technical skills to study plants in a holistic manner.
- Students would be trained in all areas of plant biology using a unique combination of core and elective papers with significant interdisciplinary components.
- Students would be exposed to cutting-edge technologies that are currently used in the study of plant life forms, their evolution and interactions with other organisms and with the ecosystem. Students would also become aware about the social and environmental significance of plants and their relevance to the national
- To develop an aptitude towards science and nature.
- To equip the students with the basic skills in identifying and labeling different plants.
- To impart quality education in the field of Botany enabling our students to confidently face the job market.
- To sensitize the students towards the need for keeping the environment clean and conserve our natural resources.

- **Program Outcomes**(PO**)**

PO1.Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2.Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO5. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO6. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio- technological changes

Program Specific Outcomes:

(PSO) **PSO1**. Understand the nature and basic concepts of cell biology, Biochemistry, Taxonomy and ecology.

PSO2. Analyse the relationships among animals, plants and microbes

PSO3. Perform procedures as per laboratory standards in the areas of Biochemistry, Bioinformatics, Taxonomy, Economic Botany and Ecology

Course Outcomes (CO):

BOT101: The structure in relation to function of cells the fundamental unit of life, are concerned in this course along with molecular present in cells and the flow they make the basic framework of cells and their continuity.

BOT102: Pertains to heredity and variation at molecular and cellular levels.

BOT103: Deals with regulation of growth and development of plant as affected by various growth regulations, thus cross talk and extrinsic biotic and abiotic factors.

BOT104: Provides a detailed view of the visualizing concepts and technique for genetic engineering and biotechnology.

BOT302: Highlights structural and functional aspects of the development of plants from zygots to the nature stage.

BOT202: Deals with naming and classification of plants their interrelationships and evolution.

BOT402: Apprises students of conventional and non-conventional plant resources being used by human, their effective and sustainable utilization and improvement by biotechnological tools.

BOT 203: Makes students aware of the posts and pathogens adversely affecting the yield of important crop plants, their control underlying mechanisms of employed by plants for their defense and the approaches to strengthen their irsplenta to have resistant crops.

BOT301: Algae on paper deals the diversity and the important roles. Algae, a letergenious group of prokaryotes protons and plants role in environment and human welfare. BOT 302: Deals with all microbes and the technologies for their effective uses in industry and mitigation of environmental concerns.

BOT303: Highlights advances made in diversity analysis, developmental biology, reproductive biology and phylogenetics of the lower plants with female organ being archegoniuous present in bryophytes, pteridophytes and some most gymnosperms.

BOT304: Understanding the population structure of the organisms, organization into communities and their functional relationships with their environment.

BOT 305: Strategies adopted by the organisms under clanging environment in relation to their biogeographic distribution.

BOT306: Deals with fundamentals of bioinformatics tools, computational biology and statistical methods utmost necessary for contemporary research.

BOT307: Genetic modulation of Protien. BOT 308: Deals with the fundamental of organisms capability to resist anslength by foreign organisms and molecules with adverse effects

Programme Specific Outcomes (PSOs):

PSO1.

A student completing the course is able to understand different specializations of Botany such as systematics, evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics and molecular biology of various life-forms.

PSO2.

The student completing the course is trained in various analytical techniques of plant biology, use of plants as industrial resources or as human livelihood support system and is well versed with the use of transgenic technologies for basic and applied research in plants. PSO3. The student completing the course is able to identify various life forms of plant

PSO3.

The student completing the course is able to identify various life forms of plants, design and execute experiments related to basic studies on evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics, microbiology, molecular biology, recombinant DNA technology, proteomics and transgenic technology. Students are also familiarized with the use of bioinformatics tools and databases and in the application of statistics to biological data.

PSO4.. The student completing the course is capable of executing short research projects incorporating various tools and techniques in any of the basic specializations of Plant Sciences under supervise

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Programme PO's and PSO's Mapping

			PO 1	PO 2	PO3	PO4	PO 5		PO 6	PO7	PO 8	PO9	PO10	PO11	PO 12		
S. No	**Program**	**Courses Category**	Engineering Knowledge	Problem Analysis	Design/Development of Solution	Investigation	Modern Tool Usage		The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team Work	Communication	Project Management	Life-Long Learning	**PSO 1**	**PSO 2**
1	M.SC	Humanities and Social Sciences including Management courses	*	*			*				*		*		*		
2		Basic Science courses	*	*	*	*	*			*	*						
3		Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	*	*	*		*								*		
4		Professional core courses		*	*	*											
5		Professional Elective courses relevant to chosen specialization /branch		*	*	*	*				*	*					
6		Open subjects – Electives from other technical and /or emerging *subjects				*	*		*	*	*	*			*	*	*
7		Project work, seminar and internship in industry or elsewhere		*	*	*			*	*	*	*	*	*	*		*
8		Specific core subject															
9		Mandatory Course (Non credit)							*	*	*	*	*		*		

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Semester wise PO's and SPO's Mapping

Semester	Name of the Courses/POs(Basic, Core Electives, Projects, Internships etc.)	P0`1	PO2 Problem Analysis	PO3 Design/ Development of Solution	PO4 Investigation	PO5 Modern Tool Usage	PO6 The Engineer and Society	PO7 Environment and Sustainability	PO8 Ethics	PO9 Individual and Team Work	PO10 Communication	PO11 Project Management	PO12 Life-Long Learning	PSO1	PSO2
Semester-Ist	BOT 101 Biology&diversity of viruses,bacteria and fungi		*	*	*								*		
	Bot 102biology &diversity of algae,bryophytes and pteriodophyta		*		*								*		
	Bot 103 biology &diversity of gymnosperms		*	*	*	*			*		*		*		
	Bot 104 Plant Ecology\		*		*	*		*	*				*		
						*			*	*	*		*		
			*	*	*	*			*	*		*	*		
Semester-IInd	Bot 201 Taxonomy of Angiosperms		*	*	*								*		
	Bot 202 Plant Physiology		*	*	*										
	BOT 203PLANT PATHOLOGY										*			*	
	BOT 204 Plant cell and molecular biology		*	*	*										
			*	*	*										*
						*			*	*	*	*	*		
				*	*			*	*	*		*	*	*	
Semester-IIIrd	Bot 301Evolutionary and economic botany		*	*	*										
	Bot 302 Plant Reproduction		*	*											
	Bot 303Ethnobotany		*	*											
	Bot 304 Biodiversity and conservation		*	*											

Semester-IVth	Bot 401							*		*					
	Cytology &Genetics		*											*	
	Bot 402 Plant Biotechnology		*	*											
	Bot 403Pollution&Biodiversity conservation		*	*	*										
	Bot 404Plant Disease Management	*	*	*											

08) <u>Structure of Programme</u>: To fulfill the need of development of all the POs/ GAs, as per above mapping, the following semester wise programme structure are as under.

[L= Lecture, T = Tutorials, P = Practical's & C = Credits]

Total Credits*= 160

Structure of Post Graduate M.SC BOTANY:

S.No.	Course Category	Credits of the EE Curriculum
1.		11
2.	Basic Sciences	24
3.	Engineering Sciences including workshop, drawing, basics of electrical/mechanical/computer etc.	19
4.	Professional Core Subjects	52
5.	Professional Subjects: Subjects relevant to chosen specialization/branch	18
6.	Open Subjects: Electives from other technical and/or emerging subjects	18
7.	Project work, seminar and internship in industry or elsewhere	18
8.	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	Non-credit
	Total	**160**

***Definition of Credit:**

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) perweek	0.5 Credit
2 HoursPractical(Lab)/week	1 Credit

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COURSWISE SCHEME 2015-16												
SUBJECT CODE	COMPULSORY/ OPTIONAL	SUBJECT NAME	THEORY						PRACTICAL		TOTAL	
			PAPER		CCE / INTERNAL		TOTAL MARKS					
			MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
BOT101	COMPULSORY	**Biology & diversity of Viruses, Bacteria And Fungi**	70	28	30	10	100	38	50	18	150	56
BOT102	COMPULSORY	**Biology & diversity of Algae, Baryophytes&Pteridophyes**	70	28	30	10	100	38	50	18	150	56
BOT103	COMPULSORY	**Biology & diversity of Gymnosperms**	70	28	30	10	100	38	50	18	150	56
BOT14	COMPULSORY	**Plant Ecology**	70	28	30	10	100	38	50	18	150	56

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M.Sc. (BOTANY) III Semester Scheme

Code	Subject	CCE/INTERNAL		Theory		Practical	
		Max	Min	Max	Min	Max	Min
BOT301	Evolutionary and Economic Botany	30	11	70	25	0	0
BOT302	Plant Reproduction	30	11	70	25	0	0
BOT303	Ethnobotany	30	11	70	25	0	0
BOT304	Bio diversity Conservation	30	11	70	25	0	0
BOT-305	Lab.1	0	0	0	0	100	36
BOT-306	Lab.2	0	0	0	0	100	36

(10) Course Content

Semester- I

Preamble:-

Biology & Diversity of Viruses, Bacteria and Fungi

BOT101

Outcomes

1.Algae on paper deals the diversity and the important roles. Algae, a letergenious group of prokaryotes protons and plants role in environment and human welfare.

2: Deals with all microbes and the technologies for their effective uses in industry and mitigation of environmental concerns.

Course content

UNIT-I

Viruses: characteristics and ultrastructurte of virions, isolation and purification viruses; chemical nature, replication, transmission of viruses; econon importance.

UNIT-II

Archaebacteria and Eibacteria: General account; ultrastructure, nutrition a reproduction; biology and economic importance; cyanobacteria — salient featur and biological importance.

UNIT-III

Classification of bacteria, Actinomycetes, Mycoplasma, Rickettsiae, Chiamyd and their significance.

UNIT-IV

Mycology: classification and general characters of fungi; substrate relationshir fungi; cell ultra structure; unicellular and multicellular organization; cell v composition; nutrition (saprobic, biotrophic, symbiotic); reproduction (vegetatiasexual,sexual), heterothallic; parasexuality; recent trends in classification.

UNIT-V

Phylogeny of Fungi: Phylogeny of fungi; general account of MastigomycotiZygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina; fungi industry, medicine and as food; fungul diseases in plants and puma Mycorriza; fungi as biocontroi agents.

Suggested Readings:

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Taxonomy of angiosperms

Paper Code BOT201

Preamble Perform procedures as per laboratory standards in the areas of, Taxonomy, Economic Botany and Ecology

Outcomes

Course content

UNIT-I
origin and envolution of angiosperms,general principles of angiosperm phylogeny,evolutionary trends in angiosperms,ecads and ecotypes,concept of taxonomic characters

UNIT-II
international code of botanical nomenclature(icbn),some important rules of nomenclature ,principles of taxonomic characters,merits and demerits of major systems of classification .

UNIT-III
Systems of classification,modern trends in plant taxonomy,taxonomic evidence: morphology,anatomy,palynology,embryology,cytology,

UNIT-IV
herbarium and botanical garden,purpose of modern herbarium,techniques of herbarium,description of flowering plant,major Indian herbariaumand botanical gardens,relevance of taxonomy to conserve conservation,sustainable utilization of bio-resourec and ecosystem research.

UNIT-V
origin and evolution of monocotyledon and dicotyledon flower,salientfeatures,floral diversity of family and phylogeny of the orders; ranales,tubiflorae,glumiflorae,amentiferae,centrospermae.

Suggested Readings:

1. EJW Barrington-General & comparative Endoctrinology-Oxford, Claredon Press
2. R.H. Williams-Text Book of Endocrinology-W.B. Saunders
3. C.R. Martin- Endocrine Physiology-Oxford University Press.
4. Molecular CellBiology-J. Darnell, H. Lodish and D. Baltimore-Scientific American Book USA

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Plant Physiology

Paper code BOT202

Preamble- The course aims at making students realize how plants function, namely the importance of water, minerals, hormones, and light in plant growth and development; understand transport mechanisms and translocation in the phloem, and appreciate the commercial applications of plant physiology.

Outcomes:

1. Students will be taught about proteins, their biosynthesis, folding into specific structures, post translational modifications and degradation mechanisms. The course will also teach about catalytic mechanistic of enzymes, its inhibitors and regulation

2. . The students will be learning about the various signal transduction mechnisms in plants. The concept of second messengers, calcium signaling, kinases/phosphatases in plant signaling would be delineated to enhance their grasping power for understanding of different signaling pathways operative in plants. Two component signaling concept would be introduced and extended to plant hormone signaling. Quoram sensing and its potential biotechnological applications should be clear to students after these classes
3. . 3. During the course students will gain knowledge about various mechanisms such as channel or transport proteins involved in nutrient uptake in plants. Further the course will deal with various phytohormones and their role in physiology of growth and development. This course will introduce students to physiological advances in sensory photobiology. 4. Students will gain the knowledge on reproductive strategies in higher plants along with physiology of flowering, molecular and hormonal basis of flowering mechanism

Course content

UNIT-I
water ; structure and properties of water ,waterabsorption and conduction,loss of water from plants,stomatal physiology. Nutrients and their functions,active and passive absorption of waterand nutrients .
UNIT-II

signal transduction: overview,receptors and G – Proteins, phospholipid signaling,role of cyclic nucleotides . diversity in protein kinases and phosphatases, specific signaling mechanism,eg- two component sensor system in bacteria and plants,sensory photo receptors.

UNIT-III
Photosynthesis: photosynthetic apparatus, pigments and light harvesting complexes, photooxidation of water,calvin cycle, photorespiration,CAM,C3 AND C4 Cycle and its significance.

UNIT-IV
Plant growth regulators: physiological effects and general mechanism of action of plant harmones. Brief account on brassinosteroids,jasmonicacid,NO,And Salicylic acid. Photoperiodism and its significance,endogenous clock and its regulataion,vernalization.

UNIT-V
Stress physiology: Plant responses to biotic and abiotic stress, general mechanism of abiotic stress tolerance,drought and salinity stress and antioxidants systems in plants.

Suggested Readings: Sri Satya Sai University of Technology & Medical Sciences, SehoreMsc (Botany) wef 2015-16

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Plant pathology

Paper code BOT203

Preamble -To gain the knowledge of structure and functions of DNA and RNA

Outcomes

1. Understanding of nucleic acid, organization of DNA in prokaryotes and Eukaryotes, DNA replication mechanism, genetic code and transcription process.
2. Processing and modification of RNA and translation process, function and regulation of expression.
3 Application in biotechnology

UNIT-I

Fundamentals of plant pathology- history of plant pathology; varios levels of parasites ,classification of plant diseases.
Pathogenesis- penetration and entry of plant pathogens,development inside host tissue.

UNIT-II

AGENTS OF PLANT DISEASES,GENERAL Characteristics and symptoms caused by- Agents of infectious diseases (fungi,bacteria ,mycoplasma,virus and nematodes) and agents of non infectious diseases (air ,pollution, chemicals,minerals,temperature)

UNIT-III

Plant diseases: causal organisms,symptoms and management of -–
1 , Downy mildew of grapes
2, karnel bunt of wheat
3 smut of bajra
4. late & early blight of potato

UNIT-IV

: Plant diseases: causal organisms,symptoms and management of -
1, yellow vein mosaic of bhindi
2, black rust of wheat
3, Blight of paddy
4,Tikka disease
5, Sandal spike

UNIT-V

Defence mechanism in plants : Structural induced and biochemical defense mechanism, hypersensitivity reaction .Detoxification of pathogen toxin- Application of molecular biology in diseases ,control stratigies,plant quarantines.

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Plant cell and molecular biology

BOT204

UNIT-I

Cell and cell wall- Ultrastructure of prokaryotic and eukaryotic cells; structure ,organization and function of plant cell wall,membrane structure and function of model membrane ,lipid bilayer membrane protein diffusion,osmosis,ionchanels, electrical properties of membranes.

UNIT-II

Structural organization and function of intracellular organelles(mitochondria,plastid,endoplasmicreticulum,golgibodies,ER,) Cell division and cell cycle, mechanism of programmed cell death.

UNIT-III

RNA synthesis& processing; transcription,dnareplication,operonmodel,extra chromosomal replicons.conformation of nucleic acids(A,B,Z)RNA processing,RNAEDITING,Trna.

UNIT-IV

Prokaryotic transcription- Transcription units; RNA polymerase,structure and assembly,promoters,initiation,elongation and termination. Eukaryotic transcription- RNA POLYMERASE , Structure and asse,bly,promoters,DNA damage and repair.

UNIT-V

Translation; Translational mechanism.geneticcode,Wobblehypothesis,mechanism of protein synthesis. Translational factors; Initiation ,elongation and termination.

M. Sc. Botany (Semester-III)
Paper-I: Evolutionary and Economic Botany
BOT301

UNIT-I

Evolutionary Biology: Origin of life (including aspects of prebiotic environment and molecular evolution); Concept of evolution; Theories of organic evolution; Mechanisms of speciation. Hardyweinberg genetic equilibrium, genetic polymorphism and selection; origin and evolution of economically important microbes and plants.

UNIT-II

Origin of agriculture: World centers of primary diversity of domesticated plants; Plant introduction; Secondary centers of origin. Plant as a source of renewable energy; Innovations for meeting world food demands.

UNIT-III

Botany, cultivation and uses of –
a. Food, forage and fodder crops (cereals, pulses, vegetables and fruits)
b. Fiber yielding plants

UNIT-IV

Botany, cultivation and uses of-
Medicinal plants
a. Aromatic plants
b. Oil yielding plants

UNIT-V

Important fire-wood, timber-yielding plants and Non-wood forest products (NWFPs) such as-Bamboos, rattans, raw materials for paper-making, gums, tannins, dyes and resins. Plants used as avenue trees for shade, pollution control and aesthetics.

Suggested Laboratory Exercises

The practical course is divided into three units:
i) Laboratory Work
ii) Field Survey
iii) Scientific visits
i) Laboratory Work

Food Crops: Wheat, Rice, Maize, Potato, Chickpea(Bengal gram), Sugarcane. Morphology, anatomy, microchemical tests for stored food materials.

Fodder Crops: Sorghum, Bajra, Berseem, Guar, Oat.

Plant Fibres: Cotton, Jute, Sun hemp, Coir.

Medicinal and Aromatic Plants: Study of live or herbarium specimens or other visual materials to become familiar with following plants:

Papaver somniferum, Atropabelladona, Catharanthus roseus, Adhatodazeylanica, Allium sativum, Rauwolfia serpentine, Withaniasomnifera, Phyllanthus niruri, Andrographis paniculata, Aloe barbadensis, Mentha arvensis, Ricinus communis, Abutilon indicum, Datura sp., Artemisia sp., Pedalium murex, Ocimum sanctum, Vetiveriazizanoides, Cymbopogon maritini.

Gums, Resins, Tannins, Dyes: Acacia, Terminalia, Tea, Turmaric, Bixaorellana, Indigo, Butea monosperma, Lawsoniainermis.

ii) Field Survey
Prepare a list of important sourses of firewood and timber in your locality. Give their local names, scientific names and families to which they belong.
iii) Scientific visits Students should be taken to any protected area, a recognized botanical garden or
museum(such as FRI, BSI, NBRI), to a CSIR laboratory doing research on plants and their utilization and an ICAR research institute or a field station dealing with crops.

Suggested readings:

1. Swaminathan, M.N. & Jain, R.S. Biodiversity: Implications for global security, Macmillan,1982.
2. CSIR 1986. The Useful Plants in India.
3. Kothari, 1987. Understanding biodiversity, life sustainability and equity, Orient Longman.
4. Sharma, O.P. 1996. Hills Economic Botany.
5. Thakur, R.S. *et al.,* Major Medicinal Plants.
6. Kocchar, S.L. 1998. Economic Botany of Tropics..
7. Richard B. Primack. 1993. Essentials of Conservation Biology.
8. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment.
9. Peter B. Kaufman *et al*., 1999. Natural Products from Plants.
10. Negi, S.S. 1993. Biodiversity and its Conservation in India.

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PAPER-II: PLANT REPRODUCTION

BOT302

Preamble have knowledge of the flowering and fruiting, reproduction process, role of pollinators, ovule
and seed development.

Course Outcomes

Student would have an understanding of
1. Induction of flowering and molecular and genetic aspects of flower development.
2. Pollen development, dispersal and pollination
3. Ovule development and fertilization,
4. Endosperm development and its importance
5. alternation pathways of reproduction
6. Student would be able to apply this knowledge for conservation of pollinators and fruit Development

Course content

UNIT-I

Male gametophyte: Structure of anther; microsporogenesis; role of tapetum; pollen development and gene expression; male sterility, sperm dimorphism; pollen germination; pollen tube growth and guidance, pollen storage; pollen allergy.

UNIT-II

Female gametophyte: Ovule development; megasporogenesis; organization of embryo sac; structure and functions of embryo sac cells. Pollination: Floral characteristics, mechanisms and vectors.

UNIT-III

Pollen-pistil interaction and fertilization: structure of the pistil; pollen stigma interactions, Self incompatibility- SSI and GSI (cytological, biochemical and molecular aspects); Double fertilization; in-vitrofertilization.

UNIT-IV

Seed Development: Endosperm development during early maturation and desiccation stages; embryogenesis- ultrastructure and nuclear cytology. Storage proteins of endosperms and embryo; Polyembryony; Apomixis; Embryo culture.

UNIT-V

Fruit Growth: Dynamics of fruit growth; Biochemistry and molecular biology of fruit maturation. Dormancy: Importance and types of dormancy; seed dormancy; methods of overcoming seed dormancy.

Suggested Laboratory Exercises

1. Study of microsporogenesis and gametogenesis in sections of anthers.
2. Examination of modes of anther dehiscence and collection of pollen grains for microscopic examination (maize, grasses, Cannabis sativa, Tradescantia, Crotolaria, Brassica, Petunia, Solanum melongena, etc.).
3. Tests for pollen viability using stains and *in vitro* germination. Pollen germination using hanging drop and sitting drop cultures, suspension culture and surface cultures.
4. Estimating percentage and average pollen tube length *in vitro.*
5. Role of transcription and translation inhibitors on pollen germination and pollen tube growth.
6. Pollen storage, pollen –pistil interaction, self incompatibility, *in vitro* pollination.
7. Study of ovules in cleared peparations; study of monosporic, bisporic and tetrasporic type of embryosac development through examination of permanent, stained serial sections.
8. Field study of several types of flowers with different pollination mechanisms (wind pollination, thrips pollination, bee/butterfly pollination, bird pollination).
9. Emasculation, bagging and hand pollination to study pollen germination, seed set and fruit development using self compatible and obligate out crossing systems.study of cleistogamous flowers and their adaptations.
10. Study of nuclear and cellular endosperm through permanent slides.
11. Isolation of zygotic globular, heart shaped, torpedo stage and mature embryos from suitable seeds and polyembryony in citrus, jamun, etc.by dissections.
12. Study of seed dormancy and methods to break dormancy.

Suggested readings

1. Bhojwani, S.S. and Bhatnagar, S.P. 2000The embryology of Angiosperms. (4th revised and enlarged edition), Vikas publishing house, New Delhi.
2. Maheswari, P. An Introduction to Embryology of Angiosperms, 1950.
3. Shivanna, K.R. and Johri, B.M. The Angiosperm Pollen: structure and Function, Wiley Eastern Ltd., Publications, 1989.
4. Johri, B.M., Ambegaokar, K.B. and Srivastava, P.S. Comparative Embryology of Angiosperms, Vol. I & II, SpringerVerlag publication.
5. Bhojwani, S.S.andBhatnagar,S.P.1999.The Embryology of Angiosperms.Vikas. publishing House, New Delhi.
6. Raghwan,V.1997.Developmental biology of flowering plants. Springeverlag,New York.
7 Salisbury, F.B.andRoss,C.w.1992.Plant physiology(4th edn.).Wadsworth publishing, Belmont, Callifornia.
8. Shivanna, K.R.andSawhney,V.K.1997.Pollen biotechnology for crop production and improvement. Cambridge University press, Cambridge.

Paper-III: Ethnobotany
BOT303

Unit-I

Ethnobotany:Introduction,concept,scope And objectives. Ethnobotany as an interdisciplinary science; relevance of ethnobotany in the present context.

History of plant - human interactions and centers of ethnobotanical studies in the world .Ethnic groups and Ethnobotany: Major and minor ethnic groups or Tribals of India, and their life styles.

Unit-II

Methodology of Ethnobotanical studies: a) Field work b) Herbarium c) Ancient Literature d) Archaeological findings e) temples and sacred places f) Protocols Plants vs. Traditional Life: a) Food plants b) Intoxicants and Beverages c) Resins and oils d) Ropes and Bindings materials Plants in traditional life with reference to magico-religious rituals and social customs;

Unit-III

Medicinal plants used in traditional system of medicine with examples from local plants. A brief account ethnoveterinary medicine and its significance in Indian contest. Contribution of ethnobotany in modern medicine with special examples and ethnobotany directed drug Discovery

Unit-IV

Role of ethnobotany in the conservation of native plant genetic resources; sacred groves and sacred plants of Haryana and India Ethnobotany and legal aspects; ethnobotany as a tool to protect interests of ethnic groups;

UNIT-V

National and international initiatives for benefit sharing and intellectual property rights and conservation of traditional knowledge The ethnobotanical data documentation with special reference to Traditional Knowledge Digital Library

Practicals

1. Collection of ethnobotanical data: From a local forest area and from a local people ethnobotanical data are to be collected. The details of resource persons are documented (Photography, video, tape recording, etc.)
2. Analysis of ethnobotanical data disease-wise, plant part wise, habit-wise, region-wise and pictorial presentation of these data.
3. Calculation of total importance value (TIV) indexof a species based on ethnobotanical uses; demonstrate the evaluation of two ethnobotanical sites for prioritization or disposal.
4. Submission of Ethnomedicinal herbarium /Museum specimens like leaves, barks, tubers, nuts, etc. of economic/medicinal use.

Spotters:

1. Ethnic food plants:
2. Ethnomedicianl plants:
3. Ethnoveterary plants:
4. Magio- religion/ ornamental plants:
5. A visit to a Tribal area to collect data
6. Listing of Crude drugs in pansari shops (local crude drugs shops) and their identification (little known drugs only)

Suggested Readings

Faulks, P.J. 1958. An introduction to Ethnobotany, Moredale pub. Ltd. London
Jain, S.K. (ed.) 1981. Glimpses of Indian. Ethnobotny, Oxford and I B H, New Delhi
Jain, S.K. (ed.) 1989. Methods and approaches in ethnobotany Society of ethnobotanists, Lucknow, India.
Jain, S.K. 1990. Contributions of Indian ethnobotny. Scientific publishers, Jodhpur
Jain, S.K. 1995. Manual of Ethnobotany, Scientific Publishers, Jodhpur,
Sinha, R. K. 1996 Ethnobotany: The Renaissance of Traditional Herbal Medicine – INA – SHREE
Publishers, Jaipur
Colton C.M. 1997. Ethnobotany – Principles and applications. John Wiley

Paper-IV: Biodiversity Conservation
BOT304

UNIT-I

Biodiversity: concept; national & global status; endemism, speciation and extinction; levels ofbiodiversity, hotspots and hottest hotspots; study of Indian biodiversity hot spot, significance ofbiodiversity; local plant diversity and its socio-economic importance, causes of biodiversity depletion,ICUN categories of threat; Red Data Books.

UNIT-II

Principles of conservation, major approaches to management, Biodiversity Conservation strategies,Protected areas in India - Wildlife sanctuaries; National parks; Biosphere reserves; Wetlands andRamsar convention, Role of botanical gardens, seed banks, *in-vitro* repositories and cryobanks in biodiversity conservation.

UNIT-III

Plant explorations; invasions and introductions; National Bureau of Plant Genetic Resources (NBPGR), Convention of Biological Diversity (CBD), Indian initiatives in biodiversity conservation, National Biodiversity Authority (NBA), Importance of Ethnobotany in Indian context; Farmers' Rights and Intellectual Property Rights.

UNIT-IV

Phytogeography and forest types of India - Ecological and economic importance of forests, afforestation, deforestation and social forestry; endangered plants, endemism, invasive species;

UNIT-V

Desertification and wasteland reclamation, energy plantations; Effects of global warming, climatic change and stratospheric ozone depletion on plant diversity.

Reference Books

Odum, E.P. and Barrett, G.W. 2005. Fundamentals of Ecology (5th Ed.) Brooks/Cengage Learning India Pvt. Ltd., New Delhi.
Kormondy, E.J. 2008. Concepts of Ecology. Prentice Hall of India., New Delhi.
Subrahmanyam, N.S. and Sambamurty, A.V.S.S. 2008. Ecology (2nd Ed.) Narosa Publishing House, New Delhi
Singh, J.S., Singh, S.P. and Gupta, S.R. 2008. Ecology, Environment and Resource Conservation, Anamaya Publishers, New Delhi.
Stiling, P. 2009. Ecology: Theory and Applications (4th Ed.). PHI Learning Pvt. Ltd. New Delhi.
Rana, S.V.S. 2009. Essentials of Ecology and Environmental Sciences (4th Ed.) PHI Learning Pvt. Ltd.

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SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

Outcome based Curriculum for

Postgraduate Degree Courses in MSc -BOTANY

PAPER I – BOT 401

CYTOLOGY AND GENETICS

UNIT-I

• The dynamic cells, Structural organization of the plant cell, specialized plant cell type
chemical foundation, biochemical energetics.
• Cell wall - Structure and functions, biogenesis growth.
• Plasma membrane; structure, models and functions, site for ATPase, ion carriers channels and pumps, receptors.

Unit II

Structural and numerical alterations in chromosomes: breeding behaviour of duplications, deficiency, inversion and translocation heterozygotes. Origin, occurrence, production and meiosis of haploids, aneuploids, euploids and allopolyploids. Evolution of major
crop plants.

UNIT-III

• Chloroplast-structure, genome organization, gene expression, RNA editing.
• Mitochondria; structure, genome organization, biogenesis.
• Plant Vacuole - Tonoplast membrane, ATPases transporters as a storage organelle.

Unit IV

Mendelian and Non-Mendelian Inheritance. Independent assortment, crossing over, linkage groups and chromosome mapping. Genetic recombination and genetic mapping: Correlation of genetic and physical maps; molecular markers and construction of linkage maps.

UNIT-IV

• Nucleus : Structure, nuclear pore, Nucleosome organization.
• Ribosome- Structure and functional significance.

• Cell cycle and Apoptosis; Control mechanisms, role of cyclin dependent kinases.
• Retinoblastoma and E2F proteins, cytokinesis and cell plate formation, Mechanisms of programmed cell death.

UNIT-V

• Other cell organelles: Structure and functions of microbodies, microtubules, microfilaments, Golgi apparatus, lysosome, endoplasmic reticulum.
• Techniques in cell biology: Immuno techniques, in situ hybridization to locate transcripts in cell types FISH, GISH, Confocal microscopy.

Suggested Reading:-

1. De Robertis and De Robertis 2005 (Eight edition) (Indian) Cell and Molecular Biology,
Lippincott Williams, Philadelphia. [B.I Publications Pvt. Ltd. New Delhi].
2. Sadova David – 2004 (First Indian Edition). Cell Biology, New Delhi.
3. Albert Etal 2002 (Fourth Edition). Molecular Biology of the cell, Garland Science (Iaylar
and Francis) New York Group (wt)
4. LodishEtal 2004 (Fifth Edition). Molecular Cell Biology, W H Freeman and company,
New York.
5. Giese Arthur 1979 (Fifth Edition). Cell Physiology, Toppan company Ltd., Tokyo, Japan.

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PAPER –II BOT 402
PLANT BIO TECHNOLOGY

Outcomes

1. Pertains to heredity and variation at molecular and cellular levels
2. Provides a detailed view of the visualizing concepts and technique for genetic engineering and biotechnology.

COURSE CONTENT

Unit-I

Tools of Genetic engineering - Enzymes, Cloning vectors (Plasmids, Bacteriophages, Cosmids, Phagemids, Shuttle vectors, transposons vectors, artificial chromosomes as vector and eukaryotic vectors), Constriction of genomic library , and cDNA library, Staggered cleavage, addition of oligopolymer tailing ,blunt end ligation, Polymerase Chain Reaction (PCR) Principals, technique and modifications, Gene cloning Vs PCR, application , Applications of PCR.

UNIT- II

Plant Tissue Culture: General introduction, History and Scope and basic concepts ,laboratory Organization; media preparation and sterilization techniques, Nutrition of plant tissues-Growth limiting Factor, Concept of cellular differentiation and totipotency, Types of culture, Embryo and Endosperm culture, Induction and maintence of Callus and suspension Cultures

Unit-III

DNA synthesis and gene sequencing, Aims, strategies for the development of transgenic –Transformation vectors, Promoters from heterologous sources and its utility, Terminators, Markers and Reporter genes, *Agrobacterium* mediated gene transfer, Molecular genetics of TDNA transfer from *Agrobacterium* to plants, Direct gene transfer methods, Comparison of vector – mediated & vector free methods, Gene tagging in transgenic plants

Unit-IV

Chloroplast and Mitochondrial Transformation, Mechanism and Genetics of nitrogen fixation, *nif*&*nod* gene cluster, Fermentation Technology, Genetic improvement of industrial microbes & N2 fixer, Biofertilizer, Nutritional quality improvement - Golden rice and other development

Unit-V

Molecular markers for introgression of useful traits in plants, Genomics and Proteomics: Genome project, Microarray, protein profiling and its significance, Applications of G.E. to Health, Industry & Agriculture, including gene therapy, IPR and regulatory requirements

References

1.Foster and Twell. (1997).Plant gene isolation: Principles and Practice
2. Owen and Pen (1997.Transgenic plants :(a production system for industrial and pharmaceutical proteins)
3. Kung and Wu (1993).Transgenic Plants: Vols 1&2
4. Potrykus and Spangenberg 1995.Gene Transfer to Plants
5. Brown.T.A. 1995. Gene Cloning an Introduction. (3rd edition). Chapman Hall, 2-6 Bundary Row, U.K.

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Outcome based Curriculum for

Postgraduate Degree Courses in MSc -BOTANY

PAPER –III BOT 403

POLLUTION AND BIODIVERSITY CONSERVATION

Outcomes

1. Understanding the population structure of the organisms, organization into communities and their functional relationships with their environment.
2. : Strategies adopted by the organisms under clanging environment in relation to their biogeographic distribution
3.

Course content

UNIT-I

CLIMATE, SOIL AND VEGETATION PATTERNS OF THE WORLD :

Life zones, major biomes, major vegetation types and soil types of the world, barren land.

UNIT-II

POLLUTION, CLIMATE CHANGE AND ECOSYSTEMS :

Air, water and soil pollution:- kinds, sources, quality parameters, effects on plants and ecosystem. Green house gases (Caron dioxide, methane, nitrous oxide, Chloro florocarbons: sources, trends and role), ozone layer, ozone hole, consequences of climate change) Carbon dioxide fertilization, global warming, seal level rise, UV radiation).

UNIT-III

BIOLOGICAL DIVERSITY :- Concepts and levels, status in India, Utilization and concerns, role of biodiversity in ecosystem functions and stability, speciation and extinction, IUCN categories of threat, distribution and global patterns, terrestrial biodiversity hot spots, inventory. World centers of primary diversity of domesticated plants; The Indo Burmese center, plant introductions and secondary centers.

UNIT-IV

CONSERVATION STRATEGIES

Principles of conservation, extinctions, environmental status of plants based on International union for conservation of Nature. In situ conservation, International efforts and Indian initiatives, protected areas in Indiasanctuaries, national parks,

biosphere reserves, Wetlands, Mangroves and coral reefs for conservation of wild biodiversity.

UNIT-V

Ex situ conservation : Principles and practices, botanical gardens, field gene bank, seed banks, in vitro repositories, cryo banks, general account of the activities of Botanical survey of India (BSI),National Bureau of plant genetic resources (NBPGR), Indian council of Agriculture research (ICAR), Council of scientific and Industrial research (CSIR), and the department of Biotechnology (DBT) for conservation and non formal conservation efforts.

REFERENCE BOOKS :

Threshow, M1985. Air pollution and plant life, Wiley interscience.
Mason C.F. 1991. Biology of fresh water pollution, Longman.
Hill, M.K. 1997. Understanding Environmental pollution, Cambridge University press.
Anonymous, 1987. National gene bank, Indian heritage on plant genetic resources, National

PAPER –IV
BOT 404
PLANT DISEASES AND THEIR MANAGEMENT

Unit I

Non- infectious disease: Black heart of Potato, Khaira disease of Rice,
Viroid and Viral disease: Potato spindle tuber, Tobacco Mosaic, Yellow vein mosaic of Bhindi, Leaf curl of Papaya. Phytoplasma disease: Little leaf of Brinjal, Witches broom of legumes.

Unit II

Bacterial disease: Citrus canker, Angular leaf spot of cotton, Tundu disease of wheat, Bacterial wilt of Cucurbit and Crown gall of fruits plants,

Unit III

Fungal disease: Wart disease of potato, Damping off ofchilli, Late blight of potato, Downy mildew & Green ear disease of bajra and Powdery mildew of cereals.

Unit IV

Fungal disease: Ergot of Bajra, Smut of Bajra, Rust of Wheat, Early blight of Potato, Tikka disease of Groundnut, Blast of Rice, Red rot of Sugarcane, Wilt of cotton and Blight of Gram.

Unit V

Nematode disease: Ear cockle of Wheat, Molya disease of Barley and Root Knot disease of
vegetables.

Suggested Reading

Agrios, G.N. 1997. Plant Pathology. Academic Press, London.
Albajes, R., Gullino, M.L., Van Lenteren, J.C. and Elad, Y. 2000.
Integrated Pest and Disease management in Greenhouse Crops. Kiuwel Academic Publishers.
Mehrotra, R.S. 1993. Plant Pathology, Tata McGraw Hill.
Sri Satya Sai University of Technology & Medical Sciences, Sehore (M.P.)