RABINDRANATH TAGORE UNIVERSITY

ৰবীন্দ্রনাথ ঠাকুৰ বিশ্ববিদ্যালয়

HOJAI, ASSAM

RABINDRANATH TAGORE UNIVERSITY

DEPARTMENT OF BOTANY
HOJAI, Assam, Pin-782435

FOUR YEAR UNDERGRADUATE PROGRAMME (FYUGP)

SYLLABUS FOR B.Sc. (Honours) Course, Botany

FRAMED ACCORDING TO THE NATIONAL EDUCATION POLICY, 2020

AUGUST 01, 2023

Composition of Undergraduate Board of Studies (BOS)

1. Dr. Sushil Das, Chairman, HOD & Associate Professor RTV
2. Dr. Partha Pratim Baruah- External Member- Professor, HOD, Environmental Science, GU
3. Dr. Faristha Yesmin, External Member- HOD & Associate Professor, Botany, Nowgong College (Autonomous)
4. Dr. Manjit Saikia- Member- Associate Professor, RTV
5. Dr. Utpal Phukan, Associate Professor, RTV

The syllabus prepared by Dr. Sushil Das, HOD & Associate Professor and approved by BOS dated 30th July, 2025

RABINDRANATH TAGORE UNIVERSITY
Four year undergraduate programme, FYUGP
(Based on UGC Curriculum and Credit Framework)

The Rabindranath Tagore University has adopted Under Graduate Course Curriculum Framework (UGCF) under New Education Policy, 2020 to be implemented from August, 2023. Its structure for Four Year Under Graduate Programmes in different discipline with multiple exit options.

Design of Courses: -
The categories of courses and requirement of minimum credits for 4-year degree as per UGC are as follows: -

1. MAJOR-DSC : 80 Credits
2. MINOR-DSE : 32 Credits
3. Multidisciplinary (MD/GE) : 9 Credits
4. Ability Enhancement Course (AEC) : 8 Credits
5. Skill Enhancement Course (SEC) : 9 Credits
6. Value Added Course (VAC) : 8 Credits
7. Summer Internship (SI) : 2 Credits
8. Dissertation/ Research Project : 12 Credits

Important Points: -

1. Students opts to exit after completion of 1st year securing 40 credits, he/she may be awarded a UG certificate, if he/she completed one vocational course of 4 credits during summer vacation of first year.
2. Students opts to exit after completion of 2nd year securing 80 credits, he/she may be awarded a UG Diploma, if he/she completed one vocational course of 4 credits during summer vacation od 2nd year.
3. Students opts to exit after completion of either 1st year or completion of 2nd year may be allowed to re-enter within three years and complete the degree programme within the stipulated maximum period of seven years.
4. Students opts to exit after completion of 3rd year securing 120 credits will be eligible for UG degree with Major discipline without Honors.
5. For 4-years Honours degree the major subject/discipline requires 80 credits and the minor subject/discipline requires 32 credits. The students who exit after completion of 6th semester/ 3rd year, he/she requires 60 credits in major subject/discipline and 24 credits in the minor subject/discipline.
6. **Students who intend to complete 4-year degree programme will have two options in 7th and 8th semester as:**
   (i) Students who choose Research in 4th year are to study **DSC-16, DSC-17 and DSC-18** of 4 credits each and to complete a dissertation/project of 4 credits mandatorily in 7th semester. Accordingly, in 8th semester these students will study **DSC-19, DSC-20,** of 4 credits each and to complete a dissertation/project of 8 credits.
   (ii) Students who don't choose Research will study **DSC-21*, DSC-22*, DSC-23*** mandatorily in lieu of dissertation/project in 7th and 8th semester in addition to **(DSC-16 to DSC-20)** leading to Honours without Research.
7. Students who completed 4-year degree programme with dissertation/project will be awarded Bachelor Degree of Honours with Research and students who completed 4-year Degree without dissertation/project will be awarded Bachelor Degree of Honours.

OUTCOMES OF B.Sc. BOTANY PROGRAMME AS PER NEP, 2020
Discipline Major/Core : BOTANY

By the end of the program the students will be able to deal with applications and sustainable utilization of natural resources for a harmonious global ecosystem. The programme learning outcomes have been formulated to ensure that students require strong basis in plant science and also developing a range of transferable skills and abilities that will equip them for a diverse range of professions and further studies.

a) Gathering of knowledge on various life forms, life cycle and developmental process that exist among diversified plants.
b) Understanding of mutual interactions among the various groups of plants and their role for the benefit of human being.
c) Develop skill for the proper description by using botanical terminologies, identification, nomenclature and classification of life forms, particularly of plants and microorganisms.
d) Understanding of major elements of variations that exist in the living world through comparative morpho-anatomical studies.
e) Inculcate ability to explain biodiversity and evolution of life based on the empirical evidences in morphology, anatomy, embryology, physiology, biochemistry, life history cell biology and genetics.
f) Development of skill for collection, preservation, analysis and recording of information after observation and critical analysis and to develop database up to molecular level.
g) Awareness of the scientific and technological advancements, bioinformatics, biotechnology, biostatistics, GPS, GIS, mapping and global climate change for further learning and research in all branches of botany.
h) Enable the graduates to prepare for national and international competitive examinations.
i) Enable the graduates for practicing the best teaching pedagogy as botany teacher including the latest teaching digital modules.
j) The graduate will be knowledgeable and competent enough to deliver appropriately the different aspects like ecology and environment, green technologies and organic agriculture etc.
k) Graduate will be able to demonstrate proficiency in the hands-on experimental techniques for their area of specialization within biology during research and in professional career.
l) Students will be capable of combining their understanding and skill with other disciplines and participating in multidisciplinary research and innovation.

Course structure of B. Sc. (Hons.)-FYUGP- Semester-I

Course code	Papers	Course Title	Credit	Hours	Classes
BOT-MAJOR-DSC-1	1.1	Cryptogams	4	60	60
BOT-MINOR-DSE-1	1.1	Microbes and Thallophytes	4	60	60
GE/MDC-1	1.1	History/Mathematics/ Business Management	3	45	45
AECC-1	1.1	Any language papers	2	30	30
BOT-SEC-1	1.1	Biofertilizers	3	45	45
VAC	1.1	Environmental Studies	4	60	60
		Total Credit	**20**		

Course structure of B. Sc. (Hons.)-FYUGP-Semester-II

Course code	Papers	Course Title	Credit	Hours	Classes
BOT-MAJOR-DSC-2	2.1	Morphology, Embryology, and Anatomy of Angiosperms	4	60	60
BOT-MINOR-DSE-2	2.1	Morphology and Reproduction of Seeded plants	4	60	60
GE/MDC-2	2.1	History/Education/ Economics/Mathematics/ Business management	3	45	45
AECC-2	2.1	Environmental Studies	2	30	30
BOT-SEC-2	2.1	Nursery and Gardening	3	45	45
VAC-3	2.1	Understanding India	2	30	30
VAC-4	2.2	Constitutional values and fundamental duties	2	30	30
		Total credit	**20**		

Course structure of B. Sc. (Hons.)- FYUGP- Semester-III

Course code	Papers	Course Title	Credit	Hours	Classes
BOT-MAJOR-DSC-3	3.1	Cell Biology	4	60	60
BOT-MAJORDSC-4	3.2	Microbiology and Phytopathology	4	60	60
BOT-MINOR-DSE-3	3.1	Plant Anatomy, Taxonomy and Cell biology	4	60	60
GE/MDC-3	3.1	History/Education/ Economics/Mathematics/ Business management	3	45	45
AECC-3	3.1	Any language paper	2	30	30
BOT-SEC-3	3.1	Ethnobotany	3	45	45
		Total Credit	**20**		

Course structure of B. Sc. (Hons.)- FYUGP-Semester-IV

Course code	Papers	Course Title	Credit	Hours	Classes
BOT-MAJOR-DSC-5	4.1	Plant Biochemistry and Molecular Biology	4	60	60
BOT-MAJOR-DSC-6	4.2	Morphology and Anatomy of Angiosperms	4	60	60
BOT-MAJOR-DSC-7	4.3	Economic Botany	4	60	60
BOT-MINOR-DSE-4	4.1	Plant Physiology and Metabolism	4	60	60
AECC-4	4.1	Any languages paper	2	30	30
Summer Intern-4	4.1	Summer Internship (Compulsory Paper)	2	30	30
		Total credit	**20**		

Course structure of B. Sc. (Hons.)- FYUGP- Semester-V

Course code	Papers	Course Title	Credit	Hours	Classes
BOT-MAJOR-DSC-8	5.1	Indian Knowledge System	4	60	60
BOT-MAJOR-DSC-9	5.2	Plant Ecology and Phytogeography	4	60	60
BOT-MAJOR-DSC-10	5.3	Reproductive Biology of Angiosperms	4	60	60
BOT-MAJOR-DSC-11	5.4	Plant physiology	4	60	60
BOT-MINOR-DSE-5	5.1	Indian Knowledge System	4	60	60
		Total credit	**20**		

Course structure of B. Sc. (Hons.)- FYUGP-Semester-VI

Course code	Papers	Course Title	Credit	Hours	Classes
BOT-MAJOR-DSC-12	6.1	Genetics	4	60	60
BOT-MAJOR-DSC-13	6.2	Plant Systematics	4	60	60
BOT-MAJOR-DSC-14	6.3	Plant Metabolism	4	60	60
BOT-MAJOR-DSC-15	6.4	Natural Resource Management	4	60	60
BOT-MINOR-DSE-6	6.1	Ecology and Plant Taxonomy	4	60	60
		Total credit	**20**		

Course structure of B. Sc. (Hons.)- FYUGP- Semester-VII

Course code	Papers	Course Title	Credit	Hours	Classes
BOT-MAJOR-DSC-16	7.1	Plant Biotechnology	4	60	60
BOT-MAJOR-DSC-17	7.2	Horticultural Practices and Post-Harvest Technology	4	60	60
BOT-MAJOR-DSC-18	7.3	Conservation Biology	4	60	60
BOT-MAJOR-DSC-21	7.4	**Analytical Techniques in Plant Sciences or Research Project-Dissertation**	4	60	60
BOT-MINOR-DSE-7	7.1	Cell Biology, Genetics and Plant Breeding	4	60	60
		Total credit	**20**		

Course structure of B. Sc. (Hons.)- FYUGP- Semester-VIII

Course code	Papers	Course Title	Credit	Hours	Classes
BOT-MAJOR-DSC-19	8.1	Industrial and Environmental Microbiology	4	60	60
BOT-MAJOR-DSC-20	8.2	Molecular Biology	4	60	60
BOT-MAJOR-DSC-22	8.3	**Research Methodology or Research Project-Dissertation**	4	60	60
BOT-MAJOR-DSC-23	8.4	**Bioinformatics and Biostatistics or Research Project-Dissertation**	4	60	60
BOT-MINOR-DSE-8	8.1	Economic Botany and Plant Biotechnology	4	60	60
		Total credit	**20**		

DETAILED SYLLABUS OF B. Sc. 5th SEMESTER

Title of the Course : Indian Knowledge System
Course Code : BOT-MAJOR-DSC-8
Nature of the Course : MAJOR/ CORE -5.1
Total Credits :04
Distribution of Marks : 100 : Theory-45, Practical-25, Internal assessment-30

Course objectives: -The objective of this course is to provide knowledge to the students on various forms of Traditional knowledge and Indian system of medicines-viz. different aspects of Ayurveda, siddha system of medicines, unani and ethno medicines.

UNITS	Contents	L	T	P	Total Hours
UNIT-I Marks-22	**Ayurveda System of Medicines:-** History, scope, and importance of medicinal plants. Indigenous medicinal sciences. Ancient Indian Physicians' Life and contribution to Ayurveda such as Charaka, Sushruta, Vaghabhatta, Atreya and Jivaka **Ayurveda:-** Definition, scope, history and origin Panchamahabhuta (Five elements) concept, Saptadhatu (seve n fundamental tissues) concept, Tridosha (Three fundamental energies) concept, Tridosha herbs, balancing the Tridosha and Rasayan (Rejuvenation) concept. Plants used in Ayurvedic treatments.	**12**	**3**		**15**
UNIT-II Marks-6	**Siddha system of medicines:-** Definition, history and origin. Aspect of siddha and its special features, basis of siddha system and plants used in siddha medicines.	**5**	**1**		**6**
UNIT-III Marks-10	**Unani system of medicines:-** Definition, history, origin, concept, principles and practices. Umoor-e-tabia, tumor treatments, Polyhedral formulations, Regimental therapy (Ilal-bit-tabbeer), Dietotherapy (Ilaj-bit-Ghiza) and pharmacotherapy (Ilaj-bit-Dawa)	**8**	**2**		**10**
UNIT-IV Marks-22	**Ethnobotany:-** Ethnobotany and Folk medicines, Ethnobotany in India, Methods to study ethnobotany, Application of ethnobotany, National interacts, Palaeo-ethnobotany, Folk medicines of ethnobotany, ethnomedicines, India, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- jaundice, cardiac, infertility, diabetics, blood pressure and skin diseases.	**11**	**3**		**14**
UNIT-V Practical Marks-25	1. Formulation of dry Triphala churna *(*Amla- *Emblica officinalis, (*Haritaki-*Terminalia chebula*) and Bohera- *Terminalia bellerica).* 2. Study of morphology, anatomy and medicinal uses of Ashwagandha (*Withania somnifera*), Sarpagandha (*Rauvolfia serpentina)* Turmeric (*Curcuma longa*), Tulsi (*Oscimum tenuiflorum*), Brahmi (*Bacopa monnieri*). 3. Preparation of herbal medicinal plants' extract and understanding their uses (*viz.* Turmeric (*Curcuma longa*), Tulsi (*Oscimum tenuiflorum*), Brahmi (*Bacopa monnieri*). 4. **Herbal formulation**- (i) **Decoction:-** - (Yasthimadhu-*Glycyrrhiza glabra*) (ii) **Infusion:-** - (Tea- *Camellia sinensis*), (Coffee- *Coffea Arabica*), (Lemon- *Citrus limon*). (iii) **Syrup:-** (Brahmi- *Bacopa monnieri*), (Arjuna - *Terminalia arjuna).*			**15**	**15**

	(iv) **Aromatic water:-** (Cardamom water, Peppermint water). (v) **Herbal Lozenges:** - (Ginger, Peppermint) **5.** Educational tour to visit Research Institute and medicinal plants garden and herbal medicine industry (out of State)				

Total = 60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 5th SEMESTER

Title of the Course: Plant Ecology and Phytogeography
Course code: BOT-MAJOR-DSC-9
Nature of the Course: MAJOR/CORE-5.2
Total Credits: 04
Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30
Course objectives: The objective of this course is to provide knowledge to the students on various aspects of basic concept of plant ecology, soil, water, biotic and abiotic factors, population ecology, ecosystem and its functional aspects and phytogeography.

UNITS	CONTENTS	L	T	P	Total Hours
Unit-I Marks:18	**Introduction: -** Basic concepts; Levels of organization. Inter-relationships between the living world and the environment, the components and dynamism, homeostasis. **Soil :-** Importance; Origin; Formation; Composition; Physical; Chemical and Biological components; Soil profile; soil types, Role of climate in soil development. **Water :-** Importance: States of water in the environment; Atmospheric moisture; Precipitation types (rain, fog, snow, hail, dew); Hydrological Cycle; Water in soil; Water table.	13	2		15
Unit-II Marks:12	**Adaptation of plants to various environmental factors:** - **Abiotic factors:-** Light, temperature, wind and fire **Biotic interactions :-** Trophic organization, basic source of energy, autotrophy, heterotrophy; symbiosis, commensalism, parasitism; food chains and webs; ecological pyramids; biomass, standing crop. **Population ecology :-** Population characteristics, Growth curve, population regulation, r and k selection. Ecological speciation: Allopatric/ Sympatric and Parapatric speciation.	9	1		10
Unit-III Marks:12	**Plant communities :-**Concept of ecological amplitude; Habitat and niche; Characters: analytical and synthetic; Ecotone and edge effect; Dynamics: succession – processes, types; climax concepts. **Ecosystems :-** Structure; Trophic organization; Food chains and Food webs; Ecological pyramids.	9	1		10

Unit-IV **Marks:18**	**<u>Functional aspects of ecosystem:-</u>** Principles and models of energy flow; Production and productivity; Ecological efficiencies; Biogeochemical cycles; Cycling of Carbon, Nitrogen and Phosphorus **<u>Phytogeography:-</u>** Principles; Continental drift; Theory of tolerance; Endemism; Brief description of major terrestrial biomes (one each from tropical, temperate & tundra); Phytogeographical division of India; Vegetation types of NE India with special reference to Assam	9	1		10
Practicals **Marks:25**	1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer / hygrometer, rain gauge and lux meter. 2. Determination of pH of various soil and water samples using pH meter. 3. Analysis for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency from two soil samples by rapid field tests. 4. Determination of organic matter of different soil samples by Walkley & Black rapid titration method. 5. Determination of dissolved oxygen of water samples from polluted and unpolluted sources. 6. (a). Study of morphological adaptations of hydrophytes and xerophytes. (b) Study of biotic interactions of the following: Stem parasite (*Cuscuta*), Root parasite (*Orobanche*) Epiphytes, Predation (Insectivorous plants). 7. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus, by species area curve method (species to be listed). 8. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law. 9. Quantitative analysis of herbaceous vegetation for density and abundance in the college campus.			15	15
				Total classes=60	

Mode of Internal Assessment: -1. Sessional examination-15 marks

2.Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 5th SEMESTER

Title of the Course: Reproductive Biology of Angiosperms
Course code: BOT-MAJOR-DSC-10
Nature of the Course: MAJOR/ CORE-5.3
Total Credits: 04
Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30
Course objectives: The objective of this course is to provide knowledge to the students on various aspects of reproductive biology of angiosperm viz. reproductive development, anther pollen grain, ovule, pollination and fertilization, self- incompatibility, embryo, endosperm, seeds, polyembryony and apomixis.

UNITS	CONTENTS	L	T	P	Total Hours
Unit-I Marks: 10	**Introduction :-** History (contributions of G.B. Amici, W. Hofmeister, E. Strasburger, S.G. Nawaschin, P. Maheshwari, B.M. Johri, W.A. Jensen, J. Heslop-Harrison) and scope **Reproductive development :-** Induction of flowering; flower as a modified determinate shoot. Flower development: genetic and molecular aspects.	7			7
Unit-II Marks:20	**Anther and pollen biology :-** Anther wall: Structure and functions, microsporogenesis, callose deposition and its significance. Microgametogenesis; Pollen wall structure, MGU (male germ unit) structure, NPC system; Palynology and scope (a brief account); Pollen wall proteins; Pollen viability, storage and germination; Abnormal features: Pseudomonads, polyads, massulae, pollinia. **Ovule :-** Structure; Types; Special structures–endothelium, obturator, aril, caruncle and hypostase; Female gametophyte–megasporogenesis (monosporic, bisporic and tetrasporic) and megagametogenesis (details of Polygonum type); Organization and ultrastructure of mature embryo sac.	14	1		15
Unit- III Marks:15	**Pollination and fertilization :-** Pollination types and significance; adaptations; structure of stigma and style; path of pollen tube in pistil; double fertilization **Self incompatibility :-** Basic concepts (interspecific, intraspecific, homomorphic, heteromorphic, GSI and SSI); Methods to overcome self-incompatibility: mixed pollination, bud pollination, stub pollination; Intra-ovarian and in vitro pollination; Modification of stigma surface, parasexual hybridization; Cybrids, in vitro fertilization.	13	2		15
Unit-IV Marks:15	**Embryo, Endosperm and Seed :-** Structure and types; General pattern of development of dicot and monocot embryo and endosperm; Suspensor: structure and functions; Embryo-endosperm relationship; Nutrition of embryo; Unusual features; Embryo development in Paeonia. Seed structure, importance and dispersal mechanisms **Polyembryony and apomixis :-** Introduction; Classification; Causes and applications.	8			8

Practicals Marks:25	1. **Anther:** Wall and its ontogeny; Tapetum (amoeboid and glandular); MMC, spore tetrads, uninucleate, bicelled and dehisced anther stages through slides/micrographs, male germ unit (MGU) through photographs and schematic representation. 2. **Pollen grains:** Fresh and acetolyzed showing ornamentation and aperture, psuedomonads, polyads, pollinia (slides/photographs,fresh material), ultrastructure of pollen wall (micrograph); Pollen viability: Tetrazolium test.germination: Calculation of percentage germination in different media using hanging drop method. 3. **Ovule:**Types anatropous, orthotropous, amphitropous/ campylotropous, circinotropous, unitegmic, bitegmic; Tenuinucellate and crassinucellate; Special structures: Endothelium, obturator, hypostase, caruncle and aril (permanent slides/ specimens/ photographs). 4. **Female gametophyte through permanent slides/ photographs:** Types, ultrastructure of mature egg apparatus. 5. **Intra-ovarian pollination;** Test tube pollination through photographs. 6. **Endosperm: -**Dissections of developing seeds for endosperm with free-nuclear haustoria. 7. **Embryogenesis:** Study of development of dicot embryo through permanent slides; dissection of developing seeds for embryos at various developmental stages.	15			15

Total-60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 5th SEMESTER

Title of the Course: Plant Physiology
Course code: BOT-MAJOR-DSC-11
Nature of the Course: MAJOR/CORE-5.4
Total Credits: 04
Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30
Course objectives: The objective of this course is to provide knowledge to the students on various aspect of plant physiology viz. plant water relation, mineral nutrition, nutrient uptake, translocation of phloem, plant growth regulators, physiology of flowering, phytochrome etc.

UNITS	CONTENTS	L	T	P	Total Hours
Unit-I Marks:15	**Plant-water relations :-** Water Potential and its components, water absorption by roots, aquaporins, pathway of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation. Ascent of sap– cohesion-tension theory.Transpiration and factors affecting transpiration, antitranspirants, mechanism of stomatal movement. Plant response to water stress.	13	2		15
Unit-II Marks:20	**Mineral nutrition :-** Essential and beneficial elements, macro and micronutrients, methods of study and use of nutrient solutions, criteria for essentiality, mineral deficiency symptoms, roles of essential elements, chelating agents, Ion antagonism and toxicity. **Nutrient Uptake :-** Soil as a nutrient reservoir, transport of ions across cell membrane, passive absorption, electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier systems, proton ATPase pump and ion flux, uniport, co-transport, symport, antiport.	13	2		15
Unit-III Marks:15	**Translocation in the phloem :-** Experimental evidence in support of phloem as the site of sugar translocation. Pressure–Flow Model; Phloem loading and unloading; Source–sink relationship. **Plant growth regulators :-** Discovery, chemical nature (basic structure), bioassay and physiological roles of Auxin, Gibberellins, Cytokinin, Abscisic acid, Ethylene, Brassinosteroids and Jasmonic acid.	7	1		8
Unit-IV Marks:10	**Physiology of flowering :-** Photoperiodism, flowering stimulus, florigen concept, vernalization, seed dormancy- causes and breaking of seed dormancy, physiological clock. **Plants movement**:- Defunition, different types of plants movement **Phytochrome, crytochromes and phototropins:-** Discovery, chemical nature, role in photomorphogenesis, low energy responses (LER) and high irradiance responses (HIR), mode of action.	7			7

Practicals Marks:25	1. Determination of osmotic potential of plant cell sap by plasmolytic method. 2. Determination of water potential of given tissue (potato tuber) by weight method. 3. Study of the effect of light on the rate of transpiration in excised twig/leaf. 4. Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of a mesophyte and xerophyte. 5. To study the effect of different growth hormones (IAA, GA_3 and cytokinin) on legume and grass seedlings on Plant development 6. To study the induction of amylase activity in germinating Maize/Bean grains. **Demonstration experiments** 1. To demonstrate suction due to transpiration. 2. Fruit ripening / Rooting from cuttings (Demonstration) only			15	15

Total-60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF B. Sc. 5th SEMESTER

Title of the Course : Indian Knowledge System
Course Code : BOT-MINOR-DSE-5
Nature of the Course : MINOR-5.1
Total Credits :04
Distribution of Marks : 100: Theory-45, Practical-25, Internal assessment-30
Course objectives: -The objective of this course is to provide knowledge to the students on various forms of Traditional knowledge and Indian system of medicines-viz. different aspects of Ayurveda, siddha system of medicines, unani and ethno medicines.

UNITS	Contents	L	T	P	Total hours
UNIT-I Marks-25	**Ayurveda System of Medicines:** - Ancient Indian Physicians' Life and contribution to Ayurveda such as Charaka, Sushruta and Atreya **Ayurveda:**- Definition, scope, history and origin Panchamahabhuta (Five elements) concept, Saptadhatu (seven fundamental tissues) concept, Tridosha (Three fundamental energies) concept, Tridosha herbs, balancing the Tridosha and Rasayan (Rejuvenation) concept. Plants used in Ayurvedic treatments.	**12**	**3**		**15**
UNIT-II Marks-10	**Siddha system of medicines:-**Definition, history and origin. Aspect of siddha and its special features, basis of siddha system and plants used in siddha medicines.	**5**	**1**		**6**
UNIT-III Marks-10	**Unani system of medicines:-**Definition, history, origin, concept, principles and practices. Umoor-e-tabia, tumor treatments, Polyhedral formulations, Regimental therapy (Iial-bit-tabbeer), Dietotherapy (Ilaj-bit-Ghiza) and pharmacotherapy (Ilaj-bit-Dawa)	**8**	**2**		**10**
UNIT-IV-15	**Ethnobotany:** - Ehtnobotany and Folk medicines, Ethnobotany in India, Methods to study ethnobotany, Application of ethnobotany, ethnomedicines, Application of natural products to certain diseases- jaundice, cardiac, infertility, diabetics, blood pressure and skin diseases.	**11**	**3**		**14**
Practical Marks-25	1. Formulation of dry *Triphala churna (*Amla- *Emblica officinalis, (*Haritaki-*Terminalia chebula*) and Bohera-*Terminalia bellerica).* 2. Study of morphology, anatomy and medicinal uses of Ashwagandha (*Withania somnifera*), Sarpagandha (*Rauvolfia serpentina).* 3. Preparation of herbal medicinal plants' extract and understanding their uses (*viz.* Tuemeric (*Curcuma longa*), Tulsi (*Oscimum tenuiflorum*). **4. Herbal formulation-** (i) **Decoction** (Yasthimadhu-*Glycyrrhiza glabra*), (ii) **Infusion** (Tea-*Camellia sinensis*), (Lemon-*Citrus limon*), (iii) **Syrup** (Brahmi-*Bacopa monnieri*), (Arjuna - *Terminalia arjuna),* (iv) **Aromatic water** (Cardamom water, Peppermint water), (v) **Herbal Lozenges** (Ginger, Peppermint)			**15**	**15**

	5. Educational tour to visit Research Institute and medicinal plants garden and herbal medicine industry (out of State)				

Total= 60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 6th SEMESTER

Title of the Course: Genetics
Course code: BOT-MAJOR-DSC-12
Nature of the Course: MAJOR/CORE-6.1
Total Credits: 4
Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30
Course objectives: - The objective of this course is to provide knowledge to the students on various aspect of Mendalian genetics, non-Mendalian genetics, linkages and crossing over, chromosomal aberrations, gene mutations and population genetics.

UNITS	CONTENTS	L	T	P	Total Hours
Unit-I Marks:25	**1. Genetics of Mendelian Inheritance-** (a) **Mentalism:** Introduction, History, Principles of inheritance- Law of segression and law of independent assortment. (b) **Physical basis of heredity:** --Chromosome theory of inheritance; (c) **Genetic Interactions**: - **Allelic and Non-allelic interaction: -** Definition, Complete dominance, incomplete dominance, Co-dominance and multiple alleles, Complementary gene interaction, Epistasis, Masking gene interaction, Duplicate gene interaction, Polymeric gene interaction, Pleotropy, Lethal alleles and polygenic gene interaction **2. Genetics of Non-Mendelian Inheritance: -** Cytoplasmic inheritance: Criteria of cytoplasmic inheritance, chloroplast inheritance in leaf Variegation of Four o'clock plant (*Mirabilis jalapa*); Mitochondrial inheritance in yeast.	16	2		18
Unit- II Marks:10	**Linkage and crossing Over: -** 1. **Linkage: -** Definition, types of linkages, Coupling and Repulsion theory, detection of linkage and significance of linkage. 2. **Crossing over and recombination -** Definition, theories of crossing over, cytological basis of crossing over; estimation of recombination frequency from F2 data, significance of crossing over.	6			6
Unit-III Marks:10	**1. Chromosomal aberration: -** **(a) Structural chromosomal aberration :-** Origin, cytology and genetic effects of Deletion Duplication, Inversion, Translocation (b) **Numerical chromosomal aberration: -** (i) Aneuploidy and its types viz. Nullisomy, Monosomy, Trisomy,Tetrasomy (ii) Euploidy:- Polyploidy- Autopolyploidy and Allopolyploidy and their application in crop improvement.	8	1		9

Unit-IV Marks:15	**Gene mutations**: - Definition, Types of mutations; Molecular basis of Mutations; Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); Detection of mutations: ClB method. Role of Transposons in mutation. DNA repair mechanisms. **Population Genetics: -** Gene frequencies, Genotype frequencies, Hardy-Weinberg Law, role of evolutionary factors natural selection, mutation, genetic drift. Genetic variation and Speciation.	11	1		12
Practicals Marks-25	1. Meiosis through temporary squash preparation. 2. Calculation of Mitotic Index in mitotic cell division of onion root tip. 3. Mendel's laws through seed ratios in monohybrid and dihybrid cross. 4. Chromosome mapping using point test cross data. 5. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4). 6. Permanent Slides showing Translocation Ring, Photograph showing Laggards and Inversion Bridge.			15	15

Total=60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 6th SEMESTER

Title of the Course: Plant Systematics
Course code: BOT-MAJOR-DSC-13
Nature of the Course: MAJOR/CORE-6.2
Total Credits:04
Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30
Course objectives: The objective of this course is to provide knowledge to the students on various aspect of plant systematics viz. significance of plant systematics, botanical nomenclature, systems of classification, numerical taxonomy, cladistics, phylogeny of angiosperm and angiosperm families.

UNITS	CONTENTS	L	T	P	Total Hours
Unit-I Marks:20	**Significance of Plant systematics :-** Introduction to plant systematic; Plant identification, Classification, Nomenclature. Evidences from palynology, cytology, embryology, phytochemistry and molecular data and numerical taxonomy. Functions and importance of Herbarium; Important herbaria and botanical gardens of the world and India; Virtual herbarium; E-flora; Concept of taxa (family, genus, species); Categories and taxonomic hierarchy.	13	2		15
Unit-II Marks:20	**Botanical nomenclature :-** Principles and rules (ICN); Ranks and names; Typification, author citation, Effective and valid publication, rejection of names, principle of priority and its limitations; Names of hybrids. **Systems of classification :-** Major contributions of Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist; Classification systems of Bentham and Hooker (upto series) and Engler and Prantl (upto series); Brief reference of Angiosperm Phylogeny Group (APG) classification.	13	2		15
Unit-III Marks:12	**Numerical taxonomy and cladistics :-** Characters; Variations; OTUs, character weighting and coding; Cluster analysis; Phenograms, cladograms (definitions and differences). **Phylogeny of Angiosperms:-** Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly and clades). Origin and evolution of angiosperms; Co-evolution of angiosperms and animals; Methods of illustrating .	7	1		8
Unit-IV Marks:8	**Angiospermic Families :-** Detail study of the following families: Magnoliaceae, Fabaceae, Asteraceae, Solanaceae, Acanthaceae, Lamiaceae, Euphorbiaceae, Orchidaceae, Musaceae, Zingiberaceae, Poaceae.	6	1		7

Practicals Marks:25	1. Study of vegetative and floral characters of locally available angiospermic plants belonging to the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Poaceae, Fabaceae,Solanaceae, Acanthaceae, Lamiaceae, Euphorbiaceae, Musaceae, Asteraceae. 2. Field visit to familiarize students with vegetation of an area and identification of plant species / Visit to Academic or Research Institutions. 3. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book). 4. Study of pollen grain from local honey sample			15	15

Total-60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 6th SEMESTER

Title of the Course: Plant Metabolism
Course code: BOT-MAJOR-DSC-14
Nature of the Course: MAJOR/ CORE-6.3
Total Credits: 04
Distribution of Marks: 100 : Theory-45, Practical-25, Internal assessment-30
Course objectives: The objective of this course is to provide knowledge to the students on various aspect of plant metabolism viz. concept of metabolism, carbon assimilation, carbohydrate metabolism, carbon oxidation, lipid metabolism, nitrogen metabolism, ATP synthesis, mechanism of signal transduction.

UNITS	CONTENTS	L	T	P	Total Hours
Unit-I Marks:20	**Concept of metabolism:-** Introduction, anabolic and catabolic pathways, regulation of metabolism, role of regulatory enzymes; classification, nomenclature and importance of enzyme; concept of coenzyme, apoenzyme and prosthetic group; enzyme inhibition (allosteric, covalent modulation and Isozymes). **Carbon assimilation:-** Historical background, photosynthetic pigments, role of photosynthetic pigments (chlorophylls and accessory pigments), antenna molecules and reaction centres, photochemical reactions, photosynthetic electron transport, PSI, PSII, Q cycle, CO2 reduction, photorespiration, C4pathways; Crassulacean acid metabolism; Factors affecting CO2 reduction.	16	2		18
Unit-II Marks:15	**Carbohydrate metabolism:-** Synthesis and catabolism of sucrose and starch. **Carbon Oxidation :-** Glycolysis, fate of pyruvate, regulation of glycolysis, oxidative pentose phosphate pathway, oxidative decarboxylation of pyruvate, regulation of PDH, NADH shuttle; TCA cycle, amphibolic role, anaplerotic reactions, regulation of the cycle, mitochondrial electron transport, oxidative phosphorylation, cyanide-resistant respiration, factors affecting respiration.	11	1		12
Unit-III Marks:15	**ATP-Synthesis :-** Mechanism of ATP synthesis, substrate level phosphorylation, chemiosmotic mechanism (oxidative and photophosphorylation), ATP synthase, Boyers conformational model, Racker's experiment, Jagendorf's experiment; role of uncouplers **Lipid metabolism :-** Synthesis and breakdown of triglycerides, β-oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilisation of lipids during seed germination, α oxidation.	7	1		8

Unit-IV Marks:10	**Nitrogen metabolism :-** Nitrate assimilation, biological nitrogen fixation (examples of legumes and non-legumes); Physiology and biochemistry of nitrogen fixation; Ammonia assimilation and transamination. **Mechanisms of signal transduction:-** Receptor-ligand interactions; Second messenger concept, Calcium calmodulin, MAP kinase cascade.	6	1		7
Practicals Marks:25	1. Separation of plants pigments by solvent method. 2. Estimation of sugar content by Somogyi method. 3. Determination of TAN in plant materials. 4. To compare the rate of respiration in different parts of a plant (Demonstration). 5. Estimation of protein in a sample by Biuret method. 6. Separation of amino acids by paper chromatography. 7. Demonstration of Thin layer chromatography (TLC). 8. Quantitative analysis of absorption spectrum of photosynthetic pigments. 9. Effect of carbon dioxide concentration on the rate of photosynthesis.			15	15

Total-60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 6th SEMESTER

Title of the Course: Natural Resources Management
Course code: BOT-MAJOR-DSC-15
Nature of the Course: MAJOR/ CORE-6.4
Total Credits: 04
Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30
Course objectives: The objective of this course is to provide knowledge to the students on various aspects of natural resource management viz. diversity, conservation, natural resources, resource utilization, sustainable development, resource management and its conservation.

UNITS	CONTENTS	L	T	P	Total Hours
Unit- I Marks:15	**Ecosystem:** - Definition, types and function **Biodiversity and conservation**: - Introduction to biodiversity, biogeographic zones of India, pattern of species diversity, global biodiversity hotspots and its list, endangered and endemic species of India, threats to biodiversity, invasive plant species of India, conservation of biodiversity (In-situ and ex-situ). Significance; Threats; Management strategies; Bioprospecting; IPR, CBD, National Biodiversity Action Plan	12	1		13
Unit- II Marks:15	**Natural resources:-** **Land:**- Land as a resource, landuse change, land degradation-causes and effect. Soil erosion- types, effects, soil conservation practices, desertification-causes, effect, prevention and current global desertification scenario. **Forest resources: -** Definition, major forest resources, benefit of forest resources, deforestation- causes and consequences Forest cover and its significance (with special reference to India); Major and minor forest products; Management.	11	1		12
Unit-III Marks:15	**Water:-** Definition and different water resources, use and over-exploitation of surface and ground water, flood-causes of flood with special reference to North-East India, its management, inter-state and international conflicts over water, drought- types, causes and consequences. **Energy resources: -** Definition, Renewable and non-renewable sources of energy and their advantages and disadvantages. Alternative energy sources and its advantages and disadvantages. .	9	1		10
Unit-IV Marks:15	**Resource utilization and sustainable development:-** Concept, approaches, economic, ecological and socio-cultural, Key aspects of resource utilization and sustainable development, examples of sustainable resource utilization, challenges to sustainable resource utilization**,** Gross National Productivity and the quality of life, Tragedy of Commons, Economics of Pollution control, Cost-benefit and cost effectiveness analysis, WTO and Environment, Corporate Social Responsibility, Environmental awareness and Education; Environmental Ethics.	9	1		10

	Contemporary practices in resource management: EIA, GIS, Participatory Resource Appraisal, Ecological Footprint with emphasis on carbon footprint, Resource Accounting; Waste management. **Resource management and conservation:-** National and international efforts in resource management and conservation				
Practicals Marks:25	1. Estimation of solid waste generated by a domestic system (biodegradable and non-biodegradable) and its impact on land degradation. 2. Collection of data on forest cover of specific area. 3. Measurement of dominance of woody species by DBH (diameter at breast height) method. 4. Calculation and analysis of ecological footprint. 5. Uses of GPS and GIS (Mapping of an area). 6. Determine PH, conductivity, density and water holding capacity of soil.			15	15

Total-60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 6th SEMESTER

Title of the Course: Ecology and Plant Taxonomy
Course code: BOT-MINOR-DSE-6
Nature of the Course: Minor-6.1
Total Credits:
Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30
Course objectives: The objective of this course is to provide knowledge to the students on various aspects of plant ecology viz. ecological factors, population ecology, community ecology, ecosystem, phytogeography, botanical nomenclature, types of classification, some angiosperm families.

UNITS	CONTENTS	L	T	P	Total Hours
Unit- I Marks:15	**Introduction to Ecology; -** Definition, historical prespectives, objective of study, significance of ecology, ecology and future of mankind. **Ecological factors:** Abiotic factors (light, temperature, water, gases and wind and biotic factors (producers, consumers, decomposers and scavengers with examples) **Population Ecology:-** Definition, population attributes(density, natality, mortality, sex ration, age pyramid, population growth, population interactions (positive and negative), ecological speciation.	11	1		12
Unit-II Marks:15	**Community Ecology:-** Definition, major and minor community, structure of plant communities, ecological succession-types of seres, process of plant succession, major steps in autotrophic succession, causes of succession, microsuccession and climax concept **Ecosystem :-** Definition, types, structure and function, Food chains and food webs, Ecological pyramids, production and productivity; Biogeochemical cycling; Cycling of carbon, nitrogen and Phosphorous **Phytogeography:-** Principal biogeographical zones; Endemism, Endemic species of India	12	1		13
Unit-III Marks:15	**Identification :-** Functions of Herbarium, important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access Taxonomic evidences from palynology, cytology, phytochemistry and molecular data. **Taxonomic hierarchy :-** Introduction to plant taxonomy Identification, Classification, Nomenclature, Ranks, categories and taxonomic groups	9	1		10

Unit-IV Marks: 15	**Botanical nomenclature :-** Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations Classification : **Types of classification:--** Artificial system (Carolus Linnaeus), Natural system (Bentham and Hooker) and phylogenetic system -Engler and Prantl (upto series). Biometrics, numerical taxonomy and cladistics: **Characters of angiospermic families**:- Poaceae, Asteraceae, Lamiaceae, Euphorbiaceae, Acanthaceae, Verbanacese	9	1		10
Practical Marks-25	1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer / hygrometer, rain gauge and lux meter. 2. Study of morphological adaptations of hydrophytes and xerophytes (four each). 3. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (species to be listed) 4. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law. 5. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Brassicaceae, Solanaceae, Lamiaceae. 6. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book). 7. Field study to a hill area and submission of report.			15	15

Total-60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF B.Sc. 7th SEMESTER

Title of the Course :Plant Biotechnology
Course Code : BOT-MAJOR-DSC-16
Nature of the Course : MAJOR/CORE-7.1
Total Credits : 04
Distribution of Marks : 100 : Theory-45, Practical-25, Internal assessment-30

Course Objectives: The objective of the Plant Biotechnology course is to introduce undergraduate students to the fundamental concepts and applications of biotechnology in plants. It aims to develop an understanding of plant tissue culture, genetic engineering, transgenic and their roles in crop improvement and sustainable agriculture.

UNITS	CONTENTS	L	T	P	Total hours
Unit-I Marks: 10	**Introduction to Plant Biotechnology** Definition and understanding of Plant Biotechnology; Scope of Plant Biotechnology; Historical Background in Plant Biotechnology; Branches of Plant Biotechnology; Importance of Plant Biotechnology	**6**	**1**		**7**
Unit-II Marks: 20	**Plant Tissue Culture** Historical perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, Cryopreservation, Germplasm Conservation).	**14**	**1**		**15**
Unit-III Marks:15	**Recombinant DNA technology** Restriction Endonucleases (History, Types I-IV, biological role and application); Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pUC 18 and pUC19, pBR322, Ti plasmid, BAC); M13 phagemid, Cosmid, Shuttle vector; Eukaryotic Vectors (YAC).	**7**	**1**		**8**
Unit-IV Marks:15	**Gene Cloning & Method of Gene Transfer:-** Recombinant DNA, PCR-mediated gene cloning; Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection; colony hybridization **Method of gene transfer** *Agrobacterium*-mediated, Direct gene transfer by Electroporation, Microprojectile bombardment; Selection of transgenics- selectable marker and reporter genes (Luciferase, GUS, GFP). **Applications of Plant Biotechnology** Pest resistant (Bt-cotton); herbicide resistant plants (Round Up Ready soybean); Transgenic crops with improved quality traits (Golden rice); edible vaccines; Industrial enzymes (Aspergillase, Protease); Genome editing through CRISPR/Cas; Ethical	**15**			**15**

	considerations and Biosafety concerns related to Plant Biotechnology				
Practical Marks: 25	1. Preparation of MS medium 2. Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of tobacco, Datura, Brassica etc. 3. Isolation of genomic DNA. 4. Isolation of plasmid DNA 5. Quantification of Plant DNA Using a Spectrophotometer / Nanodrop Spectrophotometer 6. Gel Electrophoresis of Genomic DNA from Plants 7. Study of anther, embryo culture, micropropagation, somatic embryogenesis & artificial seeds through photographs. 8. Construction of restriction map of circular and linear DNA from the data provided. 9. Study of methods of gene transfer through photographs: *Agrobacterium*-mediated and microprojectile bombardment. 10. Study of steps of genetic engineering for production of Bt cotton and Golden rice through photographs.			**15**	**15**

Total=60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 7th SEMESTER

Title of the Course: Horticultural technique and Post-Harvest Technology
Course code: BOT-MAJOR-DSC-17
Nature of the Course: MAJOR/ CORE-7.2
Total Credits: 04
Distribution of Marks: 100 : Theory-45, Practical-25, Internal assessment-30
Course objectives: - The objective of this course is to provide knowledge to the students on various aspect of types, classification of crop plants, horticultural techniques, landscaping, garden design, floriculture, post-harvest technology, diseases control and management, conservation and management of crop plants.

UNITS	CONTENTS	L	T	P	Total Hours
Unit-I Marks:15	**Introduction:-** Scope and importance, Branches of horticulture; Role in rural economy and employment generation; Importance in food and nutritional security; Urban horticulture and ecotourism. **Plants:-** Types, classification (annuals, perennials, climbers and trees); Identification and salient features of some ornamental plants [rose, marigold, gladiolus, carnations, orchids, poppies, gerberas, tuberose, sages, cacti and succulents (opuntia, agave and spurges)] Ornamental flowering trees (Indian laburnum, Gulmohar, Jacaranda, Lagerstroemia, fishtail and areca palms, Samul, coral tree).	11	1		12
Unit- II Marks: 15	**Horticultural techniques :-** Application of manure, fertilizers, nutrients and PGRs; Weed control; Bio-fertilizers, bio-pesticides; Irrigation methods (drip irrigation, surface irrigation, furrow and border irrigation); Hydroponics; Propagation Methods: asexual (grafting, cutting, layering, budding), sexual (seed propagation), Scope and limitations **Landscaping and garden design :-** Planning and layout (parks and avenues); gardening traditions - Ancient Indian, European, Mughal and Japanese Gardens; Urban forestry; policies and practices **Floriculture:-** Cut flowers, bonsai, commerce (market demand and supply); Importance of flower shows and exhibitions	11	1		12

Unit-III Marks:15	**Post-harvest technology :-** Importance of post-harvest technology in horticultural crops; Evaluation of quality traits; Harvesting and handling of fruits, vegetables and cut flowers; Principles, methods of preservation and processing; Methods of minimizing loses during storage and transportation; Food irradiation - advantages and disadvantages; food safety. **Disease control and management :-** Field and post-harvest diseases; Identification of deficiency symptoms; remedial measures and nutritional management practices; Crop sanitation; IPM strategies (genetic, biological and chemical methods for pest control); Quarantine practices; Identification of common diseases and pests of ornamentals, fruits and vegetable crops.	11	1		12
Unit-IV Marks:15	**Fruit and vegetable crops: -** Production, origin and distribution; Description of plants and their economic products; Management and marketing of vegetable and fruit crops; Identification of some fruits and vegetable varieties (citrus, banana, mango, chillies and cucurbits). **Horticultural crops - conservation and management: -** Documentation and conservation of germplasm; Role of micropropagation and tissue culture techniques; Varieties and cultivars of various horticultural crops; IPR issues; National, international and professional societies and sources of information on horticulture.	8	1		9
Practicals: Marks:25	**1.** To study methods of commercial production of Bio-fertilizers. 2. To study the methods of control of fungal and bacterial diseases. 3. To study the properties of some fungicides and bactericides 4. To study the methods of grafting, cutting, layering, Budding. 5. Field trip Field visits to gardens, standing crop sites, nurseries, vegetable gardens and horticultural fields at suitable locations.			15	15

Total=60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 7th SEMESTER

Title of the Course: Conservation Biology
Course code: BOT-MAJOR-DSC-18
Nature of the Course: MAJOR/ CORE-7.3
Total Credits: 04
Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30
Course objectives: The objective of this course is to provide knowledge to the students on various aspects of environment, environmental problems, microbiology of waste water treatment, xenobiotic, enzymes in the treatment of waste water treatment pf toxic compounds, sustainable development, international legislation and management of environmental issues.

UNITS	CONTENTS	L	T	P	Total Hours
Unit-I Marks:15	**Environment :-** Basic concepts and issues, global environmental problems - ozone depletion, UV-B, greenhouse effect and acid rain due to anthropogenic activities, their impact and biotechnological approaches for management **Environmental problems:-** **Environmental pollution** - types of pollution (Air, land, water and sound pollution- causes and control; Accidental pollution, Greenhouse effect, global warming measurement of pollution, methods of measurement of pollution, fate of pollutants in the environment, Bio-concentration, bio / geomagnification	7	1		8
Unit- II Marks:15	**Xenobiotic compounds:-** Organic (chlorinated hydrocarbons, substituted simple aromatic compounds, polyaromatic hydrocarbons, pesticides, surfactants) and inorganic (metals, radionuclides, phosphates, nitrates). Bioremediation of xenobiotics in environment - ecological consideration, decay behavior and degradative plasmids, molecular techniques in bioremediation	13	2		15
Unit-III Marks:15	**Role of immobilized cells/enzymes in treatment of toxic compounds: -** Biopesticides, bioreactors, bioleaching, biomining, biosensors, biotechniques for air pollution abatement and odour control	6	1		7
	International Legislations, Policies for Environmental Protection: - Stockholm Conference (1972) and its declaration, WCED (1983) and Brundtland Report (1987), Rio Earth Summit-UNCED (1992) and its declaration, Montreal Protocol - 1987, Basel Convention (1989), Kyoto Protocol- 1997, Ramsar Convention 1971.				

Unit-IV Marks:15	**National Legislation, Policies for pollution management:-** Salient features of Wild life protection act 1972, Water Pollution (Prevention and Control) Act1974, Forest conservation act 1980, Air Pollution (Prevention and Control) Act-1981, National Environmental Policy -2006, Central and State Pollution Control Boards: Constitution and power. **Public Participation for Environmental Protection: -** Environmental movement and people's participation with special references to Gandhamardan, Chilika and Narmada Bachao Andolan, Chipko and Silent valley Movement; Women and Environmental Protection, Role of NGO in bringing environmental awareness and education in the society	13	2		15
Practicals Marks:25	1. Water/Soil analysis - DO, BOD, COD, salinity, pH, chloride, total hardness, alkalinity, acidity, nitrate, calcium, Magnesium and phosphorus. 2. Gravimetric Analysis-Total solid, dissolved solid, suspended solid in an effluent 3. Microbial assessment of air (open plate and air sample) and water 4. To visit a nearby polluted area and study the impact of air and water pollution on surrounding vegetation.			15	15

Total-60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 7th SEMESTER

Title of the Course: Analytical Techniques in Plant Sciences
Course code: BOT-MAJOR-21
Nature of the Course: MAJOR/ CORE-7.4
Total Credits: 04
Distribution of Marks: 100 : Theory-45, Practical-25, Internal assessment-30
Course objectives: The objective of this course is to provide knowledge to the students on various aspect of principles of microscopy, cell fractionation, radioisotopes, spectrophotometry, x-ray diffraction, AGE, PAGE and biostatistics

UNITS	CONTENTS	L	T	P	Total Hours
Unit- I Marks:20	**Imaging and related techniques :-** Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.	13	2		15
Unit- II Marks:10	**Cell fractionation:-** Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, $Cscl_2$ gradient, analytical centrifugation, ultracentrifugation, marker enzymes.	6	1		7
Unit- III Marks:10	**Radioisotopes :-** Use in biological research, auto-radiography, pulse chase experiment. **Spectrophotometry:-** Principle and its application in biological research. **Chromatography:-** Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ion-exchange chromatography; Molecular sieve chromatography; Affinity chromatography.	7	1		8
Unit-IV Marks:20	**Characterization of proteins and nucleic acids :-** Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE **Biostatistics :-** Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, 55 mean deviation, variation, standard deviation; Chi-square test for goodness of fit.	12	3		15

Practical Marks:25	1. Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs. 2. Demonstration of ELISA. 3. To separate sugars by thin layer chromatography. 4. Isolation of chloroplasts by differential centrifugation. 5. To separate chloroplast pigments by column chromatography. 6. To estimate protein concentration through Lowry's methods. 7. To separate proteins using PAGE. 8. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH). 1. Educational tour to research station			15	15

Total-60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 7th SEMESTER

Title of the Course: Cell Biology, Genetics and Plant Breeding

Course code: BOT-MINOR-DSE-7

Nature of the Course: Minor-7.1

Total Credits: 04

Distribution of Marks: 100 : Theory-45, Practical-25, Internal assessment-30

Course objectives: The objective of this course is to provide knowledge to the students on various aspect of microscopes, cell cycle, cell organelles, cell membrane, principles of inheritance, chromosome, nucleic acids, fine structure of gene, genetic code, transcription, regulation of gene expression and plant breeding.

UNITS	CONTENTS	L	T	P	Total Hours
Unit- I Marks:15	**Techniques in cell Biology:-** **Principles of microscopy**: - Light Microscopy; Phase contrast microscopy; Fluorescence microscopy; Sample Preparation for light microscopy. **Cell as a unit of Life :-** The Cell Theory; Prokaryotic and eukaryotic cells; Cell size and shape; Eukaryotic Cell components. **Cell Cycle:-** Overview of Cell cycle, Mitosis and Meiosis and their significance	7	1		8
Unit-II Marks:12	**Cell Organelles:-** **Morphology, ultrastructure, chemical composition and functions of cell organelles:** - Mitochondria, Chloroplast, Nucleus, Golgi body, Endoplasmic Reticulum (ER), Ribosomes, Endosomes, Lysosomes, Peroxysomes, hydrogenosomes and Centrosomes **Cell Membrane and Cell Wall :-** The functions of membranes; Models of membrane structure; (Fluid-mosaic model); Selective permeability of the membranes; ultrastructure and functions of Cell wall	8	1		9
Unit-III Marks:18	**Principles of inheritance**: -Mendel's Laws of inheritance, dominance, codominance **Chromosome:** - Chromosome morphology and its chemical composition and functions. Chromatin- euchromatin and heterochromatin. Nucleosome concept **Genetic material :-**, Griffith's and Avery's transformation experiments DNA as genetic materials, Fraenkel-Conrat and Singer experiment RNA as genetic material DNA structure, types of DNA, types of genetic material **Nucleic acids: -** Forms of DNA, Chemical structure of DNA. Watson and Crick model of DNA double helix. Chemical structure of RNA molecules, Types of RNA **DNA replication: -**Evidences of semi–conservative mode of DNA replication (Linear Model), bidirectional replication replication and circular model of DNA replication. **Fine structure of genes**: - Muton, recon, cistron **Genetic code**:- Definition, codon assignment, deciphering the genetic code and features of genetic code. **Mutation:-** Definition, physical and chemical mutagens, Spontaneous and induced mutation, point mutation.	14	1		15

Unit-IV Marks:15	**Transcription**: - Generalized model of prokaryotic transcription **Regulation of gene expression: -** Process of gene expression in prokaryotes **Plant breeding: -** Objectives of plant breeding, plant introduction, domestication and acclimatization. Hybridization technique, heterosis and inbreeding depression and its commercial application, distant hybridization technique. Barrier to the production of distant hybridization, limitations	12	1		13
Practicals Marks:25	1. To study the mitotic and meiotic cell division in onion root/ garlic tip using acetocarmine stain and prepare temporary and permanent slides. 2. To study of the photomicrographs of cell organelles. 3. To study the structure of plant cell through temporary mounts. 4. To Study the plasmolysis and deplasmolysis of cell on Tradescantia leaf peel. 5. To measure the cell size (either length or breadth/diameter) by micrometer. 6. To study the structure of nuclear pore complex by photograph. 7. Isolation of DNA from plant materials by CTAB method 8. To study the hand emasculation technique for hybridization of crop plants.			15	15

Total-60 Classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2.Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 8th SEMESTER

Title of the Course: Industrial & Environmental Microbiology

Course code: BOT-MAJOR-DSC-19

Nature of the Course: MAJOR/ CORE-8.1

Total Credits: 04

Distribution of Marks: 100 : Theory-45, Practical-25, Internal assessment-30

Course objectives: The objective of this course is to provide knowledge to the students on various aspect of industrial and environmental microbiology such as bioreactor, fermentation process, microbial production of industrial products, microbial enzymes, microbes in water and agriculture.

UNITS	CONTENTS	L	T	P	Total Hours
Unit-I Marks:15	Scope of microbes in industry and environment **Bioreactors/Fermenters and fermentation processes:-** Solid-state and liquid-state (stationary and submerged) fermentations; Batch and continuous fermentations. Components of a typical bioreactor, Types of bioreactors-laboratory, pilot scale and production fermenters; Constantly stirred tank fermenter, tower fermenter, fixed bed and fluidized bed bioreactors and air-lift fermenter. A visit to any educational institute/ industry to see an industrial fermenter, and other downstream processing operations.	10	1		11
Unit-II Marks:15	**Microbial production of industrial products :-** Microorganisms involved, media, fermentation conditions, downstream processing and uses; Filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, lyophilization, spray drying; Hands on microbial fermentations for the production and estimation (qualitative and quantitative) of Enzyme: amylase or lipase activity, Organic acid (citric acid or glutamic acid), alcohol (Ethanol) and antibiotic (Penicillin)	10	2		12
Unit- III Marks:15	**Microbial enzymes of industrial interest and enzyme immobilization :-** Microorganisms for industrial applications and hands on screening microorganisms for casein hydrolysis; starch hydrolysis; cellulose hydrolysis. Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose 53 isomerase and penicillin amylase). **Microbes and quality of environment:-** Distribution of microbes in air; Isolation of microorganisms from soil, air and water.	10	2		12

Unit-IV Marks:15	**Microbial flora of water:-** Water pollution, role of microbes in sewage and domestic waste water treatment systems. Determination of BOD, COD, TDS and TOC of water samples; Microorganisms as indicators of water quality, check coliform and fecal coliform in water samples. **Microbes in agriculture and remediation of contaminated soils**:- Biological fixation; Mycorrhizae; Bioremediation of contaminated soils. Isolation of root nodulating bacteria, arbuscular mycorrhizal colonization in plant roots. **Microbiology of waste water treatment: -** Aerobic process - activated sludge, oxidation ponds, trickling filter, towers, rotating discs, rotating drums, oxidation ditch. Anaerobic process - anaerobic digestion, anaerobic filters, up-flow anaerobic sludge blanket reactors. Treatment schemes for waste waters of dairy, distillery, tannery, sugar and antibiotic	9	1		10
Practical Marks:25	1. Principles and functioning of instruments in microbiology laboratory. 2. Hands on sterilization techniques and preparation of culture media. 3. Preparation of culture media for growing bacteria/yeast 4. Pure culture techniques. 5. Isolation of soil micro-flora by serial dilution method. 6. Isolation of microflora by sticky slide methods from air 7. To study the method of fermentation process of carbohydrates and its product			15	15

Total-60 Classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip/ Excursion Tour/Seminar/quiz/Home assignment- 15 marks

DETAILED SYLLABUS OF 8th SEMESTER

Title of the Course: Molecular Biology
Course code: BOT-MAJOR-DSC-20
Nature of the Course: MAJOR/CORE-8.2
Total Credits:04
Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30
Course objectives: The objective of this course is to provide knowledge to the students on various aspect of cytogenetics, DNA structure, central dogma, genetic code, transcription, translation, processing and modification of RNA.

UNITS	CONTENTS	L	T	P	Total Hours
Unit-I Marks:25	**Chromosome and Chromatin:-** Introduction, Chromosome number, Chromosome size, Chromosome morphology, types of chromosomes, Karyotype, Chemical composition, Organisation of chromatin fibers. The Nucleosome concept, Chromatin structure- Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin. **Concept of gene**:- Cistron, muton, recon etc. **The Structures of DNA :-** Historic prespective, Occurance, Chemical structure of DNA, Watson and Crick structural model of DNA, Salient features of double helix, denaturation and renaturation of DNA, cot curves; Organization of Prokaryotic and Viral DNA and cell free DNA. **Organelle DNA** -- mitochondria (mt DNA) and chloroplast (cp DNA), **Structure of RNA**:- Structure of RNA, Types of non-genetic RNA and Clover leaf model of tRNA	15	3		18
Unit-II Marks:15	**Central dogma and genetic code :-** Key experiments establishing-The Central Dogma (Adaptor hypothesis and discovery of mRNA template), **Genetic code: -** Basis of cryptoanalysis, codon assignment (deciphering the code) & salient features of genetic code **Transcription:** **Transcription in prokaryotes and eukaryotes.** A generalized model of prokaryotic transcription **Operon concept: -** Regulation of lactose metabolism and tryptophan synthesis in E. coli. **Eukaryotes:** Eukaryotic transcription factors.	11	1		12
Unit-III Marks:10	**Processing and modification of RNA :-** Split genes-concept of introns and exons, removal of introns, spliceosome machinery, splicing pathways, group I and group II intron splicing, alternative splicing eukaryotic mRNA processing (5' cap, 3' poly A tail); Ribozymes; RNA editing and mRNA transport.	8			8
Unit-IV Marks:10	**Translation :-** Ribosome structure and assembly, mRNA; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides; Fidelity of translation; Inhibitors of protein synthesis; Post-translational modifications of proteins	7			7

Practicals Marks:25	1. DNA isolation, purification, and quantification from plant materials (CTAB method). 2. DNA isolation and Gel electrophoresis 3. Chromosome counting and Karyotype in garlic root tip 4. Calculate the average chromosome length (ACL) and total chromosome length (TCL) in garlic root tip 5. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs. 6. Study of the following through photographs: - (i) Assembly of Spliceosome machinery; (ii) Splicing mechanism in group I & group II introns; (iii) Ribozyme and Alternative splicing.			15	15

Total-60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 8th SEMESTER

Title of the Course: Research Methodology
Course code: BOT-MAJOR-DSC-22
Nature of the Course: Minor-8.3
Total Credits: 04
Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30
Course objectives:- : The objective of this course is to provide knowledge to the students on various aspects research methodology

UNITS	CONTENTS	L	T	P	Total Hours
Unit-I Marks:20	1. **Basic concept of research: -** Research-definition and types of research (descriptive vs analytical; applied vs fundamental; quantitative vs qualitative; conceptual vs empirical). Research methods vs methodology. Literature review and its consolidation; Library research; field research; laboratory research 2. **General laboratory practices: -** Common calculations in botany laboratories, understanding the details on the label of reagent bottles. Molarity and normality of common acids and bases, preparation of solutions, Dilution, percentage solutions. Molar and normal solutions. Technique of handling micropipettes. Knowledge about common toxic chemicals and safety measures in their handling.	13	1		14
Unit- II Marks:15	1. **Data collection and documentation of observations;-** Maintaining a laboratory records; Tabulation and generation of graph. Imaging of tissue specimens and application of scale bars. The art of field photography. 2. **Overview of biological problems:-** History; key biology research areas, Model organisms in biology (a brief overview);Genetics, physiology, Biochemistry, Molecular Biology, cell biology, genomics, proteomics-Transcriptional regulatory network.	10	1		11
Unit-III Marks:10	1. **Methods to study plant cell / tissue structure:-** whole mounts, peel mounts, squash preparations, cleaning, maceration and sectioning; Tissue preparation; living vs fixed, physical vs chemical fixation, coagulating fixatives, non-coagulant fixatives, tissue dehydration using graded solvent series, paraffin and plastic infiltration; preparation of thin and ultra- thin section	7	1		8

Unit-IV Marks:15	1. **Plant microtechniques**:- Staining procedure, classification and chemistry of stains. Staining equipments. Reactive dyes and fluorochromes (including genetically engineered protein labelling with GPF and other tags). Cytogenetic techniques with squashed plant materials. 2. **The art of scientific writing and its presentation:-** Numbers, units, abbreviations and nomenclature used in scientific writing. Writing references. Power point presentation. Poster presentation. Scientific writing and ethics, introduction to copyright-academic misconduct/ plagiarism	11	1		12
Practicals Marks:25	1. Experiments based on chemical calculations. 2. Plant micro technique experiments. 3. The art of imaging of samples through microphotography and field photography 4. Poster presentation on defined topics 5. Technical writing on topics assigned			15	15

Total-60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 8th SEMESTER

Title of the Course: Bioinformatics and Biostatistics

Course code: BOT-MAJOR-DSC-23

Nature of the Course: Minor-8.4

Total Credits: 04

Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30

Course objectives:- : The objective of this course is to provide knowledge to the students on various aspects Bioinformatics and Biostatistics.

UNITS	CONTENTS	L	T	P	Total Hours
Unit-I Marks:10	1. **Introduction to Bioinformatics:-** Introduction, branches of Bioinformatics, Aim, scope and research area of Bioinformatics. 2. **Databases in Bioinformatics:-** Introduction, Biological databases, classification format of Biological Databases, Biological databases retrieval system.	7	1		8
Unit- II Marks:20	1. **Biological sequence databases:**- National Center for Biotechnological Information (NCBI), Tools and Databases of NCBI, Databases retrieval Tool, Sequence submission to NCBI, Basic Local Alignment Search Tool (BLAST), Nucleotide database, Protein Database, Gene Expression database. 2. **EMBL nucleotide Sequence Database EMBL-Bank):**- Introduction, sequence Retrieval, Sequence Submission to EMBL, Sequence analysis Tool. 3. **DNA Data Bank of Japan (DDBJ):-** Introduction, Resources at DDBJ, Data submission at DDBJ. 4. **Protein Information Resources (PIR):**- About PIR, Resources of PIR, Databases of PIR, Data Retrieval in PIR. 5. **Swiss- Prot:-** Introduction and salient features	12	1		13
Unit-III Marks:15	1. **Sequence alignments: -** Introduction, Concept of Alignment, Multiple sequence Alignment (MSA), MSA by CLUSTALW, Scoring, Matrices, Percent Accepted Mutation (PAM), Block of Amino Acid Substitution Matrix (BLOSUM). 2. **Molecular Phylogeny: -** Methods of phylogeny, Software of Phylogenetic Analyses, Consistency of Molecular phylogenetic Prediction. 3. **Applications of Bioinformatics:-** Structural bioinformatics in drug discovery, quantitative structure-activity relationship (QSAR) techniques in drug design, Microbial genome applications, Crop improvement.	11	1		12
Unit-IV Marks:15	1. **Biostatistics:-** Statistics, data, population, samples, parameters, representation of data: Tabular, Graphical, Measure of central tendency,: Arithmetic mean,, mode, median, Measure of dispersion: Range, mean deviation, Variation, standard deviation, Chi-square test for goodness	11	1		12

	of fit. Correlation- types and methods of correlation, regression, simple regression equation, fitting prediction, similarities and dissimilarities of correlation and regression. Analysis of variance (ANOVA).				
Practicals Marks:25	1. Nucleic acid and protein databases 2. Sequence retrieval from databases 3. Sequence alignment 4. Sequence homology and gene annotation 5. Construction of phylogenetic tree 6. Calculation of mean, standard deviation and standard error 7. Calculation of correlation coefficient values and finding out probability 8. Calculation of 'F' value and finding out the probability value for the 'F' value.			15	15

Total-60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

DETAILED SYLLABUS OF 8th SEMESTER

Title of the Course: Economic Botany and Plant Biotechnology

Course code: BOT-MINOR-DSE-8

Nature of the Course: Minor-8.1

Total Credits: 04

Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30

Course objectives: The objective of this course is to provide knowledge to the students on various aspects of economic Botany viz. cereals, legumes etc. and Biotechnology- plant tissue culture, recombinant DNA technology, bioinformatics and applied bioinformatics

UNITS	CONTENTS	L	T	P	Total Hours
Unit-I Marks:10	1. Origin of Cultivated Plants: - Concept of center of origin, their importance with reference to Vavilov' work. 2. **Cereals:** - Wheat- Origin, morphology and uses 3. **Legumes: -** General account with special reference to Gram and Soyabean.	7			7
Unit- II Marks:18	**1. Spices: -** General account with special reference to Clove and Black Piper (Botanical name, Family, parts used, Morphology and uses. **2. Beverages:** - Tea - its morphology, Processing and uses. **3. Oils and fats:** - General description with special reference to Groundnut. **4. Fiber yielding plants:-** General description with special reference to Cotton (Botanical name, family, parts used, morphology and uses.	14	1		15
Unit-III Marks:20	1. ***Introduction to Biotechnology:*** **-** Principles and techniques 2. ***Plant tissue culture:*** **-** Micro propagation, haploid production through androgenesis and gynogenesis, brief account of embryo and endosperm culture and	14	1		15
Unit-IV Marks:12	1. **Bioinformatics: -** Introduction, Branches, aim Scope, and Research area. Biological database and retrieval system. 2. **Application of Bioinformatics:-** Molecular phylogeny, Basics of Proteomics and Genomics and their application in crop improvement and Drug discovery.	7	1		8

Practicals Marks:25	**1.**	Study of economically important plants: - Rice, Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut, Curcuma, through specimens, sections and micro-chemical tests			15	15
	2.	Familiarization with basic equipment in tissue culture.				
	3.	Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micro- propagation.				
	4.	Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.				
	5.	Data base searching, and retrieval of Sequence from databases.				
	6.	Sequence alignment, Homology and construction of Phylogenetic tree.				

Total-60 classes

Mode of Internal Assessment: -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

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