

ST.PHILOMENA'S COLLEGE (AUTONOMOUS), MYSURU

(AFFILIATED TO UNIVERSITY OF MYSORE)

REACCREDITED BY NAAC WITH A GRADE

Three-year six semesters Choice Based Credit System (CBCS) with Learning Outcome Based Curriculum framework (LOCF)

and Continuous Assessment & Grading Pattern (CAGP) Undergraduate Programme under Autonomous Structure

Programme- B.Sc.

The academic year 2018-19 onwards

DEPARTMENT OF BOTANY

VISION AND MISSION OF THE COLLEGE

VISION:

The college is guided by the visionary zeal of providing value- based education to everyone irrespective of religion, caste, creed or sex by which the character is formed, intellect is explained and one can stand on his/her feet.

MISSION:

To transform young men and women who come to learn not from books, but also from life and to share the experience of working and playing together, this inculcates life skills to become good citizens with integrity and discipline.

Programme Educational Objective (PEO)

PEO-1	Graduates will be able to master and display competency and leadership to become successful professionals, employees and entrepreneurs or pursue higher education and research.
PEO-2.	Graduates will be able to demonstrate the commitment towards professional ethics, gender sensitivity, preservation of environment and sustainable development.
PEO-3	Graduates will continue to learn and advance their careers through activities such as participation in professional organizations, attainment of professional certification and seeking higher education.

Programme Outcomes (PO): BSc. Programme

PO-1	Disciplinary Knowledge: The BSc. graduates will acquire the knowledge with facts and figures related to pure and applied sciences. Understand the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life.
PO-2	Cognitive and Communicative skills: Students learn two languages along with three major subjects. At the end of the programme, the students would have developed reading, writing, speaking, interpretive and composition skills. They would be able to communicate with others using appropriate media; confidently share one's views and express themselves
PO-3	Research Related Skills: The BSc. students will acquire the skills in handling scientific instruments, planning and performing in laboratory experiments.
PO-4	Ethics : The BSc. students will be imbibed ethical, moral and social values in personal and social life leading to highly cultured and civilized personality.
PO-5	Problem Solving: The BSc. graduates will develop the ability to analyze and solve Course-related problems and also the ability to evaluate situations and react responsibly to communicate, cooperate and lead a team among peers and others.
PO-6	Critical Thinking: The qualities of a science student – observation, precision, analytical mind, logical thinking, clarity of thought and expression, systematic approach, qualitative and quantitative decision making are enhanced.

PO-7	Social Interaction: The BSc. graduates shall appreciate the role of science in society; and its personal, social and global importance.
PO-8	Analytical Skills : The graduates will master the skills of observations and drawing logical inferences from the scientific experiments. Analyzed the given scientific data critically and systematically and the ability to draw the objective conclusions.
PO-9	Environment and Sustainability: Graduates will be able to understand the issues of environment and work towards sustainable development.
PO-10	Employability: After completing the programme, graduates will have the competency to be employed or to be an entrepreneur.
PO-11	Leadership Quality: In the graduation programme students are inculcated moral and ethical values, managerial skills, adoptability, problem solving, taking initiative, decision making, risk taking to make them confident leaders.

Programme Specific Outcomes (PSO)- BSc. Programme

PSO-No	After the completion of BSc. programme by studying CBZ//CBFn students will be able to	Cognitive level
PSO-1	Develop analytical skills and problem solving skills required for the application of chemical principles . They will be able to perform scientific experiments skillfully by application of procedural knowledge.	Analysis
PSO-2	Apply the knowledge of basic science, life sciences and fundamental process of plants to study and analyze any plant form. Create, select, and apply appropriate techniques, resources, and modern instruments and equipments for Plant Tissue culture experiments, cellular and physiological activities of plants with an understanding of the application and limitations.	Apply
PSO-3	Understand the basic concepts of Taxonomy, Physiology, Genetics, Cytology, Histology, Embryology, Ecology and Evolution. Be able to apply their knowledge of classical and applied aspects of Zoology in allied fields like Economic Zoology, Biotechnology, Pathology, Public Health, Environmental Toxicology and Wildlife conservation	Analyse
PSO-4	Recognize the interrelationship between food , nutrition and health and the food choices to make that will optimize the health and prevent diseases. Display basic and translational research skills with technical excellence and which make them research and industry ready.	Understand and apply

Mapping of Mission of the College with PEO							
Mission	PEO-1	PEO-2	PEO-3				
Mision -1	\checkmark	\checkmark	~				

	Ma	pping of	f PEOs v	with Pro	gramm	e Outco	ocome(l	PO)		
PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11
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DEPARTMENT OF BOTANY CBCS SYLLABUS FOR B.Sc BOTANY FOR THE ACADEMIC YEAR 2018-19 ONWARDS GENERAL SCHEME WITH RESPECT TO TEACHING & EVALUATION

Discipline Specific Core (DSC) or Hard Core (HC) Papers.

				Week al	la	ı actical	Max. Marks Theory/Practical		
Semester	Title of the Paper	TYPE	Course Code	Teaching Hours per Theorv/ Practic	Credits Theory/ Practic	Exam Duration in Hours Theory/ Pr	Theory/Practical	I A Theory/Practical	Total Marks
I	Paper-I. Microbial Diversity, Phycology and Mycology.	DSC	MA250	03	03	03	50	20	100
	Practical Paper-I	DSC	MA252	03	1.5	03	20	10	
п	Paper-II. Bryophyta, Pteridophytes Gymnosperm and Paleobotany	DSC	MB250	03	03	03	50	20	100
	Practical Paper-II	DSC	MB252	03	1.5	03	20	10	
ш	Paper-III. Plant Pathology, Anatomy and Evolution	DSC	MC250	03	03	03	50	20	100
	Practical Paper-III	DSC	MC252	03	1.5	03	20	10	
IV	Paper-IV. Reproductive Biology of Angiosperms, Ecology and Morphology of Angiosperm	DSC	MD250	03	03	03	50	20	100
	Practical Paper-IV	DSC	MD252	03	1.5	03	20	10	
	Paper-V. Taxonomy of Angiosperms and Plant breeding	DSC	ME250	03	03	03	70	30	
v	Paper-VI. Cell Biology and Molecular Biology	DSC	ME252	03	03	03	70	30	300
	Practical Paper-V.	DSC	ME254	03	1.5	03	35	15	
	Practical Paper-VI.	DSC	ME256	03	1.5	03	35	15	
	Paper- VII. Biomolecules and Plant Physiology	DSC	MF250	03	03	03	70	30	
VI	Paper- VIII. Genetics, Genetic Engineering and Plant Biotechnology	DSC	MF252	03	03	03	70	30	300
	Practical Paper-VII.	DSC	MF254	03	1.5	03	35	15	
	Practical Paper-VIII.	DSC	MF256	03	1.5	03	35	15	
		DSE		02	02	02	<u> </u>	20	100
		1001		04	04	02	50	20	
					40	-	760	340	1100

							Exa	minatio	n Sch	eme
SL. No	Title of the Paper	TYPE	Semester	Subject Code	Theory	Credits	Exam Duration in Hours	Theory Max. Marks	I A-Max Marks	Total Marks
1.	Title: Basics of Floriculture	DSE	Ι	MD25Y01	2	2	02	30	20	50
2.	Title: Ethnobotany and Economic Botany- An overview	DSE	-	MD25Y03	2	2	02	30	20	50
3.	Title: Plant Propagation and basic nursery methods	DSE	to	MD25Y02	2	2	02	30	20	50
4.	Title: Introduction to medicinal and aromatic plants	DSE		MD25Y05	2	2	02	30	20	50
5.	Title: Basics of Nutraceuticals in health care	DSE	-	MD25Y04	2	2	02	30	20	50
6.	Title: Introduction to Biostatistics	DSE	VI	ME25Y08	2	2	02	30	20	50
7.	Title: Introduction to applied microbiology	DSE		ME25Y06	2	2	02	30	20	50
8.	Title: Testing of Food adulterants	DSE		ME25Y07	2	2	02	30	20	50
9.	Title: Project	DSE		ME25Y09	2	2	02	30	20	50

Discipline Specific Elective (DSE or Soft Core (SC)

ST. PHILOMENA'S COLLEGE (AUTONOMOUS), MYSORE-570 015 A COLLEGE OF EXCELLENCE (UGC) SUBJECT-BOTANY SYLLABUS FOR B.Sc COURSE UNDER CBCS SCHEME DURATION OF THE COURSE - THREE YEARS-SIX SEMESTERS FROM THE ACADEMIC YEAR- 2018-2019 Onwards

PREAMBLE

The revised CBCS curriculum is designed keeping in mind the present trends in Botany. It includes both basics and advanced concepts in botany. It enables the students to have a wide perspective about the plant world; starting from the microflora to the advanced angiosperms and to appreciate the interdisciplinary approaches in plant science. Emphasis is laid on evolutionary trends, pathways and applications of plants in the present world. The curriculum is designed in such a way that it is thought-provoking and students become research-oriented. The curriculum includes small projects, field trips and industrial visits for better exposure. Students are inspired to pursue higher studies in botany and enable them to be employed in plant-based industries.

FIRST SEMESTER BOTANY PAPER-I

Course Objectives:

- **1.** To understand In plant pathology, Host-parasite relationship, pathogenicity, general symptoms and control measures have been included for a better understanding of the common plant diseases around us.
- 2. To gain knowledge on important diseases on cash crops and Biopesticides have been included for detailed study
- **3.** It gives an overview of the biology of the microbial world. The main objective is to explore their diversity, ecology and evolution as they live and evolve in and around us.

СО	After the completion of this course the student will be able to	Cognitive level
CO-01	Students are enlightened with knowledge about microbial diversity. They will be aware of different diseases caused by viruses and mycoplasma their symptoms and management.	Understand
CO-02	Students will understand the structural similarities and differences among various physiological groups of bacteria. Know general bacteriology and microbial aspects pertinent to bacteria. They will be aware of role of bacteria for human benefits and this knowledge will enable students to use bacteria for human welfare.	Apply
CO-03	Explain about the structural similarities and differences among various physiological groups of fungi. They will understand the life cycle patterns of Fungi, its economic importance and have the ability to utilize the concept of mushroom cultivation.	Apply
CO-04	After completion of this unit students will be aware of general features of Algae. They will understand the life cycle patterns of Algae and its economic importance.	Understand

1.0	UNIT-I	Hours
1.1	Introduction and a brief account of Microbiology - Microbes from soil, air &	05 Hrs

1.2	Landmarks in Virology – History and Discovery,	
	Status of viruses in microbiology (Living & non-living characteristics) Structure and multiplication of TMV and Bacteriophage [T4] A general account of	
	Symptoms, transmission and control of Tobacco mosaic disease, SARS, HIV,	
	ZIKA,	
1.3	Mycoplasma –A general account of Mycoplasma – History, Discovery and Characteristics Sandal spike disease, Bunchy top of Banana – Symptoms and management.	06 Hrs
2.0	UNIT -2	12 Hrs
2.1	BACTERIA: History and discovery Occurrence, classification based on morphology and flagellation, Ultrastructure, nutrition and reproduction – Vegetative, Fission, Budding – Endospore formation. Genetic recombination, conjugation, transformation and transduction.	
2.2	Role of bacteria in human welfare beneficial -As Natures' scavengers, Biofertilizers, Industrial curing of Tea, Tobacco, Leather, Retting of fibres, Alcohols and Acids, and harmful activities.	
2.3	And economic importance. Food value, biofertilizers, pioneers in plant succession, biological indicators, and water blooms. Type study : Spirulina and Nostoc.	
3.0	UNIT-3	12 Hrs
3.1	MYCOLOGY : A general account of the occurrence, classification, thallus structure, Nutrition and Reproduction, and Economic importance of fungi	
3.2	Type study: 1) Albugo2) Rhizopus3) Penicillium 4) Lycoperdon	
3.3	Cultivation of Mushrooms, Spawn production, Cultivation methods of Pleurotus on Paddy straw – Polythene method, Nutritional values of Mushrooms.	
3.4	Lichens: Distribution types, structure, reproduction and economic importance	
4.0.	UNIT-4	13 Hrs
4.1	PHYCOLOGY: A general account, classification, habitat, thallus structure, reproduction, economic importance.	
4.2	Type study: Chlorella, Oedogonium, Diatoms, Sargassum and Batrachospermum.	

FIRST SEMESTER PRACTICAL PAPER – I MICROBIAL DIVERSITY, MYCOLOGY AND PHYCOLOGY Practical 20 + IA 10 Marks Three hours practical per week

Course Objective:

- 1. Learn the microscopic technique, familiarize with the external and internal structure of lower and higher group organisms.
- 2. To expose students to microbial culture techniques.
- 3. To enhance the knowledge on morphology and life cycle of lower forms like virus, fungi and algae
- 4. Expose students to learn mushroom cultivation technique

СО	After the completion of this course the student will be able to	Cognitive level
CO-01	They will be aware of the principles of compound microscope and mounting techniques.	Understand
CO-02	Enlightened with microbial instruments and its application.	Apply
CO-03	They are skilled with the technique of staining different types of bacteria for better visualization	Understand
CO-04	A detail understanding on the structure of blue green algae and its benefits.	Understand
CO-05	Study the structure of fungal species	Remember
CO-06	Complete understanding on Lichens and its types by viewing the live specimen	Understand
CO-07	Students can accurately create highly diluted solutions as well as solutions for experiments by learning serial dilution technique	Apply
CO-08	Skilled to grow mushroom by learning mushroom cultivation technique which will make them entrepreneurs.	Apply

1.	PRACTICAL- I:	Study of Microscope – Use, care and Mounting techniques
2.	PRACTICAL -II	Microbial instruments – Inoculation loops, Hot air oven,
		Pressure cooker.
3.	PRACTICAL -III	Sterilization techniques, the study of microbes in water, air
		and soil by Petri-plate exposure method
4.	PRACTICAL IV	Simple and double staining of bacteria – Crystal
		violet/Safranin stain
5.	PRACTICAL- V	Study of TMV, Sandal spike, Citrus canker
6.	PRACTICAL-VI	Spirulina and Nostoc, Oedogonium.
7.	PRACTICAL-VII	Chlorella, Diatoms, Sargassum, Batrachospermum
8.	PRACTICAL-	Albugo, Rhizopus, Lycoperdon.
	VIII	
9.	PRACTICAL- IX	Penicillium, Lichens

10.	PRACTICAL-X	Serial dilution, methods of inoculation.
11.	PRACTICAL- XI	Mushroom cultivation. REVISION & TEST

SCHEME OF VALUATION FOR BOTANY PRACTICAL EXAMINATION I SEMESTER PAPER- I MODEL QUESTION PAPER MICROBIAL DIVERSITY, MYCOLOGY AND PHYCOLOGY

Time – 3 Hours	Max marks 20
I Identify the specimens A, B & C with reasons and labelled sketches	6 marks
(One from Cyanobacteria and one from fungi one from algae) Identification with reasons-01 Labelled sketches-01 II Prepare a temporary stained slide of the material D Sketch, label identify with reasons. Leave the preparation for evaluation. Staining and mounting - 1 marks Sketch, label, reasons - 2 marks (Protorphyta / fungi /algae)	3 marks
III Write a critical note on E&F (FromProtophyta i.e. bacterial/viral diseases/microbiological Instruments and one from fungi/ algae)	3 marks
 IV Identify the Micro slides G & H. One from Algae and Protophyta (Reasons and labelled sketch-01 Identification with reasons -01) 	4 marks
V Simple/ differential staining of Bacterial Procedure I Sketch, label, identify with reasons & leave the preparation for evaluation. Staining and mounting Procedure	2 marks
V1 Serial dilution/ inoculation of fungi.J	2 marks
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SECOND SEMESTER

BOTANY PAPER-II

TITLE: BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS & PALEOBOTANY

Class duration –03 hours/week 48hrs

Credit-03

Marks: Theory - 50 + Internal Assessment - 20= 70

Course objective:

- To discuss the structure and development of primitive vascular plants. The comparative studies of the steles, reproductive structures and development are considered in an evolutionary sequence.
- To gain knowledge about the more evolved Gymnosperms, their structure, anatomy, and reproduction.
- To study few fossil forms, geological time scale, Fossilization and types for a better understanding of evolution.

СО	After the completion of this course the student will be able to	Cognitive level
CO-01	Students will be aware of structure, anatomy, Classification and life cycle and economic importance of Bryophytes.	Understand
CO-02	Describe the status of higher Cryptogams as group in plant kingdom. Able to distinguish features interrelationship and evolutionary modification.	Analyze
CO-03	They will gain knowledge about life cycles of gymnosperm plants and understand the evolutionary trend affinities of living gymnosperms with respect to external and internal feature and its economic importance.	Analyze
CO-04	Compare the stages of evolution by studying geological time scale. They will be aware of fossils, fossilization process and its importance. Students will be introduced the various fossil genera representing different fossil group	Understand

UNIT	TOPIC	Hours
1.1	BRYOPHYTES: General characteristics and classification of bryophytes,	13 Hrs
1.2	Structure and Reproductive organs in:	
	1. Marchantia	
	2. Anthoceros	
	3. Funaria	
1.3	Economic Importance of Bryophytes	
2.1	PTERIDOPHYTA	14 Hrs
	Introduction, general characters, classification	
	External and internal structure and reproductive organs:	
2.2	(Developmental details not required) Economic importance of Pteridophytes.	
2.2	a. PSuolum b Solaginella	
	o. Equisatum	
	d Pteris	
	e Azolla	
2.3	A brief account of Heterospory and seed habit	
	Stelar evolution among Pteridophytes.	
3.1	GYMNOSPERMS	13 Hrs
	Introduction, general characters, classification	
	External, internal structure and reproductive structures(developmental stages	
	not required)	
3.2	Cycas – Sporophyte, the anatomy of Coralloid root, Young stem-leaflet	
	anatomy	
	Reproductive organs.	
3.3	Pinus – Sporophyte, Stem anatomy (Young), T.S of Needle and	
	Reproductive organs.	
24	Creature Secondary Store and any (Vanna) Econstria accordery anow the	
5.4	Gnetum – Sporophyte, Stelli anatomy (Young), Eccentric secondary growth	
	(Onetunitia) in the stem, leaf anatomy, reproductive organs.	
	PALEOROTANV	
41	A brief account of the geological time scale	8 Hrs
4.2	Process of fossilization and fossil types. Importance of fossils	5 44 5
4.3	Type study	
	Rhynia, Cycadeoidia.	

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SECOND SEMESTER PRACTICAL PAPER- II

BRYOPHYTA, PTERIDOPHYTA, GYMNOSPERMS & PALEOBOTANY Practical 20 + IA 10 Marks

Course Objectives:

- To make students recognize and understand the morphology, anatomical structure and reproductive organs of primitive vascular plants.
- To enlighten students about more evolved Gymnosperms, their structure, anatomy, and reproduction.
- To make students aware of fossils and fossilization.

Course Learning Outcome:

CO	After the completion of this course the student will be able to	Cognitive level
CO-01	Students will be able to recognize the morphology, anatomical characters and reproductive organs of <i>Marchantia</i> .	Understand
CO-02	Able to recognize the morphology, anatomical characters and reproductive organs of <i>Anthoceros</i> .	Understand
CO-03	Learn Funaria morphology, reproductive organs of Funaria.	Remember
CO-04	Understand the morphology, anatomical characters and reproductive organs of <i>Psilotum</i> and <i>Selaginella</i> .	Understand
CO-05	They have an understanding on <i>Equisetum</i> morphology, anatomical characters and life cycle.	Understand
CO-06	Learn the structure of <i>Pteris</i> and <i>azolla</i>	Remember
CO-07	Explain <i>Cycas and Pinus</i> morphology, practically see the anatomy of leaf	Analyse
CO-08	Enlightened with the knowledge of morphology, anatomy and reproductive organs of <i>Gnetum</i> .	Understand
CO-09	Develop Knowledge in fossil forms and fossilization.	Evaluate

One practical of two hours per week

PRACTICAL -I	Study of morphology, Internal Structure and reproduction in <i>Marchantia</i>
PRACTICAL -II	Study of morphology, Internal Structure and reproduction in <i>Anthoceros</i>
PRACTICAL-III	Study of morphology, Internal Structure and reproduction in <i>Funaria</i>
PRACTICAL-IV	Study of morphology, anatomy and reproductive organs of <i>Psilotum</i> and <i>Selaginella</i> .
PRACTICAL-V	Study of morphology, anatomy and reproductive organs of <i>Equisetum</i> .

PRACTICAL-VI	Study of morphology, anatomy and reproductive organs of <i>Pteris</i>
PRACTICAL-VII	Study of morphology, anatomy and reproductive organs of Azolla
PRACTICAL-VIII	Study of morphology, anatomy and reproductive organs of <i>Cycas</i>
PRACTICAL-IX	Study of morphology, anatomy and reproductive organs of <i>Pinus</i>
PRACTICAL-X	Study of morphology, anatomy and reproductive organs of <i>Gnetum</i>
PRACTICAL-XI	Study of morphology, anatomy and reproductive organs of
	Fossil forms-with slides and Photographs.
	Revision & Practical Test

SCHEME OF VALUATION OF BOTANY PRACTICAL EXAMINATION II SEMESTER PAPER-II MODEL QUESTION PAPER BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS & PALEOBOTANY Time – 3 Hours Max marks 20

I Identify the specimens A & B , giving reasons and labelled sketches (From Bryophyta, Pteridophyta, Gymnosperm)	4 marks
 II Prepare a temporary stained slide of the given material C. Sketch, Label and Identify giving suitable reasons (Preparation – 1 mark, Identification with diagram-2 marks and reason-1 mark) 	4 marks
III Write critical notes on D & E (From Bryophyta/ Pteridophyta/ Gymnosperms/ Paleobotany)	4 marks
IV Identify the microslides- F, G, H and I, with labelled sketches, giving	8 marks
Suitable reasons. (From Bryophyta/ Pteridophyta/ Gymnosperm, /Paleobotany)	

NOTE: In Paleobotany, Photograph or Slide may be kept.

THIRD SEMESTER BOTANY PAPER-III TITLE: PLANT PATHOLOGY, PLANT ANATOMY, EVOLUTION Class duration – 03 hours/week 48hrs Credit-03 Marks: Theory - 50 + Internal Assessment -20= 70

Course Objectives:

- To discussIncludes plant pathology, plant anatomy and evolution.
- In plant pathology, Host-parasite relationship, pathogenicity, general symptoms and control measures have been included for a better understanding of the common plant diseases around us.
- To gain knowledge of few important diseases on cash crops and Biopesticides have been included for detailed study.
- To understand Plant anatomy, which includes internal structures of Angiosperms to enable a better understanding of physiological functions.
- To understand Evolution and Origin of Life to correlate the gene flow, genetic drift and speciation occurring in nature

СО	After the completion of this course the student will be able to	Cognitive level
CO-01	Gain the skill in identifying the causative organism, symptoms treating and controlling plant disease. They will inculcate the importance of plant disease and the improve crop productivity.	Apply
CO-02	Explains the anatomical features of plant Student can easily differentiate the types of tissues and their functions.	Understand
CO-03	Describe the primary structure of dicot and monocot plant and understand the secondary growth	Understand
CO-04	Students will acquire the knowledge on traces of origin of life. They will be able to correlate the evolutionary theories with evidences in evolution.	Evaluate

UNIT	TOPIC	HOURS
1.1	Plant Pathology : Host-pathogen relationship, pathogenicity, general symptoms of plant diseases, transmission and control.	
1.2	 A general account of Symptoms causal organisms and management of 1. Tikka disease of Groundnut 2. Late blight of potato 	11Hrs
	 Koleroga of Arecanut Grain smut of Sorghum Wheat rust – <i>Puccinia graminis</i> Coffee rust. 	

1.3	 7. Red rot of sugarcane 8. Bacterial Blight of Paddy. A brief account of Biopesticides, Neem, <i>Trichoderma</i>, <i>Bacillus thuringiensis</i> in pest and disease control. 	2 Hrs
2.1	HISTOLOGY	10 Hrs
	Tissue and tissue organs, simple and complex tissues.	
2.2	Classification of Meristems – Theories of the apical meristem	
	A brief account of Simple tissues- Parenchyma, Collenchyma, Sclerenchyma and	
2.3	Bundles, types.	
	Tissue systems- structure, types and functions of Trichome,	
3.1	Stomata and Laticifers	
3.2	ANATOMY Study of the anatomy of Dicot and Monocot: Roots, Stems and Leaves.	8 Hrs
4.1	EVOLUTION : Concept of evolution, A brief account of Origin of earth and	4 Hrs
12	origin of life.	OTTra
4.2	Theories of Organic Evolution- Lamarckism, Darwinism, Weismanism, Devries	9Hrs
	Speciation.	

THIRD SEMESTER

PRACTICAL PAPER – III PLANT PATHOLOGY, PLANT ANATOMY AND EVOLUTION Practical 20 + IA 10 Marks

Course Objective:

- 1. To learn about General symptoms and control measures for a better understanding of the common plant diseases around us. Few important diseases on cash crops and Biopesticides have been included for detailed study.
- 2. To expose to internal structures of Angiosperms for better understanding of physiological functions.
- 3. To make them aware of different Evolutionist and their contributions.

Course Learning Outcome:

СО	After the completion of this course the student will be able to	Cognitive level
CO-01	Understand different fungal diseases its causal organism, symptoms and treatment.	understand
CO-02	differentiate different kinds of simple tissues.	Analyze
CO-03	compare different kinds of complex tissues.	Evaluate
CO-04	differentiate anatomy of Dicot and monocot stem.	Understand
CO-05	recognize and differentiate anatomy of Dicot and monocot root and leaves	Understand
CO-06	Will develop complete practical knowledge on Anamolous secondary growth of <i>Boerhaavia</i>	Understand
CO-07	Students will be familiar with stomata and trichomes.	Remember
CO-08	Learn the concept of biopesticides and will be able to apply it practically	Apply

One practical of two hours per week

PRACTICAL-I	Study of the fungal diseases-Late blight of Potato. Koleroga of
	Arecanut White rust Grain smut of Sorghum
PRACTICAL II	Wheat rust Bacterial blight of Paddy. Coffee rust Red rot of
I KACHCAL-II	wheat rust, Bacterial olight of Fauly, Confee rust, Keu for of
	Sugarcane, Tikka disease of Groundnut
PRACTICAL-III	Study of simple Tissue systems: Parenchyma, Collenchyma,
	Sclerenchyma.
PRACTICAL-IV	Study of complex tissues- xylem, phloem and vascular bundles
PRACTICAL-V	Anatomy of Dicot and Monocot – Stems
	(Materials may be chosen from Sunflower /Tridax/Zinnia/
	Grass/Sorghum)
PRACTICAL-VI	Anatomy of Dicot and Monocot – Roots
	(Materials may be chosen from Cicer/Musa/Sorghum)
PRACTICAL-VII	Anatomy of Dicot and Monocot -Leaves(Tridax/Zinnia/
	Grass/Sorghum/Maize)
PRACTICAL-VIII	Anomalous secondary growth- Boerhaavia/Dracaena.
PRACTICAL-IX	Study of stomata and trichome.
PRACTICAL-X	Photographs and Charts – from Evolution, Biopesticides.
PRACTICAL-XI	Revision & Practical Test

SCHEME OF VALUATION OF BOTANY PRACTICAL EXAMINATION III SEMESTER PAPER- III MODEL QUESTION PAPER

PLANT PATHOLOGY, PLANT ANATOMY AND EVOLUTION

Time – 3 Hours	Max marks 20
I Identify the specimens A and B , giving reasons (From Pathology)	4 marks
II Prepare a temporary stained slide of the given material C.Sketch, Label and Identify giving suitable reasons(Preparation – 1marks, Identification with diagram-1 mark & reason-1 mark)	3 marks
III. Write critical notes on D and E (From Histology/ anatomy/ anomalous secondary growth)	3 marks
IV Identify the microslides- F , G , H with labeled sketches, giving suitable reasons. (From Histology/ anatomy/ anomalous secondary growth)	6 marks
V .Comment on I & J (Evolution)	4 marks

FOURTH SEMESTER BOTANY PAPER – IV REPRODUCTIVE BIOLOGY OF ANGIOSPERMS, ECOLOGY, MORPHOLOGY OF ANGIOSPERMS Class duration – 03 hours/week 48hrs Credit-03 Marks: Theory - 50 + Internal Assessment -20= 70

Course objectives:

- To discuss embryology of angiosperms is included along with the scope and its applications to enable the students to understand the kind of research involved in this branch.
- T0 understand ecosystems. Forest ecosystem, its types, deforestation, conservation, forest policy and legislation, agroforestry, social forestry, dendrology have been included along with endangered and endemic species and red data book.
- To understand the basic structures of the various organs and their functions.

СО	After the completion of this course the student will be able to	Cognitive level
CO-01	Understand the developmental process and physiological changes in plant. Able to differentiate reproductive organs at Morphological, Anatomical, Physiological and Biochemical level. This knowledge will help them to apply in production of hybrids.	Apply
CO-02	Learn the concept, types, development and functions of various ecosystems and their communication. This knowledge can help to form strategies for conservation and sustainable management under the given legislative measures.	Understand
CO-03	Explain the habit and habitat of the angiosperm plant body and vegetative characteristics of the plant. Describe the reproductive characteristics of the plant and apply them in classifying plants to respective families.	Evaluate

.UNIT	TOPIC	HOURS
1.1	REPRODUCTIVE BIOLOGY (Embryology) Structure of the flowering shoot, Structure of Anther, T.S. of an anther, Microsporogenesis, Development of male gametophyte, Role of the tapet A brief account of Palynology	15 Hrs
1.2	Placentation and its types, Structure and types of Ovules Megasporogenesis, Development of female Gametophyte (Polygonum type)	

1.3	Pollination Biology: A brief account of the interaction between Pollen and pistil and its importance.	
1.4	Fertilization – a general account, recent understanding about fertilization Angiosperms	
	Endosperm – Types and development – a brief account	
	Embryo - Dicot type with development – Crucifer type	
1.5	Experimental embryology-Apomixis, Polyembryony	
	Scope of Reproductive Biology	
2.1	ECOLOGY Ecological factors, Light temperature precipitation humidity wind	20 Hrs
	Edaphic factors, biotic factors, topographic factors.	
2.2	Ecosystem - Concepts and components of the ecosystem, Classification	
	and Marine water ecosystem.	
2.3	Study of Forest ecosystem and its types, deforestation and conservation of forest,	
	forest policy and legislation. Agroforestry & Social Forestry,	
	Dendrology. Endemism, Endangered plants, Red Data Book.	
2.4	Ecological adaptations Hydrophytes, Xerophytes, Halophytes	
2.7	Parasitic flowering plants, Epiphytes.	
2.5	Plant succession: Definition, general account of the process of plant succession. Eg: Xerosere.	
2.6	Phytogeography- Definition, Vegetational types of Karnataka	
3.0	MORPHOLOGY OF ANGIOSPERMS:	13 Hrs
3.1	Root types and modification.	
3.2	Stem and its Parts- Stem modifications: Rhizome, Tuber, Corm, Bulb, Runner, Stolon, Offset, Sucker, Phylloclade (Opuntia, Euphorbia tirucalli), Cladode(Ruscus, Asparagus)	
3.3	Leaf and its Parts - Phyllotaxy, Simple and Compound leaves (Pinnate and Palmate) Leaf, modifications: Tendril, Spine, Phyllode	
	Pitcher.	
3.4	Inflorescence: Racemose Types, Cymose types and Special types (Cyathium, Thyrsus, Verticillaster, Hypanthodium)	
3.5	Fruits: Classification – Simple (Dry dehiscent, dry indehiscent, Schizocarpic and Fleshy types), Aggregate and Composite types.	
3.6	Structure of seed: Dicot.Structure of Grain: Monocot (Maize / Sorghum	

FOURTH SEMESTER PRACTICAL PAPER- IV REPRODUCTIVE BIOLOGY OF ANGIOSPERMS, ECOLOGY, MORPHOLOGY OF ANGIOSPERMS Practical 20 + IA 10 Marks

Course Objective:

- **1.** To make students aware of structure of reproductive organs of angiosperms and different modifications in them.
- **2.** To expose students to different morphological as well as anatomical modification of Hydrophytes, Xerophytes, Epiphytes, Halophytes and Parasites and their adaptations in their respective environment.
- **3.** To explain principle, experimental setup for Estimation of Dissolved Oxygen and Hardness of water and to certify the quality of water.
- 4. To understand the basic structures of the various organs and their functions.

СО	After the completion of this course the student will be able to	Cognitive level
CO-01	able to recognize and differentiate of Anther, Placentation and different kinds of ovules.	Understand
CO-02	Display Pollen mounting technique and can differentiate different pollens based on their morphology.	Apply
CO-03	Develop skill for embryo and endosperm mounting technique.	Apply
CO-04	Differentiate different modifications adapted by hydrophytic and xerophytic plants to survive in their respective environment.	Analyze
CO-05	Differentiate different modifications adapted by Epiphytic, Halophytic and Parasitic plants.	Understand
CO-06	Estimate Dissolved Oxygen in water and evaluate the quality of water.	Evaluate
CO-07	Estimation of total hardness of the water and evaluate the quality of water	Evaluate
CO-08	Exposed to different types of modification in Angiosperms.	Understand

PRACTICAL -I	Study of Anther (T.S), Placentationand Ovules of different types (L.S).
PRACTICAL-II	Mounting of different pollen grains in Lactophenol (Hibiscus, <i>Catharanthus, Solanum</i> , Honey-sample).
PRACTICAL-III	Mounting of Endosperm (<i>Cucumis</i>) Mounting of Embryo (<i>Crotalaria</i>).

PRACTICAL-IV	Hydrophyte-Morphology of <i>Elodea</i> , <i>Eichornia</i> , <i>Pistia</i> . Anatomy of <i>Elodea</i> Stem Xerophyte: <i>Casuarina</i> , <i>E.tirucali</i> , <i>Opuntia</i> ; Anatomy of <i>Casuarina</i>
PRACTICAL-V	Epiphyte: Vanda, Anatomy of Orchid root Halophyte: Pneumatophore, Vivipary, Anatomy of Pneumatophore Parasite: Cuscuta, Loranthas, Anatomy of Cuscuta on the host.
PRACTICAL-VI	Estimation of Dissolved Oxygen in water.
PRACTICAL-VII	Estimation of total hardness of the water.
PRACTICAL-VIII	Study of modifications of Root, Stem, & Leaf.
PRACTICAL-IX	Study of types of Inflorescences and fruits. Revision and test

SCHEME OF VALUATION OF BOTANY PRACTICAL EXAMINATION PAPER- IV MODEL QUESTION PAPER

REPRODUCTIVE BIOLOGY OF ANGIOSPERMS, ECOLOGY, MORPHOLOGY OF ANGIOSPERMS

Time – 3 Hours	Max marks- 20
I Estimate total hardness//oxygen in the given sample of water A (Principle-1, procedure- 2 mks, calculation and result- 2 mks)	5 marks
II Write Ecological features of B&C (From Hydrophytes, Xerophytes, Epiphytes, Halophytes, Parasitic flowering plants)	4marks
III Identify the slides D and E (Select one from Ecological Anatomy and one from Embryology)	4 marks
IV Prepare a temporary stained mount of F (Select from Pollen grains/ embryo / endosperm)	3 marks
V Comment on the morphology of G &H (From the root, stem, leaf, and one from Inflorescence, fruits)	4 marks

FIFTH SEMESTER BOTANY PAPER –V TITLE: TAXONOMY OF ANGIOSPERMS AND PLANT BREEDING Class duration-3 Hrs/wk = 48Hrs Credit-03 Marks: Theory - 70 + Internal Assessment-30

Course Objective:

- To enable the student to know the basic principles involved in the identification, naming and classification of plants.
- To introduce APG III system along with the other systems of classification.
- To enable the student to know the relationship of taxonomy with other branches of biology.
- give an insight into the diversity in nature.
- To give an insight into the diversity ...
- To understand plant breeding techniques and importance in crop improvement and hybridization.

СО	After the completion of this course the student will be able to	Cognitive level
CO-01	develop understanding about the diversity, and classification of Plants.	Analyze
CO-02	understand about modern approaches in taxonomic studies. Enlightenthem about the role of taxonomy in conservation of biodiversity.	Understand
CO-03	Develop the skills in naming the plants.	Apply
CO-04	Understand the concepts of plant breeding involving the principles, selection procedure and achievements in plant breeding.	Remember
CO-05	To enable the students to implement their knowledge on plant breeding techniques in their agriculture fields for the improvement of crops	Evaluate

UNIT	TOPIC	HOURS
1.1	TAXONOMY 1. Technical description of Angiosperm Plants, Floral	17 Hrs
	diagram, Floral formula	
1.2	Systems of classification, Broad outline of Bentham and Hooker.	
	Engler and Prantl and Cronquist's systems, ofClassifications, a	
	brief account of APG III (Angiosperm Phylogeny Group).	
1.3	Plant Nomenclature- Binomial system, ICN(ICBN) Principles and	
	aims	
	Recent trends- Chemotaxonomy, Cytotaxonomy.	

1.4	Field and Herbarium Techniques, Herbaria, Botanical gardens, Floras	
	and their importance, Botanical Survey of India and its functions	
2.1	Study of following Families according to Bentham and Hooker's	23 Hrs
	system of Classification and their economic importance	
	DICOTS: Magnoliaceae, Brassicaceae.Malvaceae, .Rutaceae,	
	Fabaceae, Cucurbitaceae, Apiaceae, Asteraceae, Asclepiadaceae,	
	Solanaceae, Apocynaceae, Verbenaceae, Lamiaceae,	
	Amaranthaceae, Euphorbiaceae.	
	MONOCOTS: 1. Orchidaceae 2. Musaceae 3 Liliaceae 4. Arecaceae,	
	5. Poaceae.	
3.1	PLANT BREEDING: A brief history, Aims and objectives of plant	8 Hrs
	breeding	
3.2	Techniques in plant breeding, Types of hybridization (intergeneric	
	and interspecific), Hybrid vigour and Hybrid	
	Seed production. Germplasm maintenance, pollen banks, and	
	quarantine	
	Measures.	
33	Plant breeding work done in India: - paddy and cotton	
5.5	i fant breeding work done in india paddy and couoli	

FIFTH SEMESTER PRACTICAL PAPER – V TAXONOMY OF ANGIOSPERMS& PLANT BREEDING Practical 35 + IA 15 Marks

Course Objective:

- To describe the Plant in technical terms
- Identify and classify the plants to their respective families
- Learn the skills in preparing the Herbarium
- Hands on experience on Hybridization techniques
- Visit to biodiversity rich places to study the flora

СО	After completion of this course students will be able to	Cognitive level
CO-01	understand about Plant taxonomy and their systematic classification systems	Create
CO-02	Comprehend the concepts of plant taxonomy and classification of Angiosperms.	Understand
CO-03	Appreciate the role of taxonomy in conservation of biodiversity	Evaluate
CO-04	learn the fundamental aspects of plant breeding	Remember
CO-05	Develop the skills in various processes of crop improvement program and techniques in their agriculture fields.	Apply

CO-06	Apply the gained knowledge of concepts of plant breeding	Apply
	involving the principles, selection procedure and achievements in	
	plant breeding.	

PRACTICAL-I	Technical description of the plants and construction of floral diagrams with floral formula
PRACTICAL-II	Study of the plants belonging to the Families prescribed in the theory
	One or Two plant – representatives per Family.
	Magnoliaceae, Brassicaceae, Malvaceae
PRACTICAL-III	Rutaceae, Fabaceae
PRACTICAL-IV	Cucurbitaceae, Apiaceae, Asteraceae
PRACTICAL-V	Asclepiadaceae, Solanaceae, Apocynaceae
PRACTICAL-VI	Verbenaceae, Lamiaceae
PRACTICAL-VII	Amaranthaceae, Euphorbiaceae
PRACTICAL-VIII	Orchidaceae, Musaceae
PRACTICAL- IX	Poaceae, Arecaceae, Liliaceae
PRACTICAL-X	Preparation of Five Herbarium sheets and submitting the same to the
	examination(Mostly of weed plants)
PRACTICAL-XI	Hybridization techniques- Emasculation and bagging

As a part of the curriculum, a Botanical trip/ tour of about two to three days shall be undertaken, to study the different types of vegetation / herbal garden / AyurvedicCollege during the semester and Tour Report to be submitted for valuation for the coming 5th Semester Practical Examination.

SCHEME OF VALUATION OF BOTANY PRACTICAL EXAMINATION V SEMESTER PAPER- V MODEL QUESTION PAPER

TAXONOMY OF ANGIOSPERMS AND PLANT BREEDING Time – 3 Hours Max marks 35

I. Assign the plants A , B and C to their respective families, giving reasons with labelled diagrams	(3 x 5) = 15 marks
(one from Monochlamydeae / Monocots, one from polypetalae and	one from
Gamopetalae)	
Family name-	1 mark,
Classification –	1 mark
Characters with important diagrams- 1mark	
II Describe plant D , in technical terms,	5 marks
III Draw the floral diagram with a floral formula of E marks Floral diagram = (4 marks), floral formula-(1 mark)	5
IV Perform emasculation and bagging on the given material F.	4 marks
V. Write critical notes on G, H and I (Photographs and charts related to plant breeding).	6 marks

FIFTH SEMESTER BOTANY PAPER –VI TITLE: CELL BIOLOGY AND MOLECULAR BIOLOGY Class duration-3 Hrs/wk = 48Hrs Credit-03 Marks:Theory - 70 + Internal Assessment-30

Course Objective:

- to make the learner understand the organization of the different types of cells and the functions of Organelles.
- To discuss the nucleic acids-DNA and RNA, their structure, chemistry and replication.
- Gene concept, Genetic code, and protein synthesis are dealt with in detail.
- Gene regulation and transposable elements in Prokaryotes and Eukaryotes are added on to give a better insight about Genetics and heredity.

СО	After completion of this course students will be able to	Cognitive level
CO-01	Describe the general principles of gene organization and expression in both prokaryotic and eukaryotic organisms.	Remember
CO-02	Explains macromolecular components of cell and their functions.	Understand
CO-03	Differentiate between DNA and RNA structure and their functions	Analyze
CO-04	Compare the mechanism of replication in Prokaryotes and Eukaryotes	Evaluate
CO-05	Illustrate various levels of gene regulation and protein function including signal transduction and cell control	Apply

UNIT	TOPIC	HOURS
1.1	CELL BIOLOGY Principles and uses of Light, Phase-contrast, Fluorescent and Electron Microscopes	9 Hrs
1.2	Ultrastructure of Prokaryotic and Eukaryotic cells. Nucleus, Chromosome-Structure and number, Karyotype and Idiogram, Nucleosome concept.	
2.1	Cell cycle – Mitosis, Meiosis and their significance	12 Hrs
2.2	Numerical variation in chromosomes, Euploidy and Aneuploidy (Detailed account)	
2.3	Structural changes in Chromosomes: Deletion, duplication, Inversion and Translocation.	
3.1	MOLECULAR BIOLOGY Nucleic acids as genetic material-Avery et.al's experiment, Fraenkel Conrat's experiment	12 Hrs
3.2	DNA – Chemistry, structure, types and function	

3.3	RNA - Chemistry, structure, types and function	
3.4	DNA-replication - mechanism of replication in Prokaryotes and Eukaryotes	15 Hrs
	Gene Concept- Gene structure, action, One gene-one polypeptide concept	
4.1	The central dogma of Molecular Biology, Genetic code, Protein Synthesis-	
	Transcription, RNA splicing and Translation,	
4.2	Gene regulation in prokaryotes (Operon concept) and Eukaryotes, Transposable	
	elements in prokaryotes and eukaryotes- Barbara Mc Clintok experiment.	

FIFTH SEMESTER PRACTICAL PAPER – VI

CELL BIOLOGY AND MOLECULAR BIOLOGY Practical 35 + IA 15Marks One Practical of 2 Hours / Week

Course Objective:

- To learn about the basics of cell and its inclusions
- To acquire the skills in practically performing Mitosis and Meiosis experiments
- To learn about Micrometry and caluculation of results.

Course Learning Outcome:

СО	After completion of this course students will be able to	Cognitive
CO-01	Prepare fixative and stains	Remember
CLO-0	Gain the skills in preparing the slides for studying mitosis and meiosis	Apply
CO-03	Critically evaluate the results got from micrometry	Evaluate
CO-04	Learn Karyotype and know the different shapes of Chromosome	Understand

PRACTICAL-I	Preparation of Fixatives and Stains
PRACTICAL-II	Study of Mitosis-Onion root tip
PRACTICAL-III	Study of Meiosis- Onion Flower Buds
PRACTICAL-IV	Micrometry
PRACTICAL-V	Karyotype Study
PRACTICAL-VI	Isolation of DNA from Coconut endosperm
PRACTICAL-VII	Photographs and Charts related to Molecular biology
PRACTICAL-VIII	Photographs and charts from Cell Biology.
PRACTICAL-IX	Revision and test.

SCHEME OF VALUATION OF BOTANY PRACTICAL EXAMINATION V SEMESTER PAPER- VI MODEL QUESTION PAPER Based on Theory Paper VI) CELL BIOLOGY AND MOLECULAR BIOLOGY e = 3 Hours Max marks

Time – 3 Hours

Max marks 35

 I. Make temporary squash preparation of the r stage with reasons. marks Leave the preparation for evaluation 	naterial A mitosis. Identify, sketch and label the
Preparation	3 marks
Procedure	J marks
Identification	1 mark
L abeled sketch	1 mark
Reasons	1 marks
Reasons	1 marks
II. Make temporary squash preparation of the	material B meiosis. Identify, sketch and label
the stage with reasons.	7marks
Leave the preparation for evaluation.	
Preparation	3 marks
Procedure	1 marks
Identification	1 mark
Labeled sketch	1 mark
Reasons	1 marks
III. Identify the given stages C and D	4 marks
(one from Meiosis I and one from Meiosis II perma Identification -1 mark, Labeled diagram and reason	anent slides) n-1 mark
IV. Comment on E	2marks
(Fixative or stains)	
Procedure for Preparation	1 mark
Uses	1 mark
V. Micromotry F	
a) Calibrate one Ocular micrometer using the s	tage micrometer and write
a) Canorate one ocurar interonieter using the s	tage interofficier and write
b) Measure the length given material	6 marks
b) Measure the length given material	0 marks
V1. Critically comment on Karyotype of G	3 marks
VI1. Comment on H , I , J	6 marks
One from Molecular biology and one from Evolu	tion photographs and microscopes
DNA Replication	
1. Lac Operon	
2. Dr. H. G. Khorana	
3. Barbara Mc Clintok	
4. Sickle cell anaemia	

5. Microscopes.

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SIXTH SEMESTER BOTANY PAPER –VII TITLE: BIOMOLECULES AND PLANT PHYSIOLOGY Class duration-3 Hrs/wk = 48Hrs Credit-03 Marks:Theory - 70 + Internal Assessment-30

Course Objective:

- To understand the structure of Biomolecules
- To get the knowledge about biomolecules that is carbohydrates, proteins and lipids .
- To explain the relationship between plants and water, their absorption, long-distance, shortdistance transport, transpiration and an account on mineral nutrition.
- To understand effectively the concepts of morphogenesis and their importance on plant propagation.
- The functional aspects of the cell photosynthesis, respiration and nitrogen metabolism are dealt with in this paper.
- To know about biological techniques like Spectrophotometer, Chromatography and Electrophoresis.

СО	After completion of this course students will be able to	Cognitive level
CO-01	Explain the structure and types of carbohydrate, proteins and	Understand
	lipids.	
CO-02	Gain the knowledge of various aspects of plant internal	Remember
	activities and the mechanism of transport system	
CO-03	Develop the skills in testing the effect of plant growth	Evaluate
	hormones in the growth and development of plants	
CO-04	To learn the various process of photosynthesis and respiration	Analyse
	mechanism	
CO-05	Developskills to conduct different molecular biological	Apply
	techniques like Spectrophotometer, Chromatography and	
	Electrophoresis students will learn how to estimate the amount	
	of macromolecule like DNA, RNA and Proteins	

UNIT	TOPIC	HOURS	
1.1	A brief account of Biomolecules- carbohydrates, proteins, lipids.		
1.2	Plant and Water Relations-Diffusion, Imbibition, Osmosis,		
	Plasmolysis. The cell as an Osmotic system, Concept of water		
	Potential		
1.3	Short Distance Transport – Active and Passive absorption of water,		
	Absorption of minerals- Donnan's Equilibrium, Carrier Concept.		
1.4	Long Distance Transport – Ascent of Sap, Root Pressure Theory,		
	TCT, Theory, Phloem Transport- Munch Hypothesis		
1.5	Transpiration – Definition, Types, Mechanism of Stomatal		
	Transpiration-Starch-Sugar Inter Conversion Hypothesis, Action of		
	potassium ion transport, Anti transpirants, Guttation.		
	A brief account of mineral nutrition, Role of P, Mg, K, Mn, Bo, Cu.		
	Hydroponics.		
2.1	Growth – Definition, Phases of growth, Sigmoid curve	9 Hrs	
	Growth Hormones - Chemical nature, biosynthesis and application		

	of Auxin, Gibberellin, Cytokinin, ethylene and ABA		
2.2	Growth and Movements – Tropisms- Phototropism, Thigmotropism,		
	Geotropism and Hydrotropism		
3.1	Enzymes – Classification, properties and mode of action	17 Hrs	
3.2	Photosynthesis –Introduction, significance, photosynthetic apparatus,		
	mechanism-light and dark reactions – C3, C4 and C2 pathways.		
3.3	Respiration - Introduction , significance, types Aerobic –		
	mechanism, Glycolysis, Kreb's cycle, Terminal Oxidation, ATP		
	Synthesis, Chemiosmotic theory.		
	Anaerobic respiration – alcoholic and lactic acid fermentation		
4.1	Nitrogen metabolism – nitrogen fixation, mechanism- biological	4Hrs	
	nitrogen fixation, Nitrate reduction. Amino acids and their		
	synthesis.		
5.1	Photoperiodism and Vernalisation	5 Hrs	
5.2	Instrumentation- spectrophotometer, Chromatography,		
	Electrophoresis		
	Types and techniques.		

SIXTH SEMESTER PRACTICAL PAPER- VII BIOMOLECULES AND PLANT PHYSIOLOGY Practical 35 + IA 15 Marks One Practical of 2 Hours/Week

Course Objective:

- To understand the basic concepts of Mendelian genetics, its variations and applications
- To acquire knowledge about the nature and function of genes and processes of inheritance as they influence the characteristics of populations and species.
- To carry out basic tissue culture experiments

СО	After completion of this course students will be able to	Cognitive level
CO-01	Understanding and solving the genetic problems	Apply
CO-02	Learn the equipments used in Tissue culture lab	Understand
CO-03	Apply the technique and perform synthetic seeds experiment	Create
CO-04	Develop the skill to prepare media required for tissue culture	Apply

PRACTICAL-I	Effect of temperature on cell permeability	
	Experiment on the relationship between transpiration and absorption.	
PRACTICAL-II	Ganong photometer experiment	
	Separation of chloroplast pigment by paper chromatography.	
PRACTICAL-III	Effect of different wavelengths of light during photosynthesis by the	
	bubble count method.	
PRACTICAL-IV	Determination on Hill reaction.	
	Experiment to demonstrate the activity of enzyme catalase on	

PRACTICAL-V	Suction force due to Transpiration.		
	Comparison on the rate of respiration in flower buds and leaves using		
	the Ganong respirometer.		
PRACTICAL-VI	Determination of root pressure.		
	Experiment to demonstrate fermentation (Kuhne's vessel).		
PRACTICAL-VII	Effect of gibberlin on internode elongation.		
	Measurement of growth by using Auxanometer.		
PRACTICAL-	Experiment to demonstrate Geotropism, Phototropism and		
VIII	Hydrotropism		
PRACTICAL-IX	Determination of rate of transpiration by using cobalt chloride paper		
PRACTICAL-X	Biochemical tests for carbohydrates, fats and proteins		
PRACTICAL-XI	Study of instruments spectrophotometer, Chromatography,		
	Electrophoresis, pH meter types and technique		
PRACTICAL-XII	Effect of mineral nutrition and hormones on plant growth:		
	Charts and photographs and specimens- Nitrogen, Potassium,		
	Phosphorous Iron, Zinc, Manganese, Hydroponics, Bolting, Ethylene,		
PRACTICAL-	Estimation of pollen viability (staining method) and pollen		
XIII	germination – (hanging drop method).		

SCHEME OF VALUATION OF BOTANY PRACTICAL EXAMINATION VI SEMESTER PAPER- VII MODEL QUESTION PAPER BIOMOLECULES AND PLANT PHYSIOLOGY

Time –	3	Hours
I IIII C	~	IIVUIS

Max marks 35

1.	Conduct the major experiment 'A'. Write the procedure, record the result, write the inference and leave the set (Requirement 2, Setting 4, Procedure 2, Result 2 marks)	10 Marks up for evaluation.
2.	Comment on minor experiment B , C ,	6 Marks
3.	Write critical notes on D (any one instrument) (Identification 1 mark, critical notes 4 marks)	4 Marks
4.	Comment on the physiological importance of E and F (Charts and specimens related to Nutrients and hormones)	6 Marks
5.	Perform the Micro Chemical test of G . Write the procedure by elimination Method (Result 2 marks, Procedure 4 marks)	6 Marks.
6.	Estimation of H pollen viability (staining method) and pollen germination (Hanging drop method).	3 Marks

SIXTH SEMESTER BOTANY PAPER –VIII TITLE: GENETICS, GENETIC ENGINEERING AND PLANT BIOTECHNOLOGY Class duration-3 Hrs/wk = 48Hrs Credit-03 Marks: Theory - 70 + Internal Assessment-30

Course Objectives:

- To discuss the principles of genetics and heredity and its importance in variation and speciation.
- Toenable the students to understand new concepts and technologies used in cloning, construction of gene libraries' etc.
- To make them aware the applications of biotechnologh in industries and agriculture . Tissue culture technique and transgenic plants have dealt in detail.
- An industrial visit is made compulsory to expose the learners to know the technical aspects of biotechnology.
- A dissertation for 50 marks has to be submitted by the students by the end of the semester it is to orient the students towards the research.

СО	After completion of this course students will be able to	Cognitive level
CO-01	Explains the fundamental information about the basic Genetic concepts, laws of inheritance and impact on genetic variation.	Understand
CO-02	Gains the knowledge of genetic engineering process and the skills employed in using different vectors.	Create
CO-03	To interpret the outcome of experiments that involves the use of recombinant DNA technology and other common gene analysis techniques.	Analyse
CO-04	To create an experimental setup in the techniques of plant tissue culture.	Evaluate
CO-05	Develop the skills in Plant biotechnology like aseptic handling of plant materials, culture of callus, protoplasts etc	Apply

UNIT	TOPIC	HOURS
1.1	GENETICS	13 Hrs
1.2	Introduction – Mendel's laws of inheritance, Test cross, Back cross, Incomplete dominance.	
1.3	Interaction of Genes – Complementary gene action – flower colour in sweet pea	
	Supplementary Interaction – Snapdragon.	
1.4	Epistasis – fruit colour in summer squashes Multiple factor inheritance – Kernalcolour in Wheat. Linkage and crossing over – linkage in maize mapping by 2 point test cross. Cytoplasmic inheritance – Plastid inheritance in <i>Mirabilis</i> – / Cytoplasmic	
1.5	Mutation – spontaneous and induced, Transposable, genetic elements.	
2.1	GENETIC ENGINEERING - A concise account of	15Hrs

	methods used in DNA- Technology. Detail study of	
	Enzymes- Restriction enzymes, Ligases, and their action	
2.2	Cloning vectors, (Plasmids- PBR322, Ti plasmid, PUC 18,	
	YAC, Lamda phage, Cosmid).	
	Construction of Recombinant DNA and c-DNA libraries.	
2.3	A brief account of Genomics and its applications.	
	A brief account of hazards and safeguards in Recombinant	
	Technology.	
3.1	PLANT BIOTECHNOLOGY	20 Hrs
	Introduction – Scope of Biotechnology	
3.2	Tissue culture – Techniques, differentiation and differentiation	
	totipotency, Organogenesis, Somatic hybridization, Somatic	
	embryos and synthetic seeds.	
	Another culture – haploid production and its	
	significance.	
3.3	Gene transfer methods – Agrobacterium-mediated gene	
	transfer, Electroporation and shotgun method.	
	Applications of Biotechnology - Transgenic plants in crop	
	improvement.	
	(Abiotic and biotic stress).	
3.4	Fermentation biotechnology-Industrial importance of	
	microorganisms, bioreactors, and media for fermentation,	
	types of fermentation, fermentation process, purification of	
	fermented products, downstream processing.	
	Industrial production of alcohol, antibiotic Penicillin,	
	single-cell protein, enzyme, and cheese.	

SIXTH SEMESTER PRACTICAL PAPER- VIII GENETICS, GENETIC ENGINEERING, AND PLANT BIOTECHNOLOGY Practical 35 + IA 15 Marks

Course Objectives:

- To understand the basic concepts of Mendelian genetics, its variations and applications
- To acquire knowledge about the nature and function of genes and processes of inheritance as they influence the characteristics of populations and species.
- To carry out basic tissue culture experiments.

СО	After completion of this course students will be able to	Cognitive level
CO-01	Understanding and solving the genetic problems	Apply
CO-02	Learn the equipments used in Tissue culture lab	Understand
CO-03	Apply the technique and perform synthetic seeds experiment	Create
CO-04	Develop the skill to prepare media required for tissue culture	Apply

One Practical of 02 Hours/Week

PRACTICAL-I	Solving the genetic problems related to the theory portion. (Monohybrid / Dihybrid crosses/Interaction of genes).		
PRACTICAL-II	Tissue culture Equipment's- Autoclave, laminar airflow.		
PRACTICAL-III	Tissue culture techniques- Media preparation, explant preparation, inoculation.		
PRACTICAL-IV	Identification of photos and charts- callus, multiple shoots. PBR-322, Ti plasmid.		
PRACTICAL-V	Genomic library, gene cloning, c-DNA.		
PRACTICAL-VI	Preparation of Synthetic seeds.		
PRACTICAL-VII	Study of biotechnology products- Antibiotic, Rhizobium, and Single Cell Protein.		
PRACTICAL-VIII	Isolation of Rhizobium from root nodules of legumes		
PRACTICAL-IX	Demonstration of Fermentation in Grapes.		
PRACTICAL-X	Visit to Industry.		

PROBLEMS ON MONOHYBRID CROSS:-

- 1. In Tomatoes Red fruit colour (R) is dominant over yellow (r) A pure Red fruited plant is crossed to a yellow fruited one, What will be the appearance of F_1 ? The F_1 is interbred and produces 320 offsprings in the F_2 . How many of them will be red and how many yellow? What will be the genotypes of F_2 and in what numbers?
- 2. In man, brown eye (B) is dominant over the blue eye (b) A man and his wife both brown-eyed, beget A blue-eyed child. What are the genotypes of the parents?
- 3. In pea plant, Tallness (T) is dominant over dwarfness (t) A tall pea crossed with dwarf produces offering of which 50% are tall and 50% are dwarf. What are the genotypes of the parents?
- 4. In Drosophila, grey (G) is dominant to black (g). Two grey bodied flies when crossed produce 150 grey and 49 black. Give the genotypes of the parents and genotypes of

PROBLEMS ON DI-HYBRID RATIO

- 1. I garden pea, yellow seed colour (Y) is dominant over green (y) and round seed shape (R) is dominant over wrinkled (r). The character par segregates separately. A pure yellow wrinkled variety is crossed to a pure green round. Give the phenotypes and genotypes of F_1 and phenotypic ratio of the F_2 generation.
- 2. A Man has brown eyes and red hair. He married a woman with blue eyes and dark hair. Give the genotype of the parents and children.

Note: Dark hair (D) is dominant over red (d) and brown eyes (B) is dominant over blue (b)

3. In garden pea, tall (T) is dominant over dwarf (t) and red flower colour (R) is dominant over white (r). An all-red plant is crossed to a dwarf white plant. Give the genotypes of P₁ and F₁ generations.

Give the phenotypic ratio of F₂.

4. A tall red, when crossed with dwarf red, produces a dwarf white. Give the genotypes of the parents.

PROBLEMS OF INTERACTION OF FACTORS:

In maize, the aleurone colour (seed colour) is expressed due to the effect between two different gene pairs. A maize variety with purple-coloured corn (AACC) is crossed to colourless corn (aacc). Give the phenotypes and genotypes of F_1 and F_2 generations. What will be the phenotypic ratio in the F_2 generation?

Two white-flowered strains of the sweet pea (*Lathyrus odoratus*) were crossed, producing an F1 with only purple flowers. Random crossing among the F1 produced 96 progeny plants, 53 exhibiting purple flowers and 43 with white flowers.

- a) What phenotypic ratio is approximated by the F2?
- b) What type of interaction is involved?
- c) What was the probable genotype of the parental strains?

PROBLEMS ON 2 POINT TEST CROSSES.

1. In tomato, red fruit (R) is dominant over yellow fruit (r) and yellow flowers (Wf) are dominant over white flowers (wf). A cross is made between true-breeding plants with red fruit and yellow flowers and plants with yellow fruit and white flowers. The F1 generation plants are then test crossed to plants with yellow fruits and white flowers. The following results are obtained. 333 red fruits / yellow flowers

64 red fruits / white flowers58 yellow fruits/ yellow flowers350 yellow fruits/ white flowersCalculate the map distance between the two genes.

2. Two different traits affecting pod characteristics in garden pea plants are enclosed by genes found on chromosome 5. A narrow pod is recessive to a normal pod, yellow pod recessive to a green pod. A true-breeding plant with narrow, green pods was crossed to a true-breeding plant with normal yellow pods. The F1 was then test crossed to plants with narrow, yellow pods. The following results were obtained.

144 narrow green pods

150 narrow yellow pods

11 Normal yellow pods

9 Normal green pods

How far apart are these two genes?

SCHEME OF VALUATION OF BOTANY PRACTICAL EXAMINATION VI SEMESTER PAPER- VIII MODEL QUESTION PAPER

GENETICS, GENETIC ENGINEERING, AND PLANT BIOTECHNOLOGY Time – 3 Hours Max marks 35

1.	Solve the Genetic Problems A , B & C One from monohybrid cross, dihybrid interaction of genes and Linkage of crossing over.	3 x 4=12 marks
2.	Perform the Biotechnology Experiments D (Requirements 2 marks, Procedure 2 marks, Preparation 3 marks) (Media preparation/ Explant preparation/ Inoculation)	7 marks
3.	Prepare the synthetic seeds E and write the Procedure (Preparation 2 marks, Procedure 2 marks)	4 marks
4.	Comment on F , & G	3 x 2 =6 marks
5.	(Genetic engineering -Photographs and charts) Write critical notes on H & I (Biotechnology products)	3x2=6 marks

THEORY QUESTION PAPER PATTERN FOR SEMESTER I-IV

	BLUEPRIN	T OF QUESTION PAPER		
Semes	ter:	Subject: BOTANY		
Title:			QP Code:	
Time:	3 Hours		Max Marks	: 60
Instruct	ions to the Candidates: Draw ne	eat labelled diagram wherev	er necessary	
		PART A		
Ι	Define any FIVE of the following	ng:	5x.	2=10
1.				
2.				
3.				
4.				
5.				
6. 7				
<i>,</i> .		PART-B		
II	Write short notes on any THREE	E of the following:	3x4	4=12
8.				
9.				
10.				
11.				
		PART- C		
III	Give a detailed account of any T	HREE of the following:	3x(6=18
12.				
13.				
14.				
15.				
		PART-D		
IV	Write an essay on any TWO of t	he following:	2x1	0=20
16.				
17. 18				
10.				

THEORY QUESTION PAPER PATTERN FOR SEMESTER V &VI BLUEPRINT OF QUESTION PAPER

Title: QP Code: Time: 3 Hours Max Marks: 70 Instructions to the Candidates: Draw neat labelled diagram wherever necessary Max Marks: 70 Instructions to the Candidates: Draw neat labelled diagram wherever necessary PART A I Define any FIVE of the following: 5x2=10 1 Define any FIVE of the following: 5x2=10 2. 3. 4. 5. 6. 7. 6. 7. 7. 7. 8. 9. 9. 10. 11. 12. PART-C 13. 14. 15. <t< th=""><th>Semest</th><th>er: VI</th><th>Subject: BOTANY</th><th></th></t<>	Semest	er: VI	Subject: BOTANY	
Time: 3 Hours Max Marks: 70 Instructions to the Candidates: Draw neat labelled diagram wherever necessary PART A 1 Define any FIVE of the following: 5x2=10 1.	Title:			QP Code:
Nature to the Candidates: Draw neat labelled diagram wherever necessary PART A I Define any FIVE of the following: 5x2=10 1.	Time:	3 Hours		Max Marks: 70
PART A I Define any FIVE of the following: 5x2=10 1.	Instruct	ions to the Candidates: Draw ne	at lahelled diagram wherever	• nocossary
I Define any FIVE of the following: 5x2=10 1.	mstruct	ions to the Canuldates. Draw he	PART A	The cost of y
1 Define any FIVE of the following: 3.22-10 1.	T	Define any FIVE of the followit		5x2-10
1.	1		12.	542-10
2.	1.			
4.	3.			
5.	4.			
6.	5.			
PART-B II Write short notes on any FOUR of the following: 4x4=16 8.	6.			
PART-B II Write short notes on any FOUR of the following: 4x4=16 8.	7.			
II Write short notes on any FOUR of the following: 4x4=16 8.			PART-B	
8.	II	Write short notes on any FOUR	of the following:	4x4=16
9.	8.			
10. 11. 11. 11. 12. PART- C III Give a detailed account on any FOUR of the following: 4x6=24 13. 14. 14. 15. 16. 11. 17. PART-D IV Write an essay on any TWO of the following: 2x10=20	9.			
11. 11. 12. PART- C III Give a detailed account on any FOUR of the following: 4x6=24 13. 14. 14. 15. 16. 11. 17. 11. 1	10.			
12. PART- C III Give a detailed account on any FOUR of the following: 4x6=24 13. 14. 14. 15. 16. 16. 17. PART-D IV Write an essay on any TWO of the following: 2x10=20	11.			
PART- C III Give a detailed account on any FOUR of the following: 4x6=24 13. 13. 14. 14. 14. 14. 15. 16. 14. 17. 14. 14. 17.	12.			
III Give a detailed account on any FOUR of the following: 4x6=24 13.			PART- C	
13. 13. 14. 14. 15. 16. 16. 17. PART-D IV Write an essay on any TWO of the following: 2x10=20	III	Give a detailed account on any F	OUR of the following:	4x6=24
14. 14. 15. 15. 16. 16. 17. 17. PART-D IV Write an essay on any TWO of the following: 2x10=20	13.			
15. 16. 16. 17. 17. 17. PART-D IV Write an essay on any TWO of the following: 2x10=20	14.			
16. 17. 17. PART-D IV Write an essay on any TWO of the following: 2x10=20	15.			
I7. PART-D IV Write an essay on any TWO of the following: 2x10=20	16.			
PART-DIVWrite an essay on any TWO of the following:2x10=20	17.			
IV Write an essay on any TWO of the following: 2x10=20		Р	ART-D	
	IV	Write an essay on any TWO of t	he following:	2x10=20
18.	18.			
<u>19.</u>	19.			

Discipline specific elective (DSE) Title: Basics of Floriculture MARKS ALLOTED: THEORY 30 marks, Practical: 20 marks 2 hours per week, Theory-32hours, 2 credits

Course Objectives:

- To create self-employment
- To encourage proper land-use practices
- To improve the natural habitat.
- To explore export opportunities

Course Learning Outcome:

CO	After completion of this course students will be able to	Cognitive level
CO-01	Create the aesthetic sense in students	Apply
CO-02	Learn the techniques used in flower production	Understand
CO-03	Develop the skill to become self-employed	Create

Course Content:

1.1	Definition, history of gardening, importance, the scope of floriculture, landscape gardening, present status in India.	2hrs
2.1	Nursery Management and routine garden operations: Sexual and vegetative	8hrs
	methods of propagation, soil sterilization, seed sowing, pricking, planting and	
	transplanting, shading, pinching, defoliation, wintering, mulching, topiary.	
2.2	Role of plant growth regulators.	
3.1	Ornamental plants: Flowering annuals, herbaceous perennials, divine vines,	8hrs
	shade and ornamental trees, ornamental bulbous and foliage plants, cacti and	
	succulents.	
	Cultivation of plants in pots, Indoor gardening, Bonsai.	
3.2	Principles of garden design: English, French, Persian, Italian, Mughal and	7hrs
	Japanese gardens. Features of a garden, Water garden, Famous gardens in India.	
	Landscaping	
4.1	Commercial floriculture: Types, factors affecting flower production, packing	7hrs
	cut flowers, flower arrangement, methods to prolong vase life.	
4.2	Cultivation of important cut flowers (Orchids, Carnations, Chrysanthemum,	
	Gladiolus, Rose), loose flowers.	
	Disease and pests of flowering plants.	
I		1

EXPECTED OUTCOME

- Improve aesthetic sense in students.
- Learn the techniques used in flower production
- To encourage self- employment.

Discipline specific elective (DSE) TITLE: ETHNOBOTANY AND ECONOMIC BOTANY- AN OVERVIEW MARKS : THEORY 30 marks+20 IA

2 hours per week, Theory-32hours

Course Objectives:

- To introduce indigenous knowledge of plants in the younger generation
- For better utilization and conservation of plant genetic resources.
- To create awareness about local medicinal plants.
- Special reference is made to some economically important plants to provide the student with an opportunity to understand the natural resources of India.

Course Learning Outcome:

CO	After completion of this course students will be able to	Cognitive level
CO-01	Better understanding of tribes of India	Understand
CO-02	Evaluate the importance of alternate medicines for better health	Apply
CO-03	Learn to conserve and propagate the medicinal plants.	Create

	Introduction, history, scope and significance of ethnobotany.	6Hrs
	Use of plants in folk medicine by tribes of India- Influence of plants on human	
1.1	culture, Important tribal communities in India, Plants utilized by different tribes,	
	Sacred grooves and its importance.	
1.2	MODERN ETHNOBOTANY- Skills required to practice ethnobotany,	8Hrs
	ethnomedicine, plants in religion and ritual, archaeoethnobotany, the role of	
	ethnobotany in pharmaceutical prospect.	
1.3	Narcotic plants- Opium, Tobacco, Cannabis	
2.1	ECONOMIC BOTANY- Introduction, origin, distribution. The botanical name,	12 Hrs
	family, part used and uses of following groups of plants.	
	Food plants- cereals and millets Rice, Wheat, Maize, Potato, Ragi.	
	Pulses: Pigeon Pea, Bengal gram, Black gram, Green gram.	
	Fibres: Classification, Extraction and processing of Cotton, Jute, Coir.	
	Oil and Fat: Classification and extraction methods of Groundnut, Coconut,	
	Sunflower. Important essential oil yielding plants- Eucalyptus, sandalwood,	
	lemongrass, Jasmine.	
	Firewood, Timber and Bamboos: Properties of Wood- Rosewood, Teak, Honne	
	and Acacia	
	Spices: Importance of Spices- Cardamom, Clove, Cinnamon, Pepper.	
	Beverages: Types and Processing of Coffee, Tea and Cocco.,	
3.1	Medicinal plants: Scope and importance of medicinal plants.	6Hrs
	Classification of drugs based on source-	
	Rauwolfia serpentina, Vinca rosea, Adathoda vasica, Centella Asiatica.	
Expected Autcome.		

pected Outcome:

- Better understanding of the culture of the tribes of India
- Importance of alternate medicines for better health
- Conservation and plant propagation of Medicinal plants

Discipline specific elective (DSE) TITLE: PLANT PROPAGATION AND BASIC NURSERY METHODS MARKS: THEORY 30 marks, IA-20 marks 2hours per week, Theory-32 hours

Course Objectives:

- To orient students to understand effectively the concepts of morphogenesis and their importance in plant propagation.
- Encourage students to take up home gardening.
- To improve aesthetic sense.

Course Learning Outcome:

CO	After completion of this course students will be able to	Cognitive level
CO-01	Develop self-employment and sustainability in Nursery techniques	Create
CO-02	Learn to use the appropriate usage of chemical pesticides and insecticides	Apply
CO-03	Gain the skills to produce new fruit and vegetable varieties	Evaluate
CO-04	Explain about soil and water management	Understand

CONTENTS:

1.1	NURSERY-Definition, objectives, scope and advantages.	2Hrs
1.2 1.2	Nursery techniques-preparation of beds, seedling, sapling and transplant, seed structure, dormancy, methods of breaking dormancy, seed viability, seed testing and certification. Basic nursery Methods and greenhouse Techniques, construction and types, mist chambers, shade houses and glasshouses. Importance of greenhouses in plant propagation.	10Hrs
2.1	Vegetative propagation- layering methods and types, cutting, selection of cutting, treatment, rooting media, planting, grafting types and methods. Advantages of plant propagation.	10 Hrs
3.1	Gardening-Definition and scope, types, landscape and home gardening, gardening operations.	10Hrs
3.2	Management of pests and diseases. Study of cultivation of vegetables and fruits, Storage and marketing.	

EXPECTED OUTCOME

- Increase self- employment and sustainability.
- Decrease the use of chemical pesticides and insectidies.
- Develop new fruit and vegetables varieties
- Better soil and water management.

Discipline specific elective (DSE) TITLE: INTRODUCTION TOMEDICINAL AND AROMATIC PLANTS MARKS: THEORY 30 marks, IA- 20 marks 2 hours per week, Theory-32 hours

OBJECTIVES:

- 1. To create awareness among students regarding local medicinal flora.
- 2. To introduce alternate forms of medicine.
- 3. For a better understanding of aromatic plants and their importance in general health and industry.

4. Course Learning Outcome:

СО	After completion of this course students will be able to	Cognitive level
CO-01	Understand various alternate medicinal sciences like Ayurveda,	Understand
	Siddha, Unani	
CO-02	Identify various locally avaiable medical plants with their	Apply
	physiological impotance	
CO-03	Analyse various methods for extraction of essential and	Analyse
	aromatic oil	-
CO-04	Better understanding on current research activities carried in	Understand
	medicinal and aromatic plants	

1.1	Brief history, scope and importance of medicinal plants, pharmacognosy and	10Hrs
	pharmacology.	
1.2	Indigenous alternate medicinal sciences- definition and scope of Ayurveda, Siddha, Unani. Classification of drugs based on source,	
2.1	Common medicinal plants, parts used and their uses (Meliaazadirachta,	11Hrs
	Terminaliachebula, Terminaliabellarica, Curcuma longa,	
	Cinnamomumzeylanica, Saraca asoca, Piper longum, Piper nigrum, Aloe vera,	
	Tinospora, Ocimum sanctum, with aniasomnifera.	
2.2	Ayurvedic preparations-Churna, lahea, oils and arista with examples.	
3.1	AROMATIC PLANTS- Importance and scope of aromatic plants, cultivation	11Hrs
	and extraction of essential oils. Uses of aromatic oils in day to day life.	
3.2	Important aromatic plants found in India (Eucalyptus, Rosemary, Cinnamon,	
	Jasmine, Geranium, Rose, Cymbopogoncitratus, Vettivera, Lavender). Research	
	on medicinal and aromatic plants in India	

EXPECTED OUTCOME:

- 1. Development of small scale industries
- 2. Improve general health using natural products
- 3. Conservation of indigenous medicinal and aromatic plant

Discipline specific elective (DSE) TITLE: BASICS OF NUTRACEUTICALS IN HEALTH CARE MARKS: THEORY 30 marks, IA-20 marks 2 hours per week, Theory-32 hours

Course Objectives:

- 1. To reveal to students the importance of food in the promotion of health.
- 2. To enlighten the students on the importance of some zoo chemicals and phytochemicals present in food.

Course Learning Outcome:

СО	After the completion of this course the student will be able to	Cognitive level
CO-01	Students can comprehend the recent updates on food and health. They can identify functional foods and pharmaceutical foods. They can apply the concepts of nutraceuticals in dietary supplements and can also translate the knowledge of functional foods in the management of health and diseases.	Apply
CO-02	They will be Enlightened with the knowledge of plant and animal based nutraceuticals their role in betterment of human health.	Understand
CO-03	Exposed to the mechanism of action of some phytochemicals and zoo chemicals in the treatment and prevention of organic diseases such as cancer, cardiovascular diseases and so on. Students will gain knowledge on medicinal plants which are grown at home its benefits and nutraceutical property in improving health care.	Apply

1.1	NUTRACEUTICALS- the importance of nutraceuticals in human health,	12Hrs
	Basic food types, cultural diet, fast foods, junk foods, functional foods.	
1.2	Classification of nutrients and their functions, vitamin and mineral	
	supplements, fortified foods- energy drinks, infant food formula and other	
	nutraceuticals in the market.	
2.1	Plant and animal-based nutraceutical- antioxidants, vitamins, carotenoids,	12Hrs
	glucoseamines, algal nutraceuticals,(spirulina and seed weeds), fungal	
	nutraceutical, bacterial nutraceutical, probiotics, prebiotics, symbiotics,	
	fermented foods in health care	
3.1	Nutraceutical in health and disease- in preventive and protective medicine, in	8Hrs
	cancer treatment, in cholesterol and obesity control.	
	Nutraceuticals from home garden- aloe, honey, turmeric, fenugreek,	
3.2	asafoetida, ginger, pepper, garlic, betel leaves, neem, Brahmi. Cosmeceuticals,	
	plant-based cosmetics in skin, hair, eye and dental care.	

EXPECTED OUTCOME

- A better understanding of easily available nutraceticals.
- Some important food components and their nutraceutical importance

Course Objectives:

- 1. Understand and apply statistical methods in research and analysis
- 2. Participate in a research team in the evaluation of new and existing methodology
- 3. Interpret results from software

Course Learning Outcome:

CO	After the completion of this course the student will be able to	Cognitive level
CO-01	After completion of these unit students will improve their Analytical skills and apply statistical methods un research.	Apply
CO-02	Students will learn to participate I research team in the evaluation of new methodology.	Evaluate
CO-03	Have a better understanding of biological and mathematical sciences	Understand
CO-04	Can easily communicate results of statistical analysis accurately	Apply

1.1	BIOSTATISTICS- definition, statistical methods-basic principles.	9hrs
	Variables-measurement, function.	
1.2	Limitations and uses of biostatistics	
2.1	Collection of data- primary and secondary- Types and methods of data	9hrs
	collection, merits and demerits.	
2.2	Classification, tabulation and presentation of data	
3.1	Measurement of central tendency-Mean, median, mode, standard deviation,	8hrs
	mean deviation, coefficient of variation	
4.1	Correlation- types and methods, Regression, similarities and difference	6 hrs

EXPECTED OUTCOME

- Improved analytical skills
- A Better understanding of biological and mathetical sciences
- Use statistical software
- Communicate results of statistical analysis accurately

Discipline specific elective (DSE) TITLE: TESTING OF FOOD ADULTERANTS MARKS: THEORY 30 marks, IA- 20 marks 2 hours per week, Theory-32 hours

Course Objectives:

- 1. To make students research oriented
- 2. To introduce students to current trends in science.
- 3. To develop analytical Skills to test food adulterants

СО	After the completion of this course the student will be able to	Cognitive level
CO-01	Will develop analytical skill on testing adulteration in foods and interpretation of the data.	Analyze
CO-02	Will gain practical experience in using techniques to determine the presence of adulterations in foods.	Apply
CO-03	Appreciate various techniques involved in testing food adulteration	Understand

Course Content-

1.1	Common Foods and Adulteration: Common Foods subjected to Adulteration - Adulteration – Definition – Types; Poisonous substances, Foreign matter, Cheap substitutes, Spoiled parts. Adulteration through Food Additives – Intentional and incidental. General Impact on Human Health.	7hrs
2.1	Adulteration of Common Foods and Methods of Detection: Means of Adulteration Methods of Detection Adulterants in the following Foods; Milk, Oil, Grain, Sugar, Spices and condiments, Processed food, Fruits and vegetables. Additives and Sweetening agents (at least three methods of detection for each food item).	10hrs
3.1	Standardization of Foods Definition, Standards of Quality, for cereals, starchy foods, spices and condiments, sweetening agents, meat and meat products, vinegar, sugar and confectionary, beverages-alcoholic and non alcoholic, carbonated water etc., Milk and milk products, oils and fats, Canned foods, fruits and vegetables products.	7hrs
4.1	Present Laws and Procedures on Adulteration: Highlights of Food Safety and Standards Act 2006 (FSSA) –Food Safety and Standards Authority of India–Rules and Procedures of Local Authorities. Role of voluntary agencies such as, Agmark, I.S.I. Quality control laboratories of companies, Private testing laboratories, Quality control laboratories of consumer co-operatives.	8hrs

Expected outcome

- Understand the adulteration of common foods and their adverse impact on health
- Comprehend certain skills of detecting adulteration of common foods.
- Be able to extend their knowledge to other kinds of adulteration, detection and remedies.

DISCIPLINE SPECIFIC ELECTIVE (DSE) TITLE: INTRODUCTION TO APPLIED MICROBIOLOGY MARKS : Project 30 marks, viva: 20 marks 2 hours per week, Total-32 hours

Course Objectives:

- 1. To expose students to recent trends in Microbiology.
- 2. To introduce concepts such as Immunology and Microbial toxins.
- 3. To enhance knowledge about human -microbial interaction.

Course Learning Outcome:

СО	After the completion of this course the student will be able to	Cognitive level
CO-01	Students are exposed to techniques involved in Bacterial culture. This will give a better involvement in fields of clinical research.	Apply
CO-02	They are aware of different toxins produced by microbes and treatment against these toxins.	Understand
CO-03	Understand the concepts such as immunology and can implement them in finding drugs.	Understand
CO-04	Will aware of new methodologies used to detect pathogen. This will help them to find good jobs in pharmaceutical companies.	Apply
CO-05	They are enhanced with the knowledge of human –microbial interaction.	Understand

1.1	Bacterial nutrition and growth factors Bacterial growth- Measurement of growth and growth yields. Techniques of pure cultures	5Hrs
1.2	Microbial toxins: Mycotoxins and bacterial toxins, food poisoning infections- Exo and endo-toxins	6Hrs
2.1	Immunology-Cellular and hormone defence system. Cells of the immune system, Immunogen, Antibody, structure of immunoglobulins	8Hrs
3.1	Types of immunity, Antibody production, Antigen-antibody reaction Immunological tests-Precipitation tests, Radioimmunoassay, ELISA	8Hrs
4.1	Plant microbial interaction-Types Normal and pathogenic microflora in Man	5 Hrs

EXPECTED OUTCOMES

- Better involvement in filed such as pharmacy, clinical research etc.
- Better job opportunities.
- Research orientation in students.

Course Objectives:

1. To make students research oriented

2. To introduce students to current trends in science.

Course Learning Outcome:

СО	After the completion of this course the student will be able to	Cognitive level
CO-01	After finishing the course, the students will get professional, Practical skills & time management skills in extraction, Isolation and Phytochemical analysis of Natural products. They will also learn about Phytochemical documentation.	Analyze
CO-02	Students will have an idea of producing plants in lab, maintaining tissue culture labs. This will help them to find good jobs in research institutes.	Apply
CO-03	They will develop analytical skill on testing adulteration in foods and interpretation of the data. They will gain practical experience in using techniques to determine the presence of adulterations in foods.	Apply

EXPECTED OUTCOME

- Increase entrepreneur
- More Focus on Research activities

DSE QUESTION PAPER PATTERN

BLUEPRINT OF QUESTION PAPER

Semest	emester : Subject:			
Title:	Title: QP Code:		Code:	
Time:	:		Ma	ax Marks: 30
Instruct	ions to the Candidates: Draw ne	eat labelled diagram	m wherever necess	sary
		PART A		
Ι	Define any FIVE of the following	ng:		5x2=10
1.				
2.				
3.				
4.				
5.				
6.				
7.				
		PART-B		
II	Write short notes on any TWO o	of the following:		2x4=8
8.				
9.				
10.				
		PART- C		
III	Explain any TWO of the followi	ng:		2x6=12
11.				
12.				
13.				

SUGGESTED READINGS – REFERENCES

AUTHOR	TITLE OF THE BOOK	PUBLISHER			
	VIRUSES AND BACTERIA				
R.C.Dubey &D.K.Maheshwari	Textbook of Microbiology	S.Chand& Company, Ramnagar, New Delhi 110005			
P D Sharma	Microbiology	Rastogi Publications, Shivaji Road, Meerut 250002, India			
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H C Dube	Text Book of fungi, Bacteria & virus	Vani Educational books, Vikas house 20/4, Industrial Area, Sahibabad, 201010, Ghaziabad, UP			
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