ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN
PALANI

(AUTONOMOUS)

RE-ACCREDITED WITH B^{++} GRADE BY NAAC

(Affiliated to Mother Teresa Women's University, Kodaikanal)

DEPARTMENT OF BOTANY

CURRICULUM FRAMEWORK AND SYLLABUS FOR OUTCOME BASED EDUCATION IN

B.Sc., BOTANY

&

EXTRA-CREDIT COURSES

UNDER

CHOICE BASED CREDIT SYSTEM

2019-2022

Preamble:

The Department of Botany has come into existence in the year 1971. The Department stands for its academic excellence and well-equipped laboratories. The highlight of the Department is the active participation of the faculty members in skill development programmes like Mushroom cultivation, Azolla cultivation, Herbal plant cultivation etc. Many seminars, workshops and outreach programmes are conducted to encourage the creative skills of the students. The faculty members publish many research papers in reputed journals. The faculty renders dedicative service to empower women and also raise the status of women by promoting them as entrepreneurs through skill based training and introducing relevant courses in the curriculum.

Bloom's Taxonomy in fixing the Learning Objectives:

Since the Academic year 2019 – 2020, the curriculum for B.Sc., (Botany) has been designed and the learning objectives and outcomes of the programmes are set, following the Bloom's Taxonomy Cognitive Domain. Accordingly, it is broken into six levels of learning objectives of each course. They are -

K1 / Knowledge = Remember

K2 / Comprehension = Understand

K3 / Application = Apply

K4 / Analysis = Analyze

K5 / Evaluation = Evaluate

K6 / Synthesis = Create

Bloom's Taxonomy Action Verbs:

K1 / Knowledge: Arrange, Define, Describe, Duplicate, Identify, Label, List, Match, Memorize, Name, Order, Outline, Recognize, Relate, Recall, Repeat, Reproduce, Select, State

K2 / Comprehension: Classify, Convert, Defend, Describe, Discuss, Distinguish, Estimate, Explain, Express, Extend, Generalize, Give example(s), Identify, Indicate, Infer, Locate, Paraphrase, Predict, Recognize, Rewrite, Review, Select, Summarize, Translate

K3 / Application: Apply, Change, Choose, Compute, Demonstrate, Discover, Dramatize,

Employ, Illustrate, Interpret, Manipulate, Modify, Operate, Practice, Predict, Prepare, Produce, Relate, Schedule, Show, Sketch, Solve, Use, Write

K4 / Analysis: Analyze, Appraise, Breakdown, Calculate, Categorize, Compare, Contrast, Criticize, Diagram, Differentiate, Discriminate, Distinguish, Examine, Experiment, Identify, Illustrate, Infer, Model, Outline, Point out, Question, Relate, Select, Separate, Subdivide, Test

K5 / Evaluation: Appraise, Argue, Assess, Attach, Choose, Compare, Conclude, Contrast, Defend, Describe, Discriminate, Estimate, Evaluate, Explain, Judge, Justify, Interpret, Relate, Predict, Rate, Select, Summarize, Support, Value

K6 / Synthesis: Arrange, Assemble, Categorize, Collect, Combine, Comply, Compose, Construct, Create, Design, Develop, Devise, Explain, Formulate, Generate, Plan, Prepare, Rearrange, Reconstruct, Relate, Reorganize, Revise, Rewrite, Set up, Summarize, Synthesize, Tell, Write

Mapping COs with POs:

For B.Sc., (Botany) programme, the Educational objectives and the Specific objectives are specified. The programme outcomes are designed according to the curriculum, teaching, learning and evaluation process. For each course, the definite outcomes are set, giving challenge to the cognitive domain. The course outcomes are mapped with the programme outcomes. The performance of the stakeholders is assessed and the attainment rate is fixed, by using the measurements ‘high’, ‘medium’ and ‘low’. The restructuring of the curriculum is done based on the rate of attainment.

Institutional Objectives:

- Women Education
- Women Empowerment
- Self-reliance and
- Making Model Citizens.

Programme Educational Objectives:

PEO 1 Graduates of the program will develop a strong and competent knowledge in basic biological science required for critical learning and research.

PEO 2 Graduates will develop diversified basic professional skills through various laboratory technical training, communicational and presentation skills.

PEO 3 They will possess an ability to identify, formulate, and solve biological problems to contribute to service efforts to communicate in both the professional and private realm.

PEO 4 Graduates will integrate related topics from separate parts of the course such as levels of organization, cell biology, ecology, evolution, biochemistry, genetics, embryology, basic biotechnology, physiology, molecular biology for successful career.

Programme Outcomes:

Upon completion of B.Sc., (Botany) Degree Programme, the graduates will be able to

PO 1	Develop a broad fundamental knowledge of the plant diversity especially habit ,habitat, morphology, adaptations and classification of plant kingdom.
PO 2	Analyze the relationship between plants, animals, microbes and deal with the local national global environment issues by realizing the right of the individuals and also need to conserve our biosphere.
PO 3	Understand how organisms function at the level of gene, genome, cell tissue, thallus, plant body drawing upon this knowledge, they are able to give specific examples of the physiological adaptations developed, reproduction and behavior of different forms of life.
PO 4	Gain knowledge about the application of biological sciences in mushroom cultivation, azolla cultivation, nursery management, herbal garden management, pest management, there by impart skill as well a source of income and self employment .
PO 5	Generate innovative ideas for performing experiments in the areas of biochemistry, physiology, genetics, microbiology, Developmental biology, anatomy, taxonomy, economic botany, and ecology.
PO 6	Explain the recent developments in genetic engineering, biotechnology, microbiology, for research activities in the department or in collaboration with other research institutions.
PO 7	Organize and deliver relevant applications of knowledge through effective written verbal, graphical/virtual communications and interact with people from diverse back ground.

Mapping PEOs with IOs:

Programme Educational Objectives	Institutional Objectives			
B.Sc., (Botany)	**1**	**2**	**3**	**4**
Graduates of the program will develop a strong and competent knowledge in basic biological science required for critical learning and research.	*			
Graduates will develop diversified basic professional skills through various laboratory technical training, communicational and presentation skills.		*		
They will possess an ability to identify, formulate, and solve biological problems to contribute to service efforts to communicate in both the professional and private realm.			*	
Graduates will integrate related topics from separate parts of the course such as levels of organization, cell biology, ecology, evolution, biochemistry, genetics, embryology, basic biotechnology, physiology, molecular biology for successful career.				*

Measuring: H – High; M – Medium; L – Low

COMMON ACADEMIC STRUCTURE

B.Sc., (Botany) / 2019 - 2022

Sem	Title of the Paper	Hrs	Cre-dits	Marks			C. Code
				CIA	CE	Total	
I	**Part I** Tamil	6	3	25	75	100	MUGT1
	Part II /Language through Literature-Paper I	6	3	25	75	100	MUGE1
	Part III:						
	Core – I: Algae and Bryophytes	5	4	25	75	100	MUBC1
	Core II: Fungi Lichenology and Plant Pathology	5	4	25	75	100	MUBC2
	Allied – I: Ancillary Zoology theory Paper I	3	3	25	75	100	MUZA1
	Part IV/ SBC – I: Biofertilizers	2	2	25	75	100	MUBBF1
	Part – V: Value Education	1	2	25	75	100	MUVE
	Total	**30**	**23**			**700**	
II	**Part I** Tamil	6	3	25	75	100	MUGT2
	Part II/ Language through Literature-Paper II	6	3	25	75	100	MUGE2
	Part III:						
	Core – III: Pteridophytes, Gymnosperms & Paleobotany	7	4	25	75	100	MUBC3
	Core – Practical Paper 1	3	4	40	60	100	MUBP1
	Allied – II: Ancillary Zoology- Theory II	3	3	25	75	100	MUZA2
	Allied – II: Ancillary Zoology- Practical I	2	4	40	60	100	MUZAP
	Part IV SBC – II: Herbal Cosmetics	2	2	25	75	100	MUBHC2
	Total	**30**	**21**			**600**	
	Part I Tamil	6	3	25	75	100	MUGT3
	Part II / Language through Literature- III	6	3	25	75	100	MUGE3

III	**Part III:** **Core – IV:** Biochemistry, Biophysics and Biotechniques **Allied:** Chemistry Theory Paper I **Allied:** Chemistry Practical Paper I	 9 3 2	 3 3 -	 25 25 -	 75 75 -	 100 100 -	 MUBC4 MUCA3 MUCAP
	Part IV SBC-III: Basic Bioinformatics **NME–I:**Gardening and Nursery Management	2 2	2 2	25 25	75 75	100 100	MUBBB3 MUBN1
	Total	**30**	**23**			**700**	
IV	**Part I** Tamil	6	3	25	75	100	MUGT4
	Part II / Language through Literature- IV	6	3	25	75	100	MUGE4
	Part III: **Core – V:** Plant Anatomy and Plant Ecology **Core – VI:** Cell biology and Embryology **Core**: Practical Paper II **Allied:** Chemistry Theory Paper II **Allied:** Chemistry Practical Paper I	 4 4 3 3 2	 5 4 4 3 4	 25 25 25 25 40	 75 75 75 75 60	 100 100 100 100 100	 MUBC5 MUBC6 MUBP2 MUCA4 MUCAP
	Part IV SBC – IV: Mushroom for Livelihood	2	2	25	75	100	MUBML4
	Part V: Extension activities	-	1	-	-	100	MUEXA4
	Total	**30**	**23**			**700**	
V	**Part III: Core – VII:** Taxonomy of Angiosperms and Economic Botany **Core – VIII:** General Microbiology **Core –** Practical Paper III **Major Elective – I:** **Option – I:** Biotechnology **Option - II:** Habitat Ecology **Major Elective – II:** **Option – I:** Horticulture and Landscaping **Option - II:** Plant Tissue Culture	6 6 6 5 - 5 -	5 4 - 5 - 5 -	25 25 40 25 - 25 -	75 75 - 75 - 75 -	100 100 - 100 - 100 -	MUBC7 MUBC8 MUBP3 MUBE1 MUBE1 MUBE2 MUBE2

	Part IV SBC – V: Food Preservation	2	2	25	75	100	MUBFP5
	Total	**30**	**25**			**600**	
VI	**Part III:**						
	Core – IX: Plant Physiology	6	5	25	75	100	MUBC9
	Core-X: Genetics and Molecular Biology	7	5	25	75	100	MUBC10
	Core – Practical Paper III	-	4	-	60	100	MUBP3
	Core – Practical Paper IV	6	4	40	60	100	MUBP4
	Major Elective – III:						
	Option – I: Herbal Medicine and Human Welfare	5	5	25	75	100	MUBE3
	Option – II: Plant Breeding, Evolution, Seed Technology and Biostatistics	-	-	-	-	-	MUBE3
	Part IV SBC – VI: Group Project	2	2	25	75	100	MUBPR
	NME–II: Herbal Therapeutics	2	2	25	75	100	MUBN2
	Part V: Environmental Studies	2	2	25	75	100	MUES6
	Total	**30**	**25**			**700**	

Total credits = 140

EXTRA-CREDIT COURSES

S.No.	Title of the Courses	Total Marks (CIE)
1.	Dietary and Nutritional Value of Fruits and Vegetables	**100**
2.	Commercial Plant Products	**100**
3.	Biodiversity Conservation and Management	**100**

SEMESTER - I

Programme: B.Sc., **Subject:** Botany

Semester: I **Course:** Algae and Bryophytes

Course Type: Core Paper - I **Course Code:** MUBC1

Contact Hours: 5 Hours/Week **Credits:** 4

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Understands about general characters, classification and economic importance of algae.
- Students are taught the detailed structure of some algal forms.
- Imparts knowledge about various algal species.
- Understands about morphology, structure, reproduction and life cycle of bryophytes.
- Students gain fundamental knowledge about evolution and economic importance of bryophytes.

COURSE CONTENT

Unit: I Algae

Introduction, general characters, classification of algae, general outline proposed by Frisch - 1935-1945 - Economic importance of algae and brief account on ecology of Algae.

Unit: II

Detailed study of structure and lifecycle of the following: *Nostoc, Chara, Caulerpa* and *Oedogonium*.

Unit: III

Detailed study of structure and lifecycle of the following*: Diatom, Sargassum, Polysiphonia,* and *Gracilaria.*

Unit: IV Bryophytes

Introduction, general characters, classification of bryophytes (Smith), morphology, structure, reproduction and lifecycle of the following: *Marchantia* and *Polytrichum.*

Unit: V

Evolution of sporophyte and gametophyte, ecological aspects and economic importance of bryophytes, fossil bryophytes.

Practicals:

Study of Morphology and Anatomy of genera as given in the syllabus.

Field trip arranged to visit sea shore and collect algae.

Prescribed Texts

- Singh Pandey and Jain. *A Text Book of Botany*, 4th Edition Rastogi Publications, 2010.
- Dr. B.P. Pandey. *College Botany*, 5th Edition S. Chand Co., Pvt. Ltd, 2013.
- Gangulee and Kar. *College Botany*, Vol II. New Central Book Agency Pvt. Ltd, 2007.
- Kumar, H.D. *Introductory Phycology*. Affiliated East –West Press Ltd., 1988.

Reference Books:

- Morris, I. *An Introduction to the Algae* .Cambridge University Press, UK, 1986.
- Parihar, N .S. *Bryophyta* .Central Book Depot, Allahabad, 1991.
- Puri, P. *Bryophytes*. Atma Ram & Sons. Delhi, 1980.
- Round, F .E. *The Biology of Algae*. Cambridge University Press, 1986.
- F.E.Fritich. *The Structure and Reproduction of the Algae*. Vol I&II, Vikas Publishing House Pvt. Ltd, 1975.
- O.P. Sharma. *Text Book of Algae.* Tata McGrow Hill Publication, 1986.

Programme: B.Sc., **Subject:** Botany

Semester: I **Course:** Fungi, Lichenology and Plant Pathology

Course Type: Core Paper - II **Course Code:** MUBC2

Contact Hours: 5 Hours/Week **Credits:** 4

CIA: 25 **CE:** 75

COURSE OUTCOMES

- To study, classify Fungi and also understand the economic importance of Fungi.
- Understands the characteristic features of different groups of Fungi.
- Imparts knowledge about the life cycle of various groups of Fungi.
- Understands the types, life cycle and benefits of Lichens.
- Gain knowledge about the Causes, Symptoms and Control measures of Plant diseases.

COURSE CONTENT

Unit: I Fungi

Fungi – General characteristics of fungi; Classification (Alexopoulos); Economic importance of fungi and List of fungal diseases caused in plants.

Unit: II

Occurrence, Structure, Reproduction and Life cycle of the following: *Albugo* sp., *Saccharomyces* sp, *Peziza* sp.,

Unit: III

Occurrence, Structure, Reproduction and Life cycle of the following *Puccinia* sp., Aspergillus sp., and *Cercospora* sp.

Unit: IV Lichenology

Introduction, Classification and Types of lichens, Economic importance of lichens, Ecology of Lichens – Occurrence, Structure and Reproduction of *Usnea*

Unit: V Plant Pathology

A study of the following plant diseases with special reference to the Symptoms, Causal Organisms, Disease Cycle and Control Measures.

Fungal Disease	-	Red rot of Sugarcane, Tikka disease of Groundnut
Bacterial Disease	-	Citrus Canker
Viral Disease	-	Bunchy top of Banana

Practicals:

Study of morphology and anatomy of the genera as given in the syllabus.

Prescribed Texts:

- Vashishta B.R., *Botany for Degree Students part – II – Fungi*, S. Chand -& Co.,
- A.V.S.S Sambamurthy. *A text book of Plant Pathology* –I.K. International Publishing House Pvt. Ltd, New Delhi.
- Chopra, G.L. *A Text Book of Fungi.* S. Nagin & Co ., New Delhi.

Reference Books:

- Alexopoulos. C.J and N.C. Bold. *Algae and Fungi*, The Macmillan Co, London.
- Gilbert M. Smith. *Cryptogamic Botany*, Vol –I, Algae and Fungi, New Delhi.
- Alexopoulos, C.J. *Introductory Mycology*, John Wiley & Sons, New York.
- Munkur. B.B. *Fungi and Plant Diseases*.
- Singh. R.S. *Principles of Plant Pathology*, Oxford , IBH Publishing Co., New Delhi.
- Ranga swami. G. Diseases of Crop Plants in India.
- M.E. Hake. *The Biology of Lichens*.
- Ahamed Geon. *Lichens.*
- Ranga swamy, G and Mahadevan, *A. Diseases of Crop Plants in India* (4th edition). Prentice Hall of India Pvt. Ltd., New Delhi. 1999.
- B. P. Pandy. *Plant Pathology*.

Programme: B.Sc., **Subject:** Botany

Semester: I **Course:** Bio-fertilizers

Course Type: SBC **Course Code:** MUBBF1

Contact Hours: 2 Hours/Week **Credits:** 2

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Enable the students to understand the scope, importance and applications of symbiotic bacteria.
- Gains knowledge about Non- symbiotic bacteria.
- Understands the mass cultivation and field applications of Blue green algae.
- Study the mass cultivation and field applications of VAM fungi.
- Develop an interest to study the role of Mycorrhizae in agriculture.

COURSE CONTENT

Unit: I

Biofertilizers – scope, importance and need, symbiotic bacterial inoculants- Rhizobium - isolation, packing and storage, field applications of inoculants and crop response.

Unit: II

Non–Symbiotic bacterial inoculants – Azotobacter– isolation, field application of inoculants, crop response

Unit: III

Blue green algae inoculants –isolation, storage –field applications and crop response, Azolla – A green manure cum bio fertilizer – Mass cultivation, field applications and uses

Unit: IV

Vesicular and Arbuscular Mycorrhizae – Mass cultivation of VAM fungi- isolation and importance, field applications

Unit: V

Mycorrhizae – mass multiplication – Role of mycorrhizae in agriculture as organic manures and Green manures.

Prescribed Text:

- Dubey .R.C. *A Text Book of Biotechnology* S. Chand and Co, New Delhi. 2002.

Reference Books:

- Subba Rao N.S. *Bio-fertilizers in Agriculture*, II Edition, Oxford & IBH Publishing Co, Pvt Ltd , New Delhi. 1988.
- Subba Rao .N.S. *Advanced Agricultural Microbiology*, Oxford & IBH Publishing Co, New Delhi. 1982.

Programme: B.Sc., **Subject:** Botany

Semester: I **Course:** Ancillary Botany Theory Paper - I

Course Type: Ancillary Botany Theory Paper **Course Code:** MUBA1

Contact Hours: 5 Hours/Week **Credits:** 3

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Impart knowledge about classification, structures and lifecycle of different forms of algae.
- Students gain fundamental knowledge of fungi and its various forms.
- Understands the classification and lifecycle of Bryophytes and Pteridophytes.
- Develop interest in understanding the classification of Gymnosperms.
- Study the anatomical structures of dicot and monocot plants.

COURSE CONTENT

Unit: I Phycology

Outline of Fritsz's (1935- 1945) classification of Algae. Structure and Life cycle of the following *Oscillatoria*, *Oedogonium*. Economic importance of algae – Agar agar, Pollution indicators.

Unit: II Fungi

Outline of Alexopolous's (1952) classification of fungi. Structure, Reproduction and life cycle of the following . *Albugo*, *Puccinia*. Economic importance of fungi – Antibiotics, and Nutrition

Plant pathology-Symptoms, Causative organisms and control measures of Bunchy top of Banana.

Unit: III Bryophytes

Outline classification (Smith – 1965). Structure, Reproduction and life cycle of *Anthoceros*.

Pteridophytes - Outline of (Sporne's1965) classification. Structure, Reproduction and life cycle of *Lycopodium*.

Unit: IV Gymnosperms

Outline classification (K.R. Sporne's 1965). Structure, Reproduction and Life cycle of Gnetum

Unit: V Anatomy

A brief account of Meristems – Types, Histogen theory, Tunica corpus theory – Tissues – Types, Definition and Function Primary and Secondary structure of Dicot stem and Primary structure of Monocot root.

Practical

A detailed study of the forms mentioned above – Specimens and Slides

Anatomy

Slides of Tissues – Parenchyma, Collenchyma, Sclerenchyma, Xylem, Phloem, Primary and Secondary of Dicot stems and Monocot root.

Embryology:

T.S. of Mature anther, Orthotropous ovule, Structure of 8 nucleate embryosac, Structure of Dicot embryo.

Prescribed Texts:

- Gangulee H. C. Das, K.S. Dutta CT. *College Botany*. Vol.1. 1986.
- Gangulee and Kar A K. College Botany Vol. I and II. 1986.

Reference Books:

- Narayanasamy, R.V and Krishnamoorthy, K.V. *Outlines of Botany*.
- Smith G.M. *Cryptogamic Botany*. Vol. I and II. 1955.
- Ramasamy S.N. and Venkateswaralu. *Taxonomy.*

SEMESTER - II

Programme: B.Sc., **Subject:** Botany

Semester: II **Course:** Pteridophytes, Gymnosperms and Paleobotany

Course Type: Core Paper - III **Course Code:** MUBC3

Contact Hours: 7 Hours/Week **Credits:** 4

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Impart knowledge about classification, structures and lifecycle of different forms of fossil Pteridophytes.
- Gain fundamental knowledge of structure, reproduction and lifecycle of Pteridophytes.
- Understand the morphology and reproduction of *Equisetum* and *Marsilea*.
- Classify the Gymnosperm, morphology and reproduction of *Williamsonia, Pinus, Cupressus* and *Gnetum*.
- Comprehend the geological time scale, kinds of fossils and Radio carbon dating.

COURSE CONTENT

Unit-I Pteridophytes

General characters and classification of Pteridophytes (Sporne, 1965).Stelar evolution in Pteridophytes; Homospory, Heterospory, Apospory, Apogamy, Leptosporangiate and Eusporangiate- Definitions only with examples. A detailed study of morphology and structure of *Rhynia, Lepidicarpon* and *Lepidodendron.*

Unit- II

A detailed study of the morphology, structure, reproduction and life cycle of *Psilotum, Lycopodium and Gleichenia.*

Unit- III

A detailed study of morphology, structure, reproduction and life cycle of *Equisetum* and *Marsilea*.

Unit-IV

Gymnosperms: General characters of Gymnosperms. Classification of Gymnosperms (Sporne, 1965). A detailed study of morphology and structure of *Williamsonia,* A detailed study of morphology, structure, reproduction and life cycle of *Pinus,* Cupressus and *Gnetum*.

Unit- V

Paleobotany: Geological time scale; fossils and fossilization- kinds of fossils-petrifaction, cast, impression and compression. Nomenclature of fossil plants. Radiocarbon dating. Contribution of Prof. Birbal Sahni (brief outline).

Practicals:

Study of morphology and anatomy of the genera *Psilotum, Lycopodium, Gleichenia, Equisetum, Marsilea, Pinus, Cupressus* and *Gnetum*.

Study of the fossil specimens *Rhynia, Lepidocarpon, Lepidodendron* and *Williamsonia*

Prescribed Texts:

- Vashista, P. C. - **Pteridophyta**
- Vashista P. C.- *Gymnosperms*
- Pandey .B.P. – *A Text book of Botany (Bryophyta, Pteridophyta & Gymnosperms)* S.Chand& Co. NewDelhi

Reference Books:

- Bhatnagar, S. P. and Moira, *A. Gymnosperms.* New age international Pvt. Ltd., New Delhi. 1996.
- Sporne, K. R. - *Morphology of Pteridophytes*.
- Sharma, O. P. - *Text book of Pteridophyta*.
- Smith, G. M. - *Cryptogamic Botany* (Vol. II).
- Sporne, K. R. - *Morphology of gymnosperms*, 1965. Hutchinson univ. Asia Publishing House.
- Arnold, C. A. - *An Introduction to Paleobotany*.
- Ganguly Dass and Dutta - *College Botany*.
- Narayanaswamy, K. N., Rao and Raman, A. *Outline of Botany Pteridophyta (Vascular Cryptogams).* 2000.

Programme: B.Sc., **Subject:** Botany

Semester: II **Course:** Core Practical Paper – I

Course Type: Core Practical Paper **Course Code:** MUBP1

Contact Hours: 3 Hours/Week **Credits:** 4

CIA: 40 **CE:** 60

COURSE OUTCOMES

- Impart knowledge about structures and different forms of Plant diversities through microscope.
- Gain knowledge about the spotters and identify the specimens.
- Understand the morphology and taking sections.
- Develop skills to identify the different species.
- Develop drawing sketches of the structures of the specimens.

COURSE CONTENT

Practical Paper I

1. Prepare suitable Micro-preparations of A, B and C stain and mount in Glycerine.

Draw labelled sketches. Identify giving reasons. Submit the slide for valuation. (7X3=21)

2. Spot at Sight (Genus and Group Only) D.E.F and G (4X2=8)

3. Comment on the Etiology of H (5X1=5)

4. Draw sketches write critical notes on and identify giving reasons I, J and K (3X4=12)

5. Comment on ‘ L’ (4X1=4)

6. Record Note Book (10)

Programme: B.Sc., **Subject:** Botany

Semester: II **Course:** Ancillary Botany Theory Paper - II

Course Type: Ancillary Botany Theory Paper **Course Code:** MUBA2

Contact Hours: 3 Hours/Week **Credits:** 3

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Impart knowledge in classifying Algae and Fungi.
- Students gain knowledge in identifying Bryophytes and Pteridophytes.
- Understand the classification of Gymnosperms.
- Develop knowledge in identify the anatomy of shoot and root of plants.

COURSE CONTENT

Unit: I Taxonomy of Angiosperms

Classification (Bentham& Hooker's System 1862-83). Study of the following families with their economic importance, Annonaceae, Rutaceae, Rubiaceae, Amaranthaceae, Poaceae.

Unit: II Embryology

Structure of Microsporangium and Male gametophyte, structure of megasporangium and female gametophyte, - Monosporic and nucleate embryosac (Polygonum type). A brief account of types of Endosperm (need not study development) Development of Dicot embryo (Crucifier type).

Unit: III Plant Physiology

Water relationship of plants, Osmosis, water potential, Active and Passive absorption of water . Photosynthesis – Photosynthetic apparatus, Primary photochemical reaction and Calvin cycle

Unit: IV Respiration

Respiration – Structure of Mitochondria, Glycolysis, Kreb cycle and Electron Transport System. Phytohormones – Auxins

Unit: V Plant Ecology

Anatomical adaptations and physiological adaptations of - Hydrophytes, Xerophytes, and Halophytes

Practicals

Taxonomy of Angiosperms – A study of the families with their economic importance that is included in the theory.

Plant Physiology – Experiments to demonstrate: 1. Osmosis, 2. Evolution of O_2 during photosynthesis, 3. CO_2 is essential for photosynthesis, 4. Evolution of CO_2 during respiration, 5. Fermentation vessel. 6. Effect of Auxins in plant growth

Plant Ecology – Morphological and Anatomical adaptations of Hydrophytes, Xerophytes, and Halophytes. Macroscopic specimens and slides.

Reference Books:

- Narayanasamy, R.V. and Krishnamoorthy, K. V- *Outlines of Botany*.
- Smith G.M. *Cryptogamic Botany* Vol. I and II. 1955.
- Ramasamy S.N. and Venkateswaralu- *Taxonomy.*
- Gangulee H. C. Das, K.S. Dutta CT. *College Botany* Vol.1. 1986.
- Gangulee and Kar A K. *College Botany* Vol. I and II. 1986.

Programme: B.Sc., **Subject:** Botany

Semester: II **Course:** Ancillary Botany Practical Paper

Course Type: Ancillary Botany Practical Paper **Course Code:** MUBAP

Contact Hours: 2 Hours/Week **Credits:** 4

CIA: 40 **CE:** 60

COURSE OUTCOMES

- Impart knowledge about structures and different forms of Plant diversities through microscope.
- Students gain knowledge about the spotters and identify the specimens.
- Understand the morphology and taking sections.
- Develop skills to identify the different species.
- Develop drawing sketches of the structures of the specimens.

COURSE CONTENT

Unit – I

External Morphology and Transverse Section of Cryptogamic Materials – Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.

Unit – II

Micro suitable Anatomical Preparations of Plant Materials – Monocot Stem and Dicot Stem.

Unit – III

Family Identification and giving reasons (Families prescribed in the syllabus).

Unit – IV

Family Technical Term Description, Etiology and Plant Physiology Set Up.

Unit – V

Spotters – Macroscopic Specimen and Microscopic Slides – Cryptogamic Materials – Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms, Embryology and Ecological Specimens.

Maintenance of Record Note Book.

Ancillary Botany Practicals / I B.Sc., Zoology

(Algae, Fungi, Plant Pathology, Bryophytes Pteridophytes Gymnosperms, Anatomy, Taxonomy of Angiosperms, Embryology, Plant Physiology and Plant Ecology)

Sub Code: MUBAP **Max. Marks: 60 Marks**

1. Make suitable Micropreparation of **A** stain and mount in Glycerine. Draw labelled sketches and identify the giving reasons. Submit the slide for valuation.
2. Prepare Transverse Sections of **B** stain and mount in Glycerine. Draw labelled sketches and identify the giving reasons. Submit the slide for valuation.
3. Refer **C** to respective family giving reasons.
4. Describe D in technical terms, draw labelled sketches including L.S of the flower.

5. Comment on the Etiology of **E.**
6. Comment on the Plant Physiology set up **F.**
7. Identify, draw sketches and Write Notes on **G, H, I** and **J.**
8. Comment on Ecological Adaptations of **K**.
9. Observation Note Book.

Programme: B.Sc., **Subject:** Botany

Semester: II **Course:** Herbal Cosmetics

Course Type: SBC **Course Code:** MUBHC2

Contact Hours: 2 Hours/Week **Credits:** 2

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Enable the students to understand the need and advantages of herbal cosmetics.
- Gains knowledge to prepare face pack using herbs.
- Understands the preparations of herbal powder and soaps.
- Study the preparations of different types of hair oils.
- Develop an interest to study the preparations of foot cream and megandi decorations.

COURSE CONTENT

Unit: I

Introduction of herbal cosmetics – Need and advantages of Herbal cosmetics – Adverse effect of chemical cosmetics.

Unit: II

Face care: Face cleanser, Ache – Pimple cream, Anti- marks lotion- Preparations of Face pack

Unit: III

Skin care: Skin beauty through panchakarma, Turmeric – Milk lotion, Anti-Wrinkle cream, Preparation of Herbal Bathing powder and soaps.

Unit: IV

Hair care: Hair oil components and preparation of oil, Neeli Bringhadi oil- (Karisalankanni thailam) – Amla Hair oil (Ashwini hair oil) – Amaranthus oil (Arsikeeraithailam) – Herbal Shampoo and Hair dyes.

Unit: V

Foot care: Preparation of foot cream- senna, caster oil, turmeric; Megandi decoration on feet.

Reference Books:

- Faroqi A.A. Sree ramu.B.S. *Cultivation of Medicinal and Crops*. 2005.
- Asha Ram. *Herbal Indian Perfumes and Cosmetics* Sri Satguru Publications, New Delhi. 2002.

- Babu .S.S., Herbal cosmetics. Pushkal Publishers.
- SS. Handa and V.K. Kapoor, *Pharmacognosy* – Second Edition, publishers Vattubh Prakasan, Delhi.
- C.K.Kokate, A.Purohit and S.R.Gokhaletwelth – *Pharmacognosy,* edition – publishers Niraliprakasan, Pune.
- T.E. Wallis- *Text Book of Pharmacognocy*. 5th edition Publishers.CBS publishers and Distributors , Delhi.

SEMESTER - III

Programme: B.Sc., **Subject:** Botany

Semester: III **Course:** Biochemistry, Biophysics and Biotechniques

Course Type: Core Paper IV **Course Code:** MUBC4

Contact Hours: 9 Hours/Week **Credits:** 4

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Impart knowledge about atoms, bonds, pH, buffer and properties of water
- Students gain fundamental knowledge of structure, classification and properties of biomolecules.
- Understand the mechanism of enzyme action, and also study the structure, properties, nomenclature and classification of enzymes.
- Develop knowledge in concepts of biophysics.
- Develop skills in studying and using instruments of biotechniques.

COURSE CONTENT

Unit: I Biochemistry

Basic concepts of Biochemistry – Brief account of atoms, bonds - ionic, hydrogen, co-valent and co- ordinate, pH and buffer - structure and properties of water.

Unit: II

Biomolecules – structure, classification and properties of carbohydrates structure & properties of monosaccharides - glucose, disaccharides - sucrose, polysaccharides – starch, protein – primary, secondary and tertiary structure and properties of proteins, lipids – classification and properties, structure of fatty acid.

Unit: III

Enzymes – structure, properties, nomenclature and classification, mechanism of enzyme action, factors affecting enzyme action

Unit: IV Biophysics

Laws of thermodynamics, concept of free energy, redox potential, ATP as high energy compound, photobiology - nature of light, solar radiation, absorption and emission spectrum, fluorescence, phosphorescence and bioluminescence.

Unit: V Biotechniques

Colorimetry and its use; centrifugation – basic principles, types; chromatography – basic principles, types (Paper); pH meter and its use, Spectrophotometer and its use.

Practicals:

1. Preparation of buffers – phosphate and citrate buffer
2. Determination of pH of any three soil samples
3. Determination of pH of lemon and watermelon
4. Qualitative test for carbohydrates, proteins and lipids.
5. Separation of amino acids by paper chromatography
6. Estimation of starch by gravimetric method.
7. Estimation of total free amino acids by ninhydrin reagent method
8. Estimation of total protein by using green grams and cicer seeds.

Prescribed Texts:

- Power C.B. and G.R Chatwal – *Fundamentals of Biochemistry*, S. Chand & Co, New Delhi.
- Jain J.L. - *Fundamentals of Biochemistry*, S. Chand& Co, New Delhi.

Reference Books:

- Conn E.E and Stumpf – *Outlines of Biochemistry*, Wiley Eastern Ltd. Chennai.
- Lehinger A.L. *Bio chemistry*, Kalyani Pub, New Delhi.
- Ambika Shanmugam – *Fundamentals of Biochemistry for Medical Students* – Chennai.
- Carey E.J. – *Biophysics,A*ffiliated East –west press P.Ltd. New Delhi.
- Albert .I Lechninger *Bioenergetics* – W.A Banjamin New York.
- Fuller et al., – *Biophysics*. Concepts and Mechanics.
- Dr. Salil Bose – *Elementary Biophysics*.
- Jeyaraman, Kunthala , M. Lakshmanan M. Gnananam and J.Jeyaraman - *Experiments in Microbiology.*
- Jeyaraman *Techniques in Biology* – A College level study.
- Plummer D.T – *An Introduction to Practical Biochemistry*, Tata Mc.Graw Hill Pub Co, Bombay.
- Asokan .V. Melvisharam – *Biochemistry and Biotechniques*

Programme: B.Sc., **Subject:** Botany

Semester: III **Course:** Basic Bioinformatics

Course Type: SBC **Course Code:** MUBBB3

Contact Hours: 2 Hours/Week **Credits:** 2

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Enable the students to understand the components of computers
- Gains knowledge about computer languages, internet and email.
- Understands the windows, ms office, excel and powerpoint.
- Study the basics of bioinformatics and phylogenetic analysis.
- Develop an interest to study the biomolecular visualization and computer aided drug designing.

COURSE CONTENT

Unit – I

Introduction to computers – components of computers – input devices – output devices – storage devices – operating system – DOS/WINDOWS/LINUX.

Unit – II

Computer languages low level (machine) language – high level languages – Introduction to Internet – data communication concept – LAN/WAN/WWW – net browsers (Internet explorer and Google chrome) – search engines (Google and Yahoo) – E-mail and FTP – Smileys and acronyms.

Unit – III

Windows OS – features – skills and options – MS office: Word (creation, editing and formatting of document) – Excel (Spreadsheet, Formula bar charts) - Powerpoint (Production, Editing, Animation and Presentation of Slides).

Unit – IV

Bioinformatics – definition – biological database (generalized and specialized) – public domain bioinformatics servers (NCBI, EBI and Genome NET) – bibliographic and sequence searching (BLAST and ENTREZ) – phylogenetic analysis – tree building and analysis.

Unit – V

Algorithm and tools for gene finding: protein prediction, biomolecular visualization (RASMOL) – Computer Aided Drug Designing (CAD) – Target and lead discovery.

Prescribed Texts :

- Alexis Leon and Mathews Leon. *Introduction to Computers*, Leon Tech World, Chennai. 2008.
- Alexis Leon and Mathews Leon. *Internet in a Nutshell*. Leon Tech World, Chennai. 1998.
- Lesk, A.M. *Introduction to Bioinformatics*, Oxford University Press, Oxford. 2002.

References books:

- Chakraborthy, C. *Bioinformatics Approaches*, Chawla offset printers – Delhi, 2004.
- D.R. Westhead. J. Parish and R.M. Twyman. *Bioinformatics,* Viva Books Private Limited – New Delhi, 2003.

Programme: B.Sc., **Subject:** Botany

Semester: III **Course:** Gardening and Nursery Management

Course Type: NME - I **Course Code:** MUBN1

Contact Hours: 2 Hours/Week **Credits:** 2

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Enable the students to understand the cropping pattern of garden.
- Gains knowledge about components of garden.
- Understands the methods of cultivating indoor garden and flower arrangement.
- Study the cultivation of vegetables and extraction of jasmine.
- Develop an interest to study the cultivation of orchards and intercropping.

COURSE CONTENT

Unit : I

Principles – Important features of garden – kitchen garden -plan, layout, cropping pattern and principles of kitchen gardening

Unit: II

Ornamental – Botanical garden – Components – Trophy, Topiary , Hedges Edges, Borders, Arches, Lawn making, sunken garden , green house.

Unit: III

Indoor gardening – hanging pots – bonsai – window boxes – potted plants –water gardening – rockery – flower arrangement

Unit: IV

Olericulture - Cultivation of Brinjal; Pomology - Cultivation of Mango; Floriculture- Cultivation of flowers – jasmine, Extraction of jasmine concrete

Unit: V

Planning and layout of orchards – cultivation methods for fruits crops- cultivation of mango- intercropping, suitable intercrops and principles of intercrops

Prescribed Texts:

- Uma Shangar, *Indian Vegetables* - 2013
- Hari Krishna, *Ornamental Gardening* – 2012
- Vishnu Swarup, *Garden Flowers*– 2012
- Ranjit Singh, *Fruits* – 2013
- Bishvajit, *Vegetables*– 2013
- LaeeqFuthehally – (B.P), *Garden* – 2013

SEMESTER - IV

P**rogramme:** B.Sc., **Subject:** Botany

Semester: IV **Course:** Plant Anatomy and Plant Ecology

Course Type: Core - V **Course Code:** MUBC5

Contact Hours: 4 Hours/Week **Credits:** 5

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Impart knowledge about meristems and its various theories.
- Students gain fundamental knowledge of structure and classification of simple and complex tissues.
- Understand the primary and secondary structure of Dicot and Monocot plants.
- Develop knowledge in studying nodal anatomy.
- Develop skills in identifying morphological, physiological and anatomical adaptations of plants.

COURSE CONTENT

Unit - I Anatomy

Cell wall: ultra structure; pits and their types;. Meristems: Classification; characteristics; shoot and root meristems- various theories (Apical cell theory, Histogen theory, Tunica corpus theory and Korper-Kappe theory); Cambium.

Unit - II

Tissues: Simple tissues – parenchyma, collenchyma, sclerenchyma; complex tissues- xylem, phloem. Structure of monocot and dicot leaves;

Unit - III

Primary structure of dicot stem and dicot root; monocot stem and monocot root. – Normal secondary thickenings of Dicot stem and Dicot root

Unit - IV

Anomalous secondary growth of *Boerhaavia* and *Dracaena.* Nodal anatomy– A brief account – Unilacunar Node – Justicia , Trilacunar node – Azadirachta, Multilacunar node – Aralia .

Unit - V Plant Ecology

Study of the plant groups with special reference to their morphological, anatomical and physiological adaptations : Hydrophytes, Xerophytes, Halophytes -Plant succession Hydrosere , Xerosere .

Practicals:

1. Observation and identification of different types of tissues (slides).

2. Observation and study of internal structure of monocot (stem and root) and dicot (stem and root).

3. Observation and study of internal structure of monocot and dicot leaf (slides).

4. Observation and study of anomalous secondary growth in Boerhaavia

5. Observation and study of internal structure of Hydrophytes and Xerophytes

Prescribed Texts:

- Vashishta P.C. Plant Anatomy , S. Nagin & Co New Delhi.
- Venkateswarlu .V. Internal Morphology of Angiosperms
- Sharma .P.D. Elements of Ecology, Rastogi Publication, Meerut .
- Shukla R.S. and P.S. Chandel – Plant Ecology and Soil Science, S. Chand and Co ., New Delhi.

Reference Books:

- Katherine Esau. Anatomy of seed plants –2nd Edition Wiley, New York, 1965.
- R. F Suan E. Eichhorn. Esau's Plant Anatomy: Meristems, Cells, and Tissue of the Plant Body, 3rd Edition, 2006.
- Fahn. A Plant Anatomy. 3rd Edition. Pergamon Press New York. 1985.
- S. Carlquest. Comparative Wood Anatomy, Springer Science Publication. 2001
- V. Singh P.C. Pande and D.K. Jain Rastogi. Anatomy of Seed Plant,1998.
- B.P Pandey S. Chand. College Botany Vol II. New Delhi 2011.
- B.P. Pandey S. Chand. Plant Anatomy, New Delhi 2009
- Ambasht .R.S. A Text book of plant Ecology.
- R.S. Shukla and P.S. Chandel. A text book of Plant Ecology, 11th Edition. C. Chand and Company Ltd. New Delhi. 2007.
- H. D. Kumar. Modern concepts of Ecology 8th Edition, UBS Publisher's & Distributors Pvt. Ltd. New Delhi. 2007.

Programme: B.Sc., **Subject:** Botany

Semester: IV **Course:** Cell Biology and Embryology

Course Type: Core Paper - VI **Course Code:** MUBC6

Contact Hours: 4 Hours/Week **Credits:** 4

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Gain knowledge about prokaryotic and eukaryotic cell, different microscopes.
- Students understand the structure and functions of cell organelles like mitochondria, nucleus and chromosomes.
- Understand the structure and functions of golgi complex and cell division.
- Develop knowledge in studying the development of male and female gametophyte and types of ovule.
- Understand the types of endosperm, double fertilization and triple fusion.

COURSE CONTENT

Unit-I Cell Biology

The ultra structure of plant cell; comparative account of prokaryotic and eukaryotic cell, compound microscope and electron microscope: Plasma membrane – Structure and functions; Types of plastids, Chloroplast – Structure, functions and its significances.

Unit-II

Mitochondria – Structure and functions; Peroxisome and Glyoxysomes, Nucleus – Structure and functions; Chromosomes-shapes and functions- special type of chromosomes – Giant and lamp brush chromosomes. Ribosomes – Origin, Structure and functions

Unit-III

Golgi apparatus- Structure and functions; Cell cycle, Cell division – Mitosis and meiosis – significance; various stages of cell division progression; cytokinesis;

Unit-IV Embryology

Structure and development of microsporangium; microsporogenesis, development of male gametophyte; pollen wall features- megasporangium - types of ovule, nucellus, integument, obturator,

Unit-V

Megasporogenesis and development of female gametophyte – monosporic (*Polygonum*), Fertilization: Double fertilization and triple fusion; Endosperm – types–Cellular, Nuclear and Helobial, Ruminate (Haustoria not included) Dicot embryo –eg. Capsella , Monocot embryo – Luzula -.Polyembryony, Apomixis, Parthenocarpy- (only definitions with examples.)

Practicals:

1. Observation and study of T.S of young anther.
2. Observation of ovule types (slides).
3. Observation of embryo sac structure (chart).
4. Dissection of dicot embryo (any one stage).
5. Study of endosperm types (slide)
6. Observation and study of ultrastructure of cell organelles (chart, slides, models& micrographs).
7. Observation of different stages of mitosis in onion root tip squash preparation

Prescribed Texts:

- S.S. Bhojwani and Bhatnagar. *Embryology of Angiosperms*- S, P.Vikas Publishing House Pvt Ltd., 2009.
- P. Maheswari. McCraw-Hill. *An Introduction to Embryology of Angiosperm*- New York. 1963.
- Gupta, P. K. *A Textbook of Cell and Molecular Biology*. Rastogi Publications, Meerut, India. 1999.
- Verma P.S. & V.K. Agarwal – *Cytology,* S,Chand & Co , New Delhi.

Reference Books:

- Freifelder, D. *Essentials of Molecular Biology*, Jones & Bartlett, Boston. 1993.
- DeRobertis & De Robertis. *Cell and Molecular Biology*, Saunders College, Philadelphia, USA. 1990.
- Elliott WH & Elliott, DC. *Biochemistry and Molecular Biology*, 3rd Ed. Oxford University, Oxford. 2005.
- Watson, J.D. *Molecular Biology of Gene*. The Benjamin. Gummings publishing co. inc. California. 1987.

- Hopkins, W. *Molecular Biology of the Gene*. Benjamin publishing Company. California. 1988.
- Geoffrey, M. Cooper, Robert, E. Hansman. The cell- *A Molecular Approach*, Sinauer Associates. USA. 2007.
- Lee, P. J. *Plant Biochemistry and Molecular Biology*, 2nd edition. John Wiley and Sons, New York. 1999.

Programme: B.Sc., **Subject:** Botany

Semester: IV **Course:** Core Practical Paper II

Course Type: Core Practical Paper **Course Code:** MUBP2

Contact Hours: 3 Hours/Week **Credits:** 4

CIA: 40 **CE:** 60

COURSE OUTCOMES

- Impart knowledge in doing biochemistry experiments
- Students gain knowledge about the spotters and identify the specimens.
- Understand the morphology and taking sections.
- Develop skills to identify the different species.
- Develop drawing sketches of the structures of the specimens.

COURSE CONTENT

Plant Anatomy

1. To make suitable micropreparations of the angiospermic materials – Dicot and Monocot stem, root &leaves .

2. To draw labelled sketches of different types of microscope (Compound & Electron)

Cell Biology

3. To smear root tip and identify different stages of mitosis.

4. To smear young anther and identify different stages in meiosis

5. To identify cell inclusions

Embryology

6. To mount embryo (Tridax, Brassica)

7. To study and write critical notes on permanent preparation showing development of anther, Embryosac and embryo.

Biochemistry

8. Qualitative test for carbohydrates, proteins and fats.

9. Measurement of PH of soil solutions.

10. Preparation of Buffer.

11. Estimation of starch in plant tissue – Gravimetric and Calorimetric.

Bio Techniques

12. Determination of complementary colours and verification of Beer's law

13. Estimation of Sugars in plant tissues – colorimetry

14. Paper chromatography for separation of sugar, Aminoacids, Pigments, Dyes, Circular, Ascending , Column chromatography, separation of pigments.

Plant Ecology

15. Identification of section stems and leaves of Hydrophytic, xerophytic groups.

16. Identification of morphological, ecological and biological interests of ecologically important plants.

17. To maintain a record notebook and to submit it for external valuation

Programme: B.Sc., **Subject:** Botany

Semester: IV **Course:** Mushroom for Livelihood

Course Type: SBC **Course Code:** MUBML4

Contact Hours: 2 Hours/Week **Credits:** 2

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Gain knowledge about the nutritional and medicinal value of mushrooms.
- Understand the structure and characteristics of edible mushrooms.
- Understand the cultivation methods, spawn production techniques and harvesting of mushrooms.
- Develop knowledge in studying the problems in mushroom cultivation.
- Understand the preparation of mushroom recipes.

COURSE CONTENT

Unit-I

Introduction: importance, classification and test for identification of mushrooms. Nutritional and medicinal value of mushrooms.

Unit-II

Morphology and characteristics of common edible mushrooms.

a. Paddy straw mushroom (Pleurotus sp.)
b. Button mushroom (Agaricus bisporus)
c. Milky mushroom (Calocybe indica)

Unit-III

Cultivation methods – compost preparation – spawn production techniques – spawn running, cropping and harvesting.

Unit- IV

Post-harvest technology: Preservation and storage of mushrooms. Problems in mushroom cultivation-pest and diseases, weed moulds and their control.

Unit-V

Delicious recipes of mushrooms (mushroom soup, pickle) Economic importance of mushroom.

Prescribed Texts:

- Nita Bahl. *Handbook of Mushrooms*. Oxford and IBH publishing co .Ltd. New Delhi. 1996.
- Kapoor, J.N. *Mushroom Cultivation*, ICAR, New Delhi. 1989.

Reference Books:

- Aneja, K.R. *Experiments in microbiology, Plant pathology, Tissue culture and Mushroom cultivation.* Wishwa Prakshan, Ne. 1993.
- Pathak V.N. Yadav N. Goor .M. *Mushroom Production and Processing Technology*, Agrobios India Ltd. 2000.

SEMESTER - V

Programme: B.Sc., **Subject:** Botany

Semester: V **Course:** Taxonomy of Angiosperms and Economic Botany

Course Type: Core Paper VII **Course Code:** MUBC7

Contact Hours: 9 Hours/Week **Credits:** 5

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Impart knowledge about the morphological structures of angiosperms
- Students understand the binomial nomenclature, herbarium technique and classification of angiosperms.
- Understand the morphology and economic importance of families.
- Develop knowledge in identifying different families.
- Understand the extraction, chemical constituents and uses of rubber and coffee.

COURSE CONTENT

Unit: I

Plant morphology – modification of tap root system – modification of stem – aerial and underground stem- morphology of leaf : inflorescence types- racemose, cymose, mixed and special types, flowers and fruits – simple, aggregate and multiple fruits.

Unit: II

Binomial Nomenclature – Herbarium technique – classification – Bentham & Hooker; ICN and its role. Botanical Survey of India (BSI) – Modern approaches - Chemo Taxonomy and Digital Taxonomy

Unit: III

Study of following families with special reference to morphology of the modified plant parts and plants of economic importance

* Annonaceae * Rutaceae * Caesalpinaceae * Cucurbitaceae * Apiaceae

Unit: IV

Study of following families with special reference to morphology of the modified plant parts and plants of economic importance

***** Rubiaceae *****Asclepiadaceae *****Lamiaceae *****Amaranthaceae *****Euphorbiaceae

Unit: V

Study of following families with special reference to morphology of the modified plant parts and plants of economic importance

* Orchidaceae * Arecaceae *Poaceae

Economic Botany: Study of economically important plants of the above mentioned families with a special reference to the morphology of their uses.; Study of the extraction, chemical constituents, and uses of the following - Coffee, - Rubber.

Practicals:

* Diversity of Angiosperms: Morphology of Angiospermic plants.

* Taxonomy: Taxonomic study of plants belonging to the families as per the syllabus (only dicot families given for identification in practical examinations).

* Field visits: Botanical study tour for 3 or 4 days to be undertaken for covering various natural habitats and one or two single day collection trips.

* Submission herbarium: Submission of 15 herbarium sheets along with tour/trip report and field note book.

* Economic Botany: Study of the morphology and structure of useful parts of the plants mentioned in and herbarium sheets and collection of samples of plants.

* Ethnobotany: Listing of the medicinal practices of one or two tribes.

Prescribed Texts:

- O.P. Sharma. *Plant Taxonomy*. Data McGraw-Hill Publishing Company New Delhi. 2007.
- B.K. Verma. *Introduction to Taxonomy of Angiosperms*. PHI Learning Pvt. Ltd New Delhi. 2011.

- V. Singh, Dr. V. Singh & Dr. D.K. Jain. *Taxonomy of Angiosperms*, Second Edition. Rastogi Publications Meerut, India. 2010.

Reference Books:

Singh. *Plant Systematics*. Oxford & IBH Publishing Co., Pvt., Ltd. New Delhi. 2004.

A.K. Mondal. *Advanced Plant Taxonomy*. New Central Agency Pvt. Ltd. New Delhi. 2009.

B.P. Pandey. *College Botany* S. Chand and Co., Ltd. Vol. I. New Delhi. 2011.

Bharathi Bhattacharyya. *Systematic Botany*. Narosa Publishing House. India. 2009.

Dr.N.S. SubrahmanyamVikas. *Modern Plant Taxonomy* Publishing House Pvt. Ltd New Delhi.

Pandey, B.P. and Anita. *Economic Botany*, S. Chand and Co., Ltd. New Delhi. 2009.

Kochar, S.L. *Economic Botany of the Tropics* – Macmillan India Pvt. Ltd. 2000.

The Useful Plants of India – CSIR Publications and Information Directorate, New Delhi. 1986.

Sharma. *Economic Botany* , Tata McGraw Hill Co., Ltd. 1996.

Programme: B.Sc., **Subject:** Botany

Semester: V **Course:** General Microbiology

Course Type: Core Paper VIII **Course Code:** MUBC8

Contact Hours: 9 Hours/Week **Credits:** 4

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Acquire knowledge about the characteristics, multiplication and control of viruses.
- Understand the food poisoning, industrial manufacture of ethanol, penicillin, etc.
- Understand the decomposition, functions of humus and microbial degradation of cellulose.
- Develop knowledge in sewage treatment and control of microorganisms.
- Understand the structure of antigen and antibody, their reaction and types of immune systems.

COURSE CONTENT

Unit: I

Introduction to microbiology - definition and scope of microbiology, General characteristics of Bacteria. Classification of bacteria based on Morphological characteristics, viruses – general characteristics, structure and multiplication of TMV and bacteriophage, transmission of viruses, symptoms and control of rabies and AIDS

Unit: II

Food microbiology – microbial flora of food – food poisoning and food infection; industrial manufacture of ethanol; antibiotics – penicillin, vitamin B12; aminoacids- glutamic acid; production of SCP, industrial effluent.

Unit: III

Soil microbiology –soil microorganism the rhizophere microorganisms – organic matter decomposition, humus, functions of humus; microbial degradation of cellulose

Unit: IV

Microbiology of domestic water – microbiology of drinking water, municipal water and sewage water – brief account of sewage treatment process; determination of sanitary quality; chemotherapy and control of micro organisms through antibiotics

Unit: V

Immunology – basic principle of immunology, structure of antigen and antibody and their reaction; types of immunology –antigen, antibody - definition, types Ag- Ab reaction – types of immunosystem, human immune system, immunization schedule (WHO)

Practicals:

Microbiology:

1. Calibration of Microscope.
2. Sterilization techniques & Types.
3. Preparation of Basal medium – solid agar and broth
4. Preparation of agar plates, agar slants and agar deep tubes.
5. Isolation and culturing techniques of microbes – streak plate and pour plate methods.
6. Simple staining of bacteria.
7. Gram's staining of bacteria.

Prescribed Texts:

- Ananthanarayayan and Panikaer's. *Text book of Microbiology* ,ArtiKapil Publishing orent Blackswan – 2013.
- Rashmi A. Joshi. *A Text book of Immunology*, -2013.
- Powar. *General Microbiology* -2010.
- Powar. *General Microbiology* – 2010.

Reference Books:

- Pelczar, M.J (Jr), Chan, E.C.S and Krieg, N. R. *Morphology.* Tata McGraw Hill Publishing Company Ltd, New Delhi. 1986.
- Scheigel, H. S. *General Microbiology*, (6^{th} edition). Cambridge University press, London. 1986.
- Sharma, P.D. *Microbiology* (2^{nd} edition). Rastogi Publication, Meerut.
- Aneja, K. K. *Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Cultivation*, Wishwa Prakashan, New Delhi. 1996.
- Purohit, S. S. *Microbiology-Fundamentals and Applications*, (6^{th} Edition). Agrobios (India), Jodhpur. 1999.
- Dubey and Mageshwari. *Text Book of Microbiology*. S. Chand & Co. Ltd.

Programme: B.Sc., **Subject:** Botany

Semester: V **Course:** Plant Biotechnology

Course Type: Elective I **Course Code:** MUBE1

Contact Hours: 5 Hours/Week **Credits:** 5

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Acquire knowledge about the techniques used in biotechnology.
- Students understand the recombinant DNA technology and human health care products.
- Understand the plant tissue culture techniques and its role in crop improvement.
- Develop knowledge in transgenic plants and biological control of pathogens..
- Understand the composition of biomass and intellectual property rights.

COURSE CONTENT

Unit: I

Biotechnology – Definition, scope & importance. Techniques used in Biotechnology – Methods used in direct gene transfer – Vector mediated gene transfer Electroporation & Microinjection , Isolation of DNA, Principles of PCR – Application and uses, DNA Finger printing Techniques in Biotechnology.

Unit: II

Recombinant DNA technology vectors, cosmid , transposans- Definitions Agrobacterium and genetic engineering in plant – Ti plasmids – Incorporation of TDNA into DNA Human health care .

a) Insulin b) Human growth hormone c)Antibiotics d) vaccines

Unit: III

Plant tissue culture – Culture techniques types of medium Regeneration of plants Root culture, Anther culture, Role of tissue culture technology in crop improvements. Artificial seeds

Unit: IV

Transgenic plants – Definition Transgenic plants for herbicide, pest, fungi, and viral resistance. Biological control of pathogens & weeds through genetically engineered microbes – B, Thuringiensis

Unit: V

Plant Biomass – Definition composition of biomass, Biomass energy conversion, Bioenergy-Biofuels, Biodiesel. Role of genetically recombinant microbes in pollution control – Pseudomonas. Intellectual property Rights

Prescribed Texts:

- Dr. Sathyanarayana .U. *Biotechnology* , I- Edition, Kolkata. 2008.
- Gupta P.K. *Elements of Biotechnology*, Rastogi and Co ., Meerut ,India. 1994.
- R.C. Dubey. *A Textbook of Biotechnology*, S. Chand and Company Ltd, Ram nagar, New Delhi. 2007.

Reference Books:

- Trivedi .P. *Plant Tissue Culture*, Scientific Publishers, India. 2004.
- Jagadand .S.N. *Environmental Biotechnology*, Himalaya Pub. House. Mumbai. 1995.
- Jagdand .S. N. *Gene Biotechnology*, Himalayan Publishing House, Mumbai. 2006.
- P. K. Gupta *Elements of Biotechnology*, Rastogi publications, Meerut

Programme: B.Sc., **Subject:** Botany

Semester: V **Course:** Habitat Ecology

Course Type: Elective I **Course Code:** MUBE1

Contact Hours: 5 Hours/Week **Credits:** 5

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Impart knowledge about the uniqueness of the varying habitats in the biosphere.
- Students acquire knowledge about the structure and functions of different ecosystem.
- Understand the ecology of various habitats.
- Develop knowledge in understanding the environmental legislations.
- Understand the inventory of habitats.

COURSE CONTENT

Unit - I

Introduction to habitat ecology – historical, ecological and evolutionary perspectives – habitat concepts (edge, ecotones, interspersion and juxtaposition) – units of vegetation (formation, association, consociation, faciation and society); plant succession - processes and types (hydrosere and xerosere).

Unit – II

Ecology of major habitats; Forest (tropical rain forest, deciduous and coniferous) – scrub jungle and deserts (hot, dry and cold deserts) – grasslands (temperature and tropical).

Unit – III

Ecology of major habitats; Aquatic (fresh water – lentic and lotic) – marine (coasts, estuaries, mud, sand and rocky shores, mangroves & coral reefs) – tundra (arctic and alpine).

Unit – IV

Physical & anthropogenic factors - impact of habitats – habitat degradation and fragmentation – Environmental Impact Assessment (EIA) – Environmental audits – Environmental Legislations and Regulations.

Unit –V

Inventory of habitats – Remote Sensing (RS) and Geographical Information System (GIS) – Principles and applications of remote sensing techniques – land cover classification and mapping – use and values of GIS approaches to habitat ecology.

Prescribed Texts:

- Odum, E. P. (ed), Fundamentals of Ecology, W. B. Saunders Company, Philadelphia.
- Sharma P. D. Ecology and Environment, Rastogi Publications, Meerut. 1997.
- Dash, M. C. Fundamentals of Ecology, Tata Mc Graw Hill, New Delhi. 1993.
- Verma. A text book of plant ecology, Emkay publications, Delhi. 1975.
- Sahu, D. D. and R. M. Solanki. Remote sensing techniques in agriculture, Agrobios (India), Jodhpur. 2008.

Reference Books:

- Leonard Ortolano, Environmental Regulation and Impact Assessment, John Wiley & Sons, Inc. 1997.

Programme: B.Sc., **Subject:** Botany

Semester: V **Course:** Horticulture and Landscaping

Course Type: Elective II **Course Code:** MUBE2

Contact Hours: 5 Hours/Week **Credits:** 5

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Enrich knowledge about the techniques of orchard cultivation, soil management practices and pruning techniques.
- Students understand the vegetative propagation methods and systems of irrigation.
- Understand the different methods of gardening and flower arrangement.
- Develop knowledge in cultivation of vegetables, fruits and flowers and extraction of jasmine.
- Understand the uses of kitchen garden and its necessity.

COURSE CONTENT

Unit: I

Horticulture-scope and divisions – Botanical garden-components. Botanical gardens of the world, Botanical gardens of India- Orchard cultivation-soil management practices, intercropping, principles and suitable intercrops; Training –principles and methods; pruning-special pruning techniques and uses; fruit set and unfruitfulness, fruit drop

Unit: II

A brief account of methods of vegetative propagation- cutting, layering, grafting; manures-organic manures; fertilizers-types and methods of application; irrigation-systems of irrigation

Unit: III

Gardening – Landscape gardening, Lawn making, Rockery, Hanging pots, Bonsai, Water garden, flower arrangement- cut flowers (Only examples), and Ikabana

Unit: IV

Olericulture - Cultivation of Brinjal; Pomology - Cultivation of Mango; Floriculture- Cultivation of jasmine, Extraction of jasmine concrete

Unit V

Growth regulators in horticulture; plant protection measures – control of insect pests; Kitchen Garden- principles, plan, layout, cropping pattern and significance.

Prescribed Texts:

- Vishnu Sworup - *Ornamental Horticulture*
- Kumar. - *Introduction to Horticulture,* N Rohini agency, Nagerkovil
- Trivedi - *Home Gardening*
- Manibhussan Rao - *Horticulture*
- Hatmann and Kestr - *Fundamentals of Horticulture*

Reference Books:

- Edmond et al – *Fundamental of Horticulture* Tata Mc. Graw Hill Publishing Co, Bombay.
- Brelt – *Planing Your garden*
- Gopala Swami Ienger .K.S. – *Complete Gardening*
- Percy Lancester – *Gardening in India* , Rekha Printing, New Delhi.
- Choudhury - *Vegetables*
- Veeraghavanathan and others - *A Guide on Vegetable Culture*
- Manibhusan Rao – *Horticulture*
- Roy Genders – *Miniature Roses*
- Heliyer – *Gardener's Golden Treasury*
- Introduction to spices plantation crops medicinal and aromatic plants

Programme: B.Sc., **Subject:** Botany

Semester: V **Course:** Plant Tissue Culture

Course Type: Elective II **Course Code:** MUBE2

Contact Hours: 5 Hours/Week **Credits:** 5

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Impart knowledge about culture media and aseptic techniques.
- Understand the micropropagation.
- Understand the anther culture, pollen culture, ovary culture, etc.
- Develop knowledge in artificial seed production.
- Understand the secondary metabolites and cryopreservation.

COURSE CONTENT

Unit – I

Introductory History, Laboratory organization, Culture Media (MS medium), Aseptic Techniques.

Unit –II

Micropropagation – Direct and Indirect (Callus culture, Nodal culture, Meristem culture, Shoot tip culture), Somaclonal variation, Suspension culture.

Unit –III

Haploid culture – Anther culture, pollen culture and ovary culture - Triploid production.

Unit –IV

Isolation and culture of protoplast, Somatic Hybridization, Somatic Embryogenesis, Artificial seed production.

Unit –V

Production of secondary metabolites – alkaloids, steroids, and terpenoids (Brief account only). Cryopreservation and germplasm preservation.

Practicals:

1. Sterilization techniques (Fumigation, Flame sterilization, Dry heat, Wet heat and Filter sterilization)
2. MS Medium preparation

3. Callus culture
4. Nodal culture

References:

Narayanasamy, S. *Plant Cell and Tissue Culture* , Tata Mc- Graw- Hill Publishing & Co Ltd

J. Renert and Y.P.S. Bajaj. *Plant Cell, Tissue and Organ Culture*, Edited by, Narosa Publishing House New Delhi First Reprint 1989.

Razdan, M.K. *An Introduction to Plant Tissue Culture: Biotechnology*- U Sathyanarayana Books and Allied (P) Ltd, 2005.

Dubey. R .C S. Chand & Co. *Text Book of Biotechnology*, New Delhi, First Edition 1993.

Kumaresan, V. *Biotechnology* .

Balasubramanian et al. *Concept of Biotechnology*- University Press.

Aneja. K.P. *Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Production.* New Age International (P) Ltd. New Delhi. 2001.

P.K Gupta. *Elements of Biotechnology*, Rastogi Publication (Revised Second Edition 2009-2010), New Delhi.

S.S.Purohit. *A Laboratory Manual Plant Biotechnology*. Agrobios (India), Jodhpur. 2006.

C.C.Giri and Archana Giri. *Plant Biotechnology* Practical Manual. I.K. International Publishing House Pvt. Ltd. New Delhi. 2007.

Programme: B.Sc., **Subject:** Botany

Semester: V **Course:** Food Preservation

Course Type: SBC **Course Code:** MUBFP5

Contact Hours: 2 Hours/Week **Credits:** 2

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Enrich knowledge about the various process of food preservation.
- Understand the process of canning of apples and carrot.
- Understand the different methods of preservation process of fruit juices.
- Develop knowledge in understanding the preparation of jelly and jam.
- Understand the preparation of different sauces and different kinds of pickles.

COURSE CONTENT

Unit: I

General Principles and methods of Food Preservation; a) Sterilization or processing by heat b) Preservation by antiseptics such as sugar, salt and chemicals c) By drying d) Preservation by fermentation – Alcoholic fermentation, Acetic fermentation and Lactic fermentation.

Unit: II

Canning of fruit - Apple - peeling, blanching, canning and sterilizing; canning of vegetable - Carrot – Washing, trimming – slicing, salting and canning.

Unit: III

Preservation of fruits juice – Grape juice pressing – Heating, Sterilizing, Storage, Apple juice – Grating and pressing – filtration – use of enzymes – Ascorbic acid – packaging and pasteurization.

Unit: IV

Preservation of fruits syrups – Concentrates; Apple concentrates, syrup juice preparation – Concentration – Preservation. Jelly – Boiling the fruit – clearing; Addition of sugar, use of pectin, Jam – preparation of fruit – Addition of sugar, Boiling – use of pectin, concentration – Packaging.

Unit: V

Sauce – Tomato sauce – preparation of pulp – addition of ingredients – cooking, pasteurizing – canning raisins – harvesting, drying – turning stacking – placing in sweet box – packing; Preparation of pickles – Mango – salting and fermentation – softening of adding ingredients, canning and bottling.

Reference Books:

- Srivasatava R.P. *Preservation of Fruits and Vegetable Products*. Bisher. 1982.
- W.C. Frazies of D.C. Westhoff, *Food Microbiology*, Tata M.C. grew – Hill publishing company Ltd, New Delhi. 1983.
- M.R. Adams & M.O. Mass, V.S. Jothi, *Food Microbiology*, For New Age International Ltd. Publishers, New Delhi.

SEMESTER - VI

Programme: B.Sc., **Subject:** Botany

Semester: VI **Course:** Plant Physiology

Course Type: Core Paper IX **Course Code:** MUBC9

Contact Hours: 6 Hours/Week **Credits:** 5

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Impart knowledge about absorption of water, ascent of sap and transpiration.
- Students understand the importance of mineral nutrition and photosynthesis
- Understand the various aspects of respiration, photorespiration and mechanism of respiration.
- Develop knowledge in nitrogen metabolism.
- Understand the physiology of flowering, seed dormancy and biological clock.

COURSE CONTENT

Unit: I

Water relations in plants **-**Absorption of water**:** Imbibitions, Diffusion, Osmosis, plant cell as osmotic system, plasmolysis, significance and practical application, soil water. Mechanism of waterabsorption.

Ascent of sap: Mechanism – Brief mention of vital theories – physical force theories – transpiration pull and cohesion theory only;

Waterloss **:** Transpiration - definition, and types, cuticular, stomatal and Lenticular, Mechanism of Stomatal movement, Siginificance of transpiration – Other methods of loss of water -Guttation

Unit: II

Mineral nutrition- Hydrophonics, Role of Macro & Micro Nutrients & Deficiency Symptoms-Mineral salt Absorption – Carrier Concept ;

Photosynthesis :Mechanism – recent views on light Reaction – Photosynthesis unit – Emerson Effect – Two photosystem – Electron Transport chain – Photophosphorylation – cyclic and non-cyclic –Dark reaction – carbon fixation C3 and c4 pathways . Kranz anatomy. Crassulacean acid metabolism –CAM pathway

Unit: III

Respiration **:**Introduction, definition, significance and types of respiration– Respiratory quotient, Respiratory substrates – Relation between aerobic and anaerobic respiration, Mechanism of

Respiration : Glycolysis – Kreb's cycle . Terminal Oxidation – Electron Transport and Oxidative phosphorylation – Photorespiration.

Unit: IV

Nitrogen Metabolism- Sources of Nitrogen – N2 fixation – Symbiotic and Non symbiotic, Nitrate reduction- amino acid synthesis and protein synthesizing machinery in plants.

Unit: V

Physiology of flowering**:** Theories and concept of Photoperiodism and Vernalization – Role of Phytochromes – Seed Dormancy – causes and methods of breaking seed dormancy. Circadian Rhythms **(**definition only**)** – Biological clock – characteristics and significance .

Practicals:

1. Determination of osmotic pressure.
2. Factors affecting permeability of membrane.
3. Determination of rate of transpiration,
4. Separation of chloroplast pigments by paper chromatography.
5. Determination of rate of photosynthesis under variable CO_2 concentrations.
6. Determination of rate of photosynthesis under various light intensities.
7. Measurement of respiration (Ganong's respiroscope).
8. Determination of water absorption/transpiration ratio.

Prescribed Texts:

- Kochhar, P . L . and Krishnamurthy, H.N. *Plant Physiology*. Atmaram & Sons, New Delhi. 1989.
- Jain, V.K. *Fundamentals of Plant Physiology*. S. Chand & Co. New Delhi. 1995.
- Hopkins,W.G. *Introduction to Plant Physiology*. John Weiley & Sons Inc. New York, USA. 1995.

Reference Books:

- Salisbury, F.B and Ross, C.W. *Plant Physiology* (4th Edition) Wordsworth Publishing Co. California, USA. 1992.
- Devlinand Witham, F.H. *Plant Physiology*. 4th Edition, CBS Publishers and Distributors, New Delhi. 1999.
- Noggle, G.R. and Fritz, G.J. *Introductory Plant Physiology*. 2nd Prentice Hall of India, New Delhi. 2010.

- Verma, S.K. *A Textbook of Plant Physiology and Biochemistry*. Chand & Company Ltd, New Delhi. 1995.
- Mukherji. S. and A.K. Ghosh. *Plant Physiology*. Tata McGrawHill Publishing Company Ltd, New Delhi. 1996.
- Subhash Chandra Datta. *Plant Physiology*. Wiley Esteem Ltd, New Delhi. 1994.
- Sinha, R.K. *Modern Plant Physiology*, Narosa Publishing House, New Delhi. 2007.

Programme: B.Sc., **Subject:** Botany

Semester: VI **Course:** Genetics and Molecular Biology

Course Type: core paper X **Course Code:** MUBC10

Contact Hours: 7 Hours/Week **Credits:** 5

CIA: 25 **CE:** 75

COURSE OUTCOMES:

- Impart knowledge about gene interaction and multiple alleles
- Students understand the theories of crossing over and mutations
- Understand the mechanism of sex determination in plants.
- Develop knowledge in DNA and RNA structure, replication and types.
- Understand the gene regulation in prokaryotes and operon concepts.

COURSE CONTENT

Unit –I Genetics:

Introduction to Genetics- Mendelian inheritance - Mendel's Experiments- Law of Segregation, Law of Independent assortment, Law of Dominance, back cross and test cross; Non Mendelian inheritance - Gene interaction: Allelic interaction -Incomplete dominance and Lethal gene action; Non allelic interaction - Complementary genes, Dominant epistasis, Recessive epistasis, Multiple alleles with reference to ABO blood groups.

Unit: II

Linkage and crossing over with example – theories explaining mechanism of cross over (Chaisma Theory, Breakage First Theory, Contact Theory, Strain Theory, Differential Contraction Theory) – significance of cross over ; Mutation (Spontaneous and induced mutations), Physical and chemical mutagens; Brief outline of Chromosomal aberration; Application of Mutation & Polyploidy in crop improvement.

Unit: III

Mechanism of sex determination in lower plants- *Melandrium*, *Sphaerocarpos* and Bacteria; sex determination in higher plants, sex reversal; Extra Chromosomal inheritance in plants. Male sterility in Maize – Plastids inheritance in plants

Unit: IV Molecular Biology

DNA structure and types of replication, Mechanism of replication; RNA types, structure and function; Proof for DNA as genetic material

Unit: V

Gene regulation in prokaryotes, Operon concepts – lac operon, Modern concepts of gene- One gene –one enzyme hypothesis.

Practicals:

Simple problems on the following aspects: Monohybrid cross, Test cross, Incomplete dominance and Dominant epistasis.

Prescribed Texts

- Verma P.S. *Genetics*, Chand and Co ., New Delhi
- P.K. Gupta, *Molecular Biology and Genetic Engineering*.

Reference Books

- Simmons and Snustad. *Principles of Genetics* – Eighth edition - Gardner, John Wiley & Sons, Inc., Newyork. 1991
- R.S. Shukla and P.S.Chandel. *Cytogenetics, Evolution and Plant Breeding*-. S.Chand& Company (Pvt) Ltd, New Delhi. 1988.
- P.K. Gupta. *A Textbook of Cytology, Genetics and Evolution*-Third edition - Rastogi Publications, Meerut, India. 1979.
- Mahabal Ram. *Fundamentals of Cytogenetics and Genetics*- PHI Learning Private Limited, New Delhi. 2010.
- P.K.Gupta. *Genetics: Classical to Modern*-First Edition- Rastogi Publications, Meerut, India. 2007.
- S.B. Basu M. Hossain. *Principles of Genetics*- Books & Allied (P) Ltd, Kolkata. 2006.

Programme: B.Sc., **Subject:** Botany

Semester: VI **Course:** Herbal Medicine and Human Welfare

Course Type: Elective III **Course Code:** MUBE3

Contact Hours: 5 Hours/Week **Credits:** 5

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Impart knowledge about different systems of medicines.
- Students understand the systematic study of crude drugs.
- Understand the drugs obtained from flowers, fruits, seeds and all parts of plants.
- Develop knowledge in understanding cardio vascular drugs and anticancer drugs.
- Understand the medicinal properties of Ricinus and Citrus.

COURSE CONTENT

Unit: I

Pharmacognocy definition – A general survey of different systems of medicine – Indian system of Medicine, AYUSH- Ayurvedha, Unani, Siddha and Homeopathy system – future of pharmacognocy

Unit: II

A systematic study of crude drugs with reference to their vernacular name, family and uses; Drugs obtained from Roots (Rauwolfia, Citrus); Drugs obtained from Underground Stem (Garlic, Ginger); Drugs obtained from Bark (Cinnamon, Cinchona); Drugs obtained from Stems & Woods (Ephedra, Catechu) ; Drugs obtained from Leaves (Adhatoda, Aloe)

Unit: III

A systematic study of crude drugs with reference to their vernacular name, family and uses; Drugs obtained from Flowers (Safron, Clove); Drugs obtained from Fruits (Emblica, Cumin); Drugs obtained from Seeds (Cardamom, Fenugreek); Drugs from Whole Plant (Neem, Phyllanthus).

Unit: IV

A brief account of the following; Drugs acting on the central nervous system (CNS) - Drugs used in the disorders of the gastro intestinal track - Cardio vascular drugs - Anticancer drugs.

Unit: V

Cultivation, description, composition, medical properties and uses of the following;

-Ricinus and Citrus

Prescribed Texts:

- A. Purohit, S.R. Gokhaletwelth and C.K.Kokate,. *Pharmacognosy, E*d Publishers Niraliprakasan, Pune.

Reference Books:

- George, E.T. and William, C. E. *Pharmocognocy* –Twelth Edition, Publishers – English Language book society – Baclliere Tindall.
- Varro, E. Tylar, Linn. R. Brady and James, E. *Pharmocognocy* –Robbers Nineth Edition publishers – Lar and Fabiger – Philidelphia
- R.S. Satoskar and S.D. Bhandarkar. *Pharmocognocy and Pharmaco Therapeutics* Vol- I & Vol – II Thirteenth Edition – Revised Publishers – Popular Prakashan, Bombay.
- S. S. Handa and V. K. Kapoor, *Pharmacognocy*. Second Edition, publishers Vattubh Prakasan, Delhi.

Programme: B.Sc., **Subject:** Botany

Semester: VI **Course:** Plant Breeding, Evolution, Seed Technology and Biostatistics

Course Type: Elective Paper III **Course Code:** MUBE3

Contact Hours: 5 Hours/Week **Credits:** 5

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Impart knowledge about Hybridization.
- Students understand the evolution.
- Understand the Seed Technology.
- Develop knowledge in understanding the seed processing and certification.
- Understand the Biostatistics - mean, median and mode.

COURSE CONTENT

Unit-I Plant Breeding

Selection (Mass, Pure line and clonal selection), Hybridization- Types, Selection of parents, Methods of Emasculation- Bagging and tagging. Heterosis in crop improvement. Breeding achievements in Rice.

Unit-II Evolution

Introduction to Evolution - Origin of Life, Evidences for organic evolution; Theories of organic evolution (Darwinism, Lamarckism, Mutation Theory and Hugo De Vries and Wisemann theory).

Unit – III Seed Technology

Amphimixis – Scope, Aim and importance of seed technology, structure of seed and seed coat; Seed germination and factors affecting germination, Vivipary, Seed dormancy and its types.

Unit – IV

Seed dispersal – types; seed viability – Tetrazolium test; overview of seed collection, processing, storage and seed certification

Unit - V Biostatistics

General concepts and Terminology, Data-types (Primary and Secondary Data), Data collection, Sampling methods, Frequency distribution, Tabulation-General rules for Tabulation, Parts of

Tables and Types of Tables, Diagrammatic and Graphic representation of Data. Analysis of Data-Measures of Central tendency (Mean, Median and Mode), Measures of Dispersion (Range, Standard Deviation and Standard Error), Test of Significance: Chi-square test.

Practicals:

Plant breeding:

- Chromosomal mapping
- Simple problems on the following aspects: Monohybrid cross, Test cross, Incomplete dominance and Dominant epistasis.
- Hybridization techniques using potted plants.

Seed Technology

- Dissection of dicot embryo (any one stage).
- Study of endosperm types (slide).
- Testing of seed viability –Tetrazolium salt test.

Biostatistics:

- Data analysis to determine Mean & Mode
- Finding out Standard Deviation by giving Data from plant sources
- Chi-square test

Reference Books:

- Simmons and Snustad. *Principles of Genetics* – Eighth edition - Gardner, John Wiley & Sons, Inc., Newyork. 1991.
- R.S. Shukla and P.S.Chandel. *Cytogenetics, Evolution and Plant Breeding*- S.Chand & Company (Pvt) Ltd, New Delhi. 1988.
- P.K. Gupta. *A Textbook of Cytology, Genetics and Evolution*-Third edition - Rastogi Publications, Meerut, India. 1979.
- Mahabal Ram. *Fundamentals of Cytogenetics and Genetics*- PHI Learning Private Limited, New Delhi. 2010.
- P.K.Gupta. *Genetics: Classical to Modern*-First Edition- Rastogi Publications, Meerut, India. 2007.
- S.B. Basu M. Hossain. *Principles of Genetics*- Books & Allied (P) Ltd, Kolkata. 2006.
- P.S.S. Sundar Rao J.Richard. *Introduction to Biostatistics and Research Methods*- Fourth Edition- Prentice-Hall of India, New Delhi. 2004.

- A. Khan & Atiya Khanum. *Fundamentals of Biostatistics*- First Edition- Irfan Ukaaz Publications, Hyderabad, Andhra Pradesh, India. 1994.
- Dr. Veer Bala Rastogi. Kedar Nath Ram. *Organic Evolution* -12th Revised Edition- Meerut, New Delhi. 2007.
- S. Christopher and P. Prasanna Samuel. *Biostatistics: Principles and Practice* - B. Antonisamy, Tata McGraw Hill Education Private Limited, New Delhi. 2010.
- J. R. Sharma. *Principles and Practice of Plant Breeding*- Tata McGraw Hill Publishing Company Limited, New Delhi. 1994.
- Marcello, P. and Kimberlee, G. *Principles of Biostatistics* – Second Edition - Cengage Learning India Private Limited, New Delhi. 2008.
- Sanjib Chattopadhyay, *Origin, Evolution and Adaptation*, Allied (P) Ltd, Calcutta. 2007.
- Peter J Russell, *Essential Genetics*, II Ed, Blackwell Scientific Pub, London. 1987.
- R. A. Shukla and P. S. Chandel. *Cytogenetics ,Evolution, Biostatistics and Plant Breeding* - First Edition –S.Chand & Company Ltd, New Delhi. 2009.
- Agarwal. *Principles of Seed Technology*. IInd Edition Oxford and IBH Publications Pvt. Ltd. New Delhi India. 1995.

Programme: B.Sc., **Subject:** Botany

Semester: VI **Course:** Core Practical Paper III

Course Type: Core Practical Paper **Course Code:** MUBP3

Contact Hours: 3 Hours/Week **Credits:** 4

CIA: 40 **CE:** 60

COURSE OUTCOMES

- Impart knowledge in doing streaking and staining techniques.
- Students gain knowledge about the spotters and identify the specimens.
- Understand the morphology and taking sections.
- Develop skills to identify the different species.
- Develop drawing sketches of the structures of the specimens.

COURSE CONTENT

(Taxonomy of Angiosperms and Economic Botany, General Microbiology and Plant Biotechnology)

Time: 3 Hours **Max. Marks: 60 Marks**

1. Refer specimen **A** & **B** their respective families giving reason.
2. Describe specimens **C** in technical terms. Draw labeled sketches of the floral diagram and write the floral formula.
3. Spot at sight (Genus and Family) **D, E, F** and **G.**
4. Write down the Botanical Name, Family Morphology of the Useful Part and Uses of Commercially Important Part of **H, I** and **J**.
5. Prepare the bacterial smear using gram staining from the given the cell suspension **K**.
6. Demonstration the inoculation of microbes Streak Method/ Hanging Drop Method from the given Cell Suspension **L**.
7. Write notes on Morphology Interest **M, N** and **O.**
8. Comment on **P** and **Q** Picture/ Photograph of Biotechnological Interest.
9. Submission of Herbarium. 20 Sheets
10. Observation Note Book.

Programme: B.Sc., **Subject:** Botany

Semester: VI **Course:** Core Practical Paper IV

Course Type: Core Practical Paper **Course Code:** MUBP4

Contact Hours: 3 Hours/Week **Credits:** 4

CIA: 40 **CE:** 60

COURSE OUTCOMES

- Impart knowledge in doing physiology experiments.
- Students gain knowledge about the spotters.
- Understand the genetics problems.
- Develop drawing sketches of the structures of the specimens.

COURSE CONTENT

(Plant Physiology, Genetics and Molecular Biology)

To set up the following experiments and explain the working with suitable diagrams, observations and interpretations.

1. Imbibition – Dilatometer and Direct weight method.
2. Measurement of water potential Chardaov's method.
3. Determination of osmotic pressure – Plasmolsis method.
4. Rate of transpiration – Ganongs' photometer method under different conditions.
5. Rate of Photosynthesis – Hydrilla experiment of Willmolt's bubbler method using different colour filters.
6. Rate of Photosynthesis in different concentrations of Bicarbonate (bubble method)
7. Extraction and separation of photosynthesis pigments by paper chromatography.
8. Respiration- Determination of RQ of different germination seeds using ganong's respiration.

Experiments Set Up – Demonstration Only

1. Root pressure 2. Suction due to transpiration 3. Farmer's Photometer Ganong'arespiroscope 4. Anaerbic respiration 5. Fermentation 6. Evolution of heat during respiration 7. Light's half leaf experiment 8. Mohl's half leaf experiments 9. Measurement of growth using lever auxanometer

Genetics and molecular Biology

* To work out simple genetic problems in Mono hybrid and Di hybrid ratios
* To write explanatory notes on the Photographs / models / specimens.

Major Practicals / Course – IV / III – B.Sc., Botany

(Plant Physiology, Genetics and Molecular Biology)

Time: 3 Hours **Max: 60 Marks**

Sub Code: MUBP4

1. Ask for requirement, write the procedure, set up experiment and perform analysis or measurements as indicated

2. Solve the genetic problems **A** and **B**

3. Identify and write critical notes on **C, D, E, F** and **G**

4. Record Note Book

Programme: B.Sc., **Subject:** Botany

Semester: VI **Course:** Herbal Therapeutics

Course Type: NME II **Course Code:** MUBN2

Contact Hours: 2 Hours/Week **Credits:** 2

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Impart knowledge about different systems of medicines.
- Students understand the systematic study of crude drugs.
- Understand the drugs obtained from flowers.
- Develop knowledge in understanding drugs obtained from fruits, seeds and all parts of plants.
- Understand the medicinal properties of *Vinca* and *Gloriosa.*

COURSE CONTENT

Unit: I

*P*harmacognocy- definition – A general survey of different systems of medicine – Indian system of Medicine, AYUSH- Ayurvedha, Unani, Siddha and Homeopathy system – future of pharmocognocy

Unit: II

A systematic study of crude drugs with reference to their vernacular name, family and uses; Drugs obtained from **root** (Rauwolfia)*;* Drugs obtained from **underground stem** (Ginger); Drugs obtained from **Bark** (Cinnamon).

Unit: III

A systematic study of crude drugs with reference to their vernacular name, family and uses***;*** Drugs obtained from **Flower** (Safron); Drugs obtained from **Stem& Wood** (Ephedra)*;* Drugs obtained from **Leaves** (Adhatoda).

Unit: IV

Drugs obtained from **Fruit** (Emblica); Drugs obtained from **Seeds** (Cardamom); Drugs from whole plant (Neem).

Unit: V

Anti cancer drugs: Definition – Biological source and medicinal uses of two important anticancer plants – *Vinca* and *Gloriosa*

Prescribed Texts:

- C.K.Kokate, A.Purohit and S.R.Gokhaletwelth. Pharmacognosy –edition – publishers Niraliprakasan, Pune.

Reference Books:

- George, E. D. and Willia, C. E. *Pharmocognocy,* XII Ed, English Language book Society, BacllereTindall.
- Varro E. Tylar Linn. R. Brady and James E. Robbers. *Pharmocognocy* –Nineth Edition Publishers, Lar and Fabiger, Philidelphia
- R.S. Satoskar and S.D. Bhandarkar, *Pharmocognocy and Pharmaco Therapeutics* Vol- I & Vol – II, XIII Edition – Revised Publishers – Popular Prakashan, Bombay.
- S. S. Handa & V. K. Kapoor, *Pharmacognocy* - II Ed, VattubhPrakasan, Delhi.

Programme: B.Sc., **Subject:** Botany

Semester: VI **Course:** Environmental Studies

Course Type: EVS **Course Code:** MUES6

Contact Hours: 2 Hours/Week **Credits:** 2

CIA: 25 **CE:** 75

COURSE OUTCOMES

- Impart knowledge about environment.
- Understand the natural resources.
- Understand the ecosystem, ecological succession and ecological pyramids.
- Develop knowledge in understanding biodiversity and its conservation.
- Understand the environment, its pollution and the human population and environment.

COURSE CONTENT

Unit: I – The multidisciplinary nature of environmental studies

- Definition, scope and importance
- Need for public awareness

Unit: II - Natural resources

- Renewable and non – renewable resources
- Natural resources and associated problems

a. Forest resources : Use and over - exploitation, deforestation, timber extraction, mining, dams and their effects on forest and tribal people.

b. Water resources : Use and over -utilization of surface and ground water.

c. Mineral resources : Use and exploitation, environment effects of extracting and using mineral resources .

d. Food resources : World food problems, changes caused by agriculture and overgrazing, fertilizer pesticide problems,

e. Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate sources.

f. Land resources : Land as a resource, Land degradation, and degradation.

- Role of an individual in conservation of natural resources

Unit: III - Eco –system

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers,consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids

Unit: IV - Biodiversity and its conservation

- Introduction : Definition
- Hotspots of biodiversity
- Threats to biodiversity : habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity .

Unit: V - Environmental pollution

- Definition
- Causes, effect and control measures of
- a).Air pollution
- b).Water pollution
- c).Soil pollution
- d). Noise pollution
- Solid waste management : causes,effect and control measures of urban an industrial wastes
- Role of an individual in prevention of pollution

Unit: VI-Environment

- From unsustainable to sustainable development
- Water conservation, rain water harvesting, watershed management
- Environmental ethics: issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion,

Unit: VII - Human population and the Environment

- Population explosion family welfare programme
- Environment and human health
- Women and child welfare
- Role of information technology in environment and human health

Unit: VIII

- Visit to a local area to document environmental assets- river /forest / grassland / hill/ mountain.
- Visit to a local polluted site – Urban /Rural/ Industrial / Agriculture

Prescribed Texts:

- N.Arumugam and V.Kumaresan. *Environmental Studies*, saras Publications, Kanyakumari. 2005.

Reference Books:

- D.K. Asthana, MeeraAsthana. *A Text Book of Environmental Studies* (For Undergraduate studies), S.Chand and Company Ltd. New Delhi. 2006.
- V. Dhulasi Birundha. *Environmental Studies*, Allied Publications,Chennai. 2006.
- K. S. Kanagasabai. *Environmental Studies*, RaSee Publications, Madurai. 2005.
- R. Kannan, P. Badri Sriman Narayan , *Environmental Studies*, NGM, Publications, Pollachi.
- A. Thagamani, Shyamal, T. *A Text book of Environmental Studies*, Pranav Syndicate, Sivakasi. 2003.

EXTRA-CERDIT COURSES

Programme: B.Sc., **Subject:** Botany

Course: Dietary and Nutritional Value of Fruits and Vegetables

Course Type: Extra Credit Course - I **Course Code:** UGEDFV

Contact Hours: 20 (Out of College Hours) **Credits:** 2

CIA: -- **CE:** 100

COURSE OUTCOMES

- Impart knowledge about balanced diet.
- Students understand the functions of food.
- Understand the nutritional classification of foods.
- Develop knowledge in understanding the diet for various deficiencies.
- Understand the allergic and non allergic foods.

COURSE CONTENT

Unit – I

Importance of balanced diet food groups and nutritive value of foods.

Unit – II

Function of foods – Physiological, Psychological and Social Functions.

Unit – III

Nutritional classification of foods – Energy Yielding Crops, Body Building Crops and Protective foods – Nutraceuticals – Definition and Importance.

Unit – IV

Fruits and Vegetables issued as the diet for Diabetes, Fever, Hyper tension, Hormonal Imbalance – Arthritis and Obesity Immunity Enchancements.

Unit – V

Allergic foods – Remedial Crops for Deficiency Disease and Allergic Symptoms.

Reference books

- Swaminathan, M. Advanced Text Book on Food and Nutrition (Vol. II), 2nd Edition. The Bangalore printing and publishing CO., Ltd., Bangalore. 1978.
- Wilson, E.D., Fischer, K.H., and Fuqua, M.E. Principles of nutrition 2nd Edition, Wiley Eastern Pvt, Ltd. 1971.
- Sri Lakshmi, B. Dietetics. New Age International Pvt, Ltd., Publishers New Delhi. 2006.

Programme: B.Sc., **Subject:** Botany

Course: Commercial Plant Products

Course Type: Extra Credit Course **-** II **Course Code:** UGECP

Contact Hours: 20 (Out of College Hours) **Credits:** 2

CIA: -- **CE:** 100

COURSE OUTCOMES

- Impart knowledge about balanced diet.
- Students understand the functions of food.
- Understand the nutritional classification of foods.
- Develop knowledge in understanding the diet for various deficiencies.
- Understand the allergic and non allergic foods.

COURSE CONTENT

Unit - I

Importance of economically important plant products – a brief Introduction about the Food Grains any two, Pulses any two, Spices any two, Woods any two.

Unit – II

Economically important plant products – Rubber, Coir Industry – Agave and Banana, Oil Industry – Sunflower oil.

Unit – III

Processing of Coffee Power – Types of Coffee – Grading of Coffee.

Unit - IV

Sugar Industry – Extraction of Sugar from Sugarcane

Unit – V

Paper Making Industry – Preparation of Pulp – Types of Paper Making of Paper

Reference Books:

- B.P. Pandey, S. Chand. Economic Botany. 1999.
- Sampat Nehra. Economic Botany.2007.
- Dr. S. Sundararajan. Morphology and Economic Botany of Angiosperms – Anmol publications P. Ltd. 1997.
- Robert Hill. Economic Botany.
- K.C. Casida. Industrial biotechnology

Programme: B.Sc., **Subject:** Botany

Course: Biodiversity Conservation and Management

Course Type: Extra Credit Course - III **Course Code:** UGEBCM

Contact Hours: 20 (Out of College Hours) **Credits:** 2

CIA: --- **CE:** 100

COURSE OUTCOMES

- Impart knowledge about environment.
- Understand the natural resources.
- Understand the threats and natural calamities.
- Develop knowledge in understanding biodiversity and its conservation.
- Understand the environment, In situ and Ex situ Conservation.

COURSE CONTENT

Unit – I

Concept and value of plant – Diversity classification types of Biodiversity consumptive, productive, social ethical and aesthetic values – Importance of Plant Diversity.

Unit – II

Centers of plant diversity in India, Ethno Botanical Survey, ICN – Types of Categories Endangered, Vulnerable, Threatened, Rare, Extinct – Major plant species in Red Data Book and Green Book.

Unit – III

Major Threats Climatic (Light, Temperature, Rain), Edaphic (Soil Types P^H Soil Nutrients), Naturals Calamities (Cyclone, Tsunami, Earth quake).

Unit - IV

Conservation of plant diversity – principles types – Insitu and Exsitu Conservation – Conservation management – methods.

Unit - V

Insitu: Nationals Parks, Nurseries and Botanical Gardens.

Exsitu: Plant Tissue Culture, Germ Plasm Storage, Cryopreservation – (Gene Banks), Needs / Methods of plant management – Forest Production Act/ Biodiversity Act any two important.

Reference books:

- Kumar, U. and Mahendra Jeet Asiya. Biodiversity, Principles and Conservation. Agrobios (India), Jodhpur India. 2005.
- Kartikeya, K. Biodiversity – Extinction and Conservation. Avavishkar Publishers, Distributors, Jaipur, India. 2005.
- Agarwal, K.C. Biodiversity. Agrobios (India), Jodhpur, India. 2000.

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