TUMKUR UNIVERSITY
TUMAKURU

B.Sc. (UG) Botany Syllabus CBCS

2016-17 on wards

Proceedings of Botany Workshop (UG) held on 04.01.2017 at Tumkur University. Tumkur

1) All members who were present has through discussion regarding CBCS Botany syllabus of III, IV, V &VI semesters.
2) There were anamolies in Paper III &IV at the same time the papers for V & VI semester were not specified.
3) The course structure and matrix for semester I-VI was not prepared previously and the same is prepared.
4) In the present workshop following changes were made which are as follows.

	Present Syllabus (Titles)	Modified Syllabus(Titles Changed)
1	Paper-I – Biodiversity	Not Modified
2	Paper-II – Plant ecology & Taxonomy	Plant Ecology, Phyto geography & Plant Pathology
3	Paper-III–Plant Anatomy & Embryology	Embryology of Angiosperms & Tissue Culture
4	Paper-IV- Plant Physiology & Metabolism	Plant Anatomy, Morphology of Angiosperms & Plant Propagations.
5	Open elective- Medicinal Botany	Not Modified
6	Paper-VI- Not Specified	Taxonomy, Economic Botany & Ethno botany
7	Paper-VII- Not Specified	Cytology, Genetics, Plant breeding & Evolution.
8	Paper-VIII- Not Specified	Plant Physiology & Metabolism
9	Paper-VIII- Not Specified	Molecular biology Genetic Engineering Bio informatics & Biotechnology

5) Members present –List enclosed

04.01.2017

The following teaching Staff members attended one day Workshop on Botany Syllabus of semester II, III, IV, V & VI at Tumkur university, Tumkur on 04.01.2017.

	Name & College	Signature
1)	H.N. Vijayendra, Sri Siddartha F.G. college, Tmk	4/1/17
2.	B.M. Chidanandaswamy	
3)	Bhalini. B.R	4/1/17
4)	Dr. V.N. Murthy	4/1/17
5)	Prakasha	
6)	S. Amarnath.	
7)	G. Chidanand. Indg	
8)	B.M. Bhyrappa.	
9	Narasimharaju. K.J.	
10	T.H. Shimma Reddy, Chairperson	

BOS CHAIRPERSON IN BOTANY (UG)
TUMKUR UNIVERSITY, TUMKUR.

BSc Programme; Course structure Matrix for Semester-I to IV in Botany –CBCS

Sl No	Course number in Semester	Paper No Title of Paper in I/II/III/IV	Type of Instruction & Hours per week	Credits	Hours of (Exam (SEE) Per Course/sem	Max Marks for IA/Course /Sem	Max Marks for SEE/Cours e/Sem	Total Marks Course/Sem
1	I Sem	Paper-I Bio diversity	04	04	03	10	90	100
2	I Sem	Practical No-I Based on Theory	04	2	3	-	50	50
3	II Sem	Paper II Plant Ecology Phyto Geography Pt Pathology	04	4	3	10	90	100
4	II Sem	Practical –II Based on theory	04	2	3	-	50	50
5	III Sem	Paper-III Embryology of Angio sperms & Tissue Culture	4	4	3	10	90	100
6	III Sem	Practical –III Based on theory	04	2	3	-	50	50
7	IV Sem	Paper-IV Pt Anatomy Morphology of Angiosporns, pt Propagation	4	4	3	10	90	100
8	IV Sem	Practical –IV Based on theory	04	2	3	-	50	50
Open Elective								
9	IV Sem	Open Elective Medicinal Botany	2	2	3	-	50	50

Tumkur University

BSc Programme: Course structure Matrix for Semester-V & VI in Botany –CBCS

Sl No	Course number in Semester	Paper No Title of Paper in V &VI	Type of Instruction & Hours per week	Credits	Hours of (Exam (SEE) Per Course/sem	Max Marks for IA/Course /sem	Max Marks for SEE/ Course/sem	Total Marks Course/sem
1	V Sem	Paper-V Taxonomy & Economic Botany & Ethnobotany	3	3	3	10	90	100
2	V Sem	Practical V Based on Theory	3	2	3	-	50	50
3	V Sem	Paper VI Cytology, Genetics, Plant breeding & Evolution	3	3	3	10	90	100
4	V Sem	Practical –VI Based on theory	3	2	3	-	50	50
5	VI Sem	Paper-VII Plant Physiology & Metabolism	3	3	3	10	90	100
6	VI Sem	Practical VII Based on Theory	3	2	3	-	50	50
7	VI Sem	Paper-VIII Molecular biology Genetic engineering, Bio informatics & Bio-technology	3	3	3	10	90	100
8	VI Sem	Practical VIII Based on Theory	3	2	3	-	50	50
		8 Courses for 4T & 4P	24/Week	20	24	40	560	600

CORE SUBJECT: BOTANY PAPER-1

FOR 1ST SEMESTER CBCS SCHEME

[2016-17 ONWARDS]

BIODIVERSITY (ALGAE, FUNGI AND ARCHEGONIATE)

Credits: Theory-4 and Practicals-2 **60 Lectures**

UNIT 1: MICROBES **11 Lectures**

Virus: Discovery, general structure, replication of TMV, HIV and T-Phage, Viral diseases in Plants-Leaf curl of Papaya and Bunchy top of Banana,

Bacteria: Discovery, general Characteristics, cell structure and reproduction-Vegetative, asexual and genetic recombination (Conjugation and transduction), Economic importance.

UNIT 2: ALGAE **11 Lectures**

General Characters, classification [G.M.Smit], thallus organization and economic importance, life cycle: Scytonema, Oedogonium, Ectocarpus and Polysiphonia

UNIT 3: FUNGI **13 Lectures**

General Characters, nutrition, classification [G.M.Smith]. Life Cycles: Pencillium, Puccinia, and Cercospora, General account of Micorrhiza and Lichens

UNIT4: ARCHEGONIATE **1 Lectures**

Introduction, Transition to land habit and alternation of generation

UNIT 5: BRYOPHYTES **10 Lectures**

General characters and classification, Morphology, anatomy and reproduction in Marchantia and Funaria

UNIT-6: PTERIDOPHYTES **8 Lectures**

General Characters, Classification [G.M. Smith} and stelar evolution, Morphology, anatomy and reproduction in Psilotum, Selaginella and Osmunda, Fossil-Rhynia

UNIT7: GYMNOSPERMS **6 Lectures**

Introduction and affinities with angiosperms, Morphology, anatomy and reproduction in Cycass and Gnetum

PRACTICAL SYLLABUS-I

BIODIVERSITY (ALGAE, FUNGI AND ARCHEGONIATAE)

1) VIRUS: TMV [Photocopy], Papaya leaf curl and Bunchy top of Banana
2) BACTERIA: Gram staining of curd sample and Rhizobium root nodule
3) STUDY OF ALGAE: Scytonema, Oedogonium,
4) STUDY OF ALGAE: Ectocarpus and Polysiphonia
5) STUDY OF FUNGI: Penicillium [photocopy / permanent slides] and Cercospora
6) STUDY OF FUNGI: Puccinia,. _,
7) STUDY OF: Lichens and Micorrhiza [photographs / permanent slides]
8) STUDY OF BRYOPHYTES: Vegetative and reproductive structures in Marchantia and Funaria
9) STUDY OF PTERIDOPHYTES: Psilotum, Selaginella
10) STUDY OF PTERIDOPHYTES: ' Osmunda, and Rhynia [photocopy/ slide].
11) STUDY OF GYMNOSPERM: Cycas: morphology [leaf /leaflet and corolloid root]T. S of leaflet, male cone, microsporophyll, megasporophyll and V.S. of ovule
12) STUDY OF GYMNOSPERM: Gnetum: morphology [leaf, male and female cone] T.S. of stem, anomalous secondary growth and V.S. of ovule

PRACTICALQUESTION PAPER-1

TIME: 03 HOURS MAX MARKS: 50

2. Identify and classify the specimens A, B, C, and D and E with reasons 5 X 3 = 15
3. Identify the permanent slides F,G,H,I ,and J with labelled diagrams and reasons 5 X 3 = 15
4. Stain the given sample K using Gram staining, write the procedure and identify with reasons and leave the preparation for evaluation 1 X 6 = 6
5. Comment on the material L 1X 2 = 2
6. Submissions:
   i. Algae (1 specimen)
   ii. infected plant material (1) in herbarium form 2X1=2
   iii. Project report on tree planting and nurturing
7. Viva voce 2
8. Class records 5

SCHEME OF VALUATION

I. A-Algae, B-Fungi, C-Bryophytes, D- Pteridophytes, E-gymnosperms
Identification - ½, Classification -½, Reasons - 2

II. F- Algae, G-Fungi, H-Bryophytes, I-Pteridophytes, J - Gymnosperms
Identification - 1, Diagram + Labelling - 1, Valid reasons - 1

III. K - Curd sample / Rhizobium root nodule
Procedure writing - 2, Preparation - 3, Identification - 1

IV. L - Photocopy of TMV / Lichens / Mycorrhiza
Identification - 1, Comment - 1

II-SEMESTER
PAPER-II PLANT ECOLOGY, PHYTOGEOGRAPHY AND PLANT PATHOLOGY

Theory : 90 Marks. Credits-4
60Hrs

4 Hrs. per week.

Unit-1: Introduction and scope of ecology. 2 hrs.

Unit-2: Ecological factors – climatic factor – Light, Temperature Wind, precipitation and Atmospheric humidity. Edaphic factors – Soil Profile, Types of soil, soil Humus, Soil Water, Soil pH, Soil organisms and soil temp. Biotic factors – Positive and Negative interactions. 10 hrs.

Unit-3 : Ecosystem – Concept, Components, Study of Marine, Grassland and Forest Ecosystems, Food Chain, Food Web, Ecological Pyramids, Production and Productivity (Primary and Secondary), Biogeochemical Cycles – Carbon, Nitrogen and Phosphorus. 10 Hrs.

Unit-4: Ecological adaptations – Hydrophytes, xerophytes, Halophytes, Epiphytes and parasites.

Ecological succession – Definition, Process of succession, Xerosere and Hydrosere.

Pollution – A brief account on air, water and soil. Global issues – Green house effect, ozone depletion, Nuclear winter, Solid Waste management.

14 Hrs.

Unit-5: Plant biodiversity – Definition, types, values of biodiversity Conservation – Soil Conservation, Social forestry, Hot spots, Endangered species, Red data book.

Phytogeography - Phytogeographical regions of India, Vegetational types of Karnataka. 10 hrs.

Unit-6 : Plant pathology – Introduction and classification of plant diseases based on pathogens.

Symptoms, causal organism and Management of

1. Koleroga
2. Late blight of Potato.
3. Grain smut of Sorghum.
4. Blast disease of Rice
5. Red rot of Sugar Cane.
6. Citrus canker.
7. Coffee rust.
8. Tikka disease.

A brief account of bio-pesticides – Neem, Trichoderma

14 hrs.

References :

1. Odum E.P. (1971) Plant Ecology, W.B. Sanderson Co. Philadelphia.
2. Sharma P.D. (1993) Ecology and Environment, Rastogi publications, New Delhi.
3. Sundarrajan S. (1997), College Botany Vol II, Himalaya Publication.
4. Trivedi. A text book of Environmental Sciences. L.B. Publishers.
5. Ambasht – A text book of Plant Ecology. L.B. Publishers.
6. R.S. Shukla & P.S. Chandel – Test book of Plant Ecology.
7. Singh R.S. Plant diseases. Oxford and IBH, New Delhi.
8. Mehrothra. Plant Pathology.
9. Kochar. Ecology.

PRACTICAL SYLLABUS – PAPER-II

Credits-2

1. Study of morphological character of Hydrophytes (*Eichhornia, Elodea*). Xerophytes (*Casuarina, Opuntia, Nerium*), Epiphyte (*Vanda),* Halophytes *(Rhizophora*), Parasites (*Cuscuta).*
2. Study of Anatomical Characters (Slides only)
   Elodea, Nerium or *Casuarina, Rhizophora,* Vanda aerial root, *Cuscuta.*
3. Study of Ecological instruments – photographs of Hygrometer, Anemometer, Rain gauze, Lux meter.
4. Determination of PH of soil, soil porocity.
5. Water holding capacity of different soil samples.
6. Determination of Relative density of Plant species by Qudrat method (Demonstration only).
7. Determination of Total hardness of the given Water sample.
8. Study of plant diseases – Koleroga, Late blight of potato, Grain smut of Sorghum, Blast disease of Rice.
9. Study of plant diseases – Red rot of Sugar Cane, Citrus Canker, Coffee rust, Tikka disease.

PRACTICAL QUESTION PAPER – II

Time : 3 Hrs. Max. Marks : 50

1.	Write Ecological features of A and B.	2x4=8
2.	Identify the slides C & D.	2x4=8
3.	Write a note on Ecological Instrument 'E'.	1x4=4
4.	Estimate Total hardness of the given sample F	1x12=12
5.	Identify the specimens G and H	2x4=8
6.	Vivo Voce + Submissions.	3+2=5
7.	Class Records.	05

SCHEME OF VALUATION

1. Specimens from Morphological characters of Ecological groups
   Identification-1, Diagram-1, Comment-2
2. Slides from Anatomy of Ecological groups
   Identification-1, Diagram-1, Comment-2
3. Ecological instruments
   Identification-1, Comment-3
4. Total hardness of given sample.
   Procedure & Principle-6, conducting-5, Result-1
5. Plant Pathology
   Identification-1, Comment-3
6. Vivo-Voce – from above topics, submissions – Any two plant diseases.
   Vivo-3 Submission-2
7. Class Records -5

Paper – III

EMBRYOLOGY OF ANGIOSPERMS AND TISSUE CULTURE

Credits 4

60 Hrs

UNIT1: INTRODUCTION TO EMBRYOLOGY 2 Hours

Contribution of Indian Embryologists–P.Maheshwari, Bhojwani and Bhatnagar, BGL Swamy and Kashyap**.**

UNIT 2: ANGIOSPERMIC FLOWER 12 Hours

Structural organization of a flower,Microsporangium - Structure and development of mature anther. Tapetum, Microsporogenesis, Types of pollen tetrads, Structure of pollen grain, Pollen embryo sac, structure and development of male gametophyte, Concept of male germ unit. Palynology: Pollen morphology (Apertures, Shape, Size and Pollen wall architecture), Significance of Palynology (Allergy and Forensic science)

UNIT 3: MEGASPORANGIUM 10 Hours

Placentation and types, Types of ovules, Structure of Anatropous ovule, Megasporogenesis - Develpoment of female gametophyte / Embryosac: Monosporic (*Polygonum* type), Bisporic (*Allium* type) and Tetrasporic (*Fritillaria* type). Structure of mature Embryosac.

UNIT 4: POLLINATION AND FERTILIZATION 9 Hours

Definition, types, mechanism (lever mechanism), contrivances and adaptations for pollination. Process of fertilization, preferential fertilization, Pollen pistil interaction, Post- fertilization changes.

UNIT 5: EMBRYO AND ENDOSPERM 9 Hours

Structure and development – Classification of Embryo, Dicot embryo (*Capsella bursa* pastoris), Monocot embryo (Najas or Grass). Endosperm: Types – Nuclear, Cellular and Helobial, Ruminate endosperm

UNIT 6: PLANT TISSUE CULTURE 12 Hours

Defination, concept of totipotency, instruments used in plant tissue culture, sterilization techniques, nutrient media- Agar, MS and White's media, techniques in plant tissue culture, Practical applications. Organ culture (anther, embryo and protoplast culture), Somatogamy, Cybrids-brief account of synthetic seeds

UNIT 7: Apomixis 6 Hours

Brief account of apomixis (recurrent and nonrecurrent) apospory, polyembryony, parthenocarpy, control of fertilization.

REFERENCES

1. Maheshwari,P TMH edition 1971, 14th reprint 1994 An introduction to the embryology of Angiosperms. Tata Mc Graw-Hill publication
2. Bhojwani,S.S and Bhatnagar,S.P 1979.Embryology of Angiosperms. Vikas publications
3. Swamy,B.G.L From flower to seed
4. Johri,B.M 1984 Embryology of Angiosperms. Springer-Verlag publications, Berlin
5. Sundarrajan,S College Botany Volume II Himalayan publication

PRACTICAL- III

Credits - 2

1. Study of T.S of Anther and types of tetrads
2. Study of pollen grain, mounting of pollen grain- Grass, Hibiscus, Acacia, Mimosa
3. Study of pollen germination by Hanging drop method
4. Calculation of percentage of pollen germination in *Vinca rosea*
5. Study of placentation and types of ovules
6. Mounting of embryo of *Tridax* and pollinia of *Calotropis*
7. Mounting of endosperm of *Cucumis sativus*
8. Study of instruments used in plant tissue culture
9. Sterilization of glass wares
10. Preparation of Agar media and MS broth

PRACTICAL QUESTION PAPER-III

Duration: 3 Hours **Maximum Marks: 50**

1.	Identify the slides **A**,**B& C** with labeled diagrams and reasons	3X5=15
2.	Prepare pollen germination of the material **D** by Hanging drop method, and calculate the percentage of Pollen germination	8
3.	Mount the material E	4
4.	Mount the endosperm / embryo of the specimen **F** and comment	5
5.	Comment on **G**	4
6.	Write the procedure for the sterilization of glass wares / preparation of nutrient media	4
7.	Viva-Voce + Submissions	3+2=5
8.	Class Records	5

SCHEME OF VALUATION FOR PRACTICAL EXAMINATION

1. Slides **A, B** & **C** - T.S of anther, types of placentation, types of ovules
   [Identification-1, Diagram-1, Labelling-1, Reasons-2]
2. Pollen germination of **D** – Vinca Rosea
   [Preparation-4, Diagram-1, Caluculation-2, Reasons-1]
3. Pollinia of Calotropis
   [Preparation-2, Diagram-1, Reasion-1]
4. Mounting of endosperm [Cucumis] / embryo [Tridax] of **F**
   [Mounting-2, Diagram+labeling-1, Comment-2]
5. Spotter **G** - instruments or photocopies of instruments used in plant tissue culture
   [Diagram-1, Labelling-1, Comment-2]
6. Procedure writing for the sterilization of glass wares / preparation of nutrient media [4Marks]
7. Viva-Voce – Questions regarding practical question paper + Submissions-2 Slides[Pollen grains Of Grass , Hibiscus, Acacia, Mimosa.] 3+2
8. Class Records. 5 Marks

IV-Semester Paper-IV

Plant Anatomy, Morphology of Angiosperms, Plant Propagations

Theory-90 Marks Credits-4

4 Hrs Per Week. 60 Hrs.

Unit-1 : Meristamatic tissues – structure, classification based on origin, position and function.

Theories of Apical meristems -Histogen theory, Tunica-Corpus theory.

Permanent tissues-Simple and Complex and Secretory tissues. 14 Hrs.

Unit-2 : Structure of Dicot & Monocot Root, Stem and Leaf. 8 Hrs.

Unit-3 : Secondary growth in Dicot stem, Anamalous secondary growth in *Dracena* and *Boerhaavia*.

Wood anatomy-A brief account, types of wood (Spring, Autumn Duramen, Alburnum, Porus wood and Non Porous wood). 10 Hrs.

Unit-4 : Morphology of Angiosperms-Root System and its modifications,

Shoot system and Stem modifications, Leaf and its modifications, Inflorescence, Floral morphology and Fruits. 20 Hrs.

Unit-5 : Plant Propagation-Methods of Vegetative propagation-

Natural- Rhizome, Tuber, Corm, Bulb, Sucker, Stolon and offset, Artificial-Stem Cutting, Grafting and Layering. 8 Hrs.

REFERENCES

1. Vashista P.C.(1994) Plant anatomy, Pradeep publication, New Delhi.
2. Srivastava H.N. (1998) Anatomy of Angiosperms, Pradeep Publication, New Delhi.
3. B.P. Pandey 2001 Plant Anatomy S. Chand Publication, New Delhi.
4. Mukarjhee College botany.
5. Datta S.C. 1988 Systamatic botany, Wailey Eastern, New Delhi.
6. Bendre & Kumar Text book of Practical botany II, Rastogi Publication, Meerut.
7. K. Esau, Anatomy of Seed Plants.

PRACTICAL SYLLABUS -IV

Credits-2

1. Anatomy of Dicot & Monocot stem-*Tridax*, Grass/Sorghum/Maize.
2. Anatomy of Dicot & Monocot Root-Cicer, Grass/Sorghum/Maize.
3. Anatomy of Dicot and Monocot Leaf-*Tridax*, Grass/Sorghum/Maize.
4. Sectioning and staining -Slide preparation.
   Root, Stem (Dicot & Monocot)
5. Study of Root modification-Fusiform, Napiform & Conical
6. Stem modifications-Rhizome, Tuber, Corm, Bulb.
7. Study of Leaf and its modification-Tendril, Phyllode (Australian Acacia)
   Inflorescence-Special types, Fruits : (any two from simple, Aggregate & Multiple)
8. Study of Vegetative propagation-Cutting, Grafting and Layering.

PRACTICAL QUESTION PAPER IV

Time : 3 Hrs. Max. Marks.50

1. Identify the slides A, B and C with labeled diagrams and reasons. 3x4=12
2. Prepare a temporary Saffronin stained T.S. of material 'D', Sketch, label and identify with reasons. Leave the preparation for evaluation. 1x8=8
3. Identify the specimens E, F, G, H and I comment on their morphological/Biological features. 5x3=15
4. Comment on 'J'. 1x5=5
5. Vivo-Voce +Submissions 3+2=5
6. Class records 5

SCHEME OF VALUATION

1. Slides identification
   (Identification-1, Diagram-1, Reasons -2)
2. Slide Preparation.
   (Identification-1, Diagram-1, Preparion-4, Reasons-2)
3. Morphology :- 1-Root, 1-Stem, 1-Leaf, 1-Inflorescence, 1-Fruits (Identification-1, Reasons -2)
4. Vegetative Propagation- One from Cutting / Grafting /Layering
   (Identification-1, Diagram-1, Description-3)
5. Vivo-Voce(based on practical syllabus)- 3
   Submissions- 2- slides (1- Root, 1- Stem)- 2
6. Class records - 5 marks

***

OPEN ELECTIVE FOR IV SEMESTER

Medicinal Botany

(Credits 2)

Theory- 50 Marks **30 Hrs**

Unit 1: History, Scope and Importance of Medicinal Plants.;
Ayurveda : History, origin, Panchamahabhutas, Saptadhatu and Tridosha concepts, Rasayana, plants used in ayurvedic treatments,
Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine.
Unani: History, concept **10 Hrs**

Unit 2: Propagation of Medicinal Plants: Objectives of the nursery, , Important components of a nursery, use of green house for nursery-harvesting - processing - storage - marketing and utilization of medicinal plants , propagation through cuttings, layering, grafting and budding.
. **10 Hrs**

Unit 3: Study of Medicinal plants: (Parts used and uses only)

1. Neem (bevu)
2. Tulasi
3. Drumstick (Nugge)
4. Fenugreek (Menthya)
5. Periwinkle (Kasi kanagalu)
6. Curry leaf (Karibevu)
7. Gooseberry (Nelli)
8. Bael (Bilva)
9. Centella (Ondelaga)
10. Sweet flag (Baje)
11. Gymnema(Madhu nashini)
12. Cynodon(Garike)
13. Aloe vera (Lolesara)
14. Tinospora (Amrutha balli)
15. Ashwagandha **10 Hrs**

Suggested Readings

1. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
2. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. _ Agrobios, India.

3. Medicinal Plants: Dr. Yoganarasimha

V Semester –Paper –V

Taxonomy of Angiosperms, Economic Botany and Ethno botany

Theory-90 Marks **Credits 3**

3 Hrs Theory per week **45 hrs**

Unit- 1 Taxonomy

Principles of Taxonomy, A brief account of Classical and Modern Taxonomy .Systems of Classification-Broad outline of Bentham and Hooker's and Engler and Prantal's classifications with Merits and demerits, species concepts.

Plant Nomenclatures; Binomial system, ICBN principles and rules, effective and valid publications. Modern trends in Taxonomy- Cytotaxonomy, Chemotaxonomy, Numerical taxonomy and Cladostics

10 Hrs

Unit-2 Field and Herbarium techniques, Herbaria, Botanical gardens, Floras and their importance

4 Hrs

Unit-3 Study of the following families according to Engler and Prantl's system of classification Monocotyledoneae -Poaceae ,Arecaceae, Musaceae, Orchidaceae,

Dicotyledoneae- Archichlamydeae: Magnoliaceae, Annonaceae, Brassicaceae, Rosaceae, Rutaceae, Euphorbiaceae, Malvaceae, Apiaceae

Metachlamydeae : Apocyanaceae, Asclepiadaceae, verbenaceae, Lamiaceae, Solanaceae, Rubiaceae, Cucurbitaceae**,** Asteraceae,

10 Hrs

Unit-4 Economic Botany Cultivation aspects not required) Study of the following plants with respect to Botanical name, family, part used and uses.

1. Cereals and Millets: Rice, Wheat, Ragi, Maize.
2. Pulses : Bengal gram Pigeon pea, Black gram, green gram.
3. Fibre plants : Cotton, jute, coir.
4. Oil yielding plants: Ground nut coconut, Sunflower, Safflower.
5. Timber : Rosewood, Teakwood.
6. Spices and Condiments: Clove, Cardamom, Cinnamon, Pepper, Saffron.
7. Beverages : Coffee and Tea.
8. Narcotic plants : Opium, Cannabis and Tobacco
9. Perfumes : Jasmine, Sandal. **6 Hrs**

Unit-5 Ethanobotany:
Introduction and significance of Ethnobotany, Medicinal values of the following plants.

1. Phyllanthus emblica *2 Phyllanthus amarus* *3.Hemidesmus indicus*
4. Terminalia chebula *5. Strychnos nux-vomica* *6. Aloe vera*
7. Boerhaavia diffusa *8. Rauwolfia serpentina*
9. Withania somnifera. 10. *Adhathoda vasica*

5 Hrs

References: Lawerence.G.H.M.1951 Taxonomy of Vascular Plants, MacMillan, New York
Mukherjhee, College Botany Vol III
Trivedi and Sharma Taxonomy of Angiosperms,LB Publications
Shukla P , An Introduction to Taxonomy of Angiosperms .Atlas Book New Delhi
Dutta Sc 1988 Systematic Botany, Wiley Eastern New Delhi
Shiva ranjan V Principles of Taxonomy, Oxford and IBH publication
Samba murhy, AVSS and Subramanyam, A text book of Economic Botany Wiley Eastern, New Delhi
Pandey, Economic Botany S. Chand and Co.
Sundara Rajan S. College Botany Vol III Himalaya Publisherws.

PRACTICAL SYLLABUS PAPER-V

CREDITS 2

1. Study of taxonomic characters of families included in theory

   (At least one genera should be studied from each family)
2. Study of economically important plants covered in theory and identify with botanical names, families, part used and uses.
3. Study of Ethno botanically important plants (Mention the Common name or Vernacular name, Botanical name, Family, Part used and therapeutic values).
4. Submission of five herbarium specimens (Locally available Weeds)
5. Study of Flora by arranging Educational tour for plant collections.

PRACTICAL QUESTION PAPER-V

Time : 3 Hrs. Max. Marks: 50

1. Assign the specimens 'A', 'B', 'C' & 'D' to their respective families giving diagnostic features. 4x5=20
2. Describe 'E' in technical terms, draw floral diagram with floral formula of the same. 1x6=6
3. Identify the specimens F, G, H & I and highlight their economic importance and Ethonobotanical values. 4x3=12
4. Herbarium Submissions - Vivo-Voce + Tour report. 2+2+3=7
5. Class Records 5

SCHEME OF VALUATION

1. 2-Archichlamydeae, 1-Metachlamydeae, 1-Monocot
   (Identification-1, Classification-1, Characters-3)
2. Technical description & Floral diagram.
   (Technical description-3, Floral diagram-2, Floral formula-1)
3. Economic botany and Ethnobotany.
   (2 from Economic botany and 2 from Ethnobotany).
4. 5 Herbaria of locally available weeds – 2 Marks , Vovo-Voce-2marks, , Tour report-3marks.
5. Class records- 5 Marks.

III B.Sc., V Sem-VI Paper

Cytology, Genetics, Plant breeding and Evolution

3 Hrs per week **Credits-3** **Total 45 Hrs**

Cytology

Unit-1- Cell and its organelles

Ultra structure of prokaryotic and Eukaryotic cells. Cell Organelles - cell wall, cell membrane, endoplasmic reticulum, Golgi apparatus, Nucleus, Chloroplast, Mitochondria, Peroxisomes and Ribosomes. **7 Hrs**

Unit-2-Chromosomes

Morphology of Chromosome,Ultra structure of chromosome, Nucleosome concept, karyotype and ideogram, polytene chromosome.

Chromosomal aberrations- Structural aberrations-deletion, duplication, inversion and translocation, Numerical aberrations-Polyploidy-Euploidy and aneuploidy. **6 Hrs**

Unit-3

Cell cycle. Mitosis- Stages, mitotic apparatus, mitotic inhibitors and significance.

Meiosis- stages, Synoptenemal complex and significance. **6 Hrs**

Genetics

Unit-4- Terminologies

Heredity, variation, gene, alleles, allelomorph, homozygous, heterozygous, hybridization, hybrid, monohybrid, monohybrid ratio, dihybrid, dihybrid ratio, genotype, genotypic ratio, phenotype, phenotypic ratio, dominance, recessiveness, Back cross, test cross, filial generation. **1Hour**

Unit-5- Mendelism

Mendel and his work, laws of heredity-based on monohybrid and dihybrid experiment. Law of dominance.

Deviation from Mendelism - Incomplete dominance, co-dominance. **6 Hrs**

Unit-6- Interaction of genes

Interactions of genes- Supplementary gene interaction, Complementary gene interaction and Epistatic gene interaction.Multiple factor inheritance with reference to plant examples.Genetic problems.

Linkage and crossing over, chromosomal mapping.Extra-chromosomal inheritance-inheritance of plastids in *Mirabilis jalapa,* Cytoplasmic male sterility. **10 Hrs**

Unit- 7-Plant breeding

Aims and objectives, Techniques in plant breeding, Steps involved in plant breeding, Hybrid vigor. Hybrid seed production , plant quarantine. **3 Hrs**

Evolution

Theories of organic evolution- Lamarckism, Darwinism,Neo-Darwinism. **2 Hrs**

References :

Gupta P.K. Cytology, Genetics and Evolution Rastogi Publication

Sinha and Sinha , Cytogenetics, Plant Breeding and Evolution, Vikas Publications

Khanna S.S. Genetics, Heredity and Evolution

Sinnot, Dunn and Dobzonsky 1958, Principles of Genetics, Tata Magraw Hill, New York

Stickburger M 1990, Genetics, 3rd Ed MacMIllan Publishing Company

Chaha,l Principles and procedures of Plant Breeding,LB Publications

Singh, Cytology and Genetics,LB Publications

Daleela and Verma, A Text book of Genetics, Jai Prakash Nath and company, Meerut

Practical Syllabus Paper-VI

Credits-2

1. Preparation of fixatives and stains.
2. Study of Mitosis-Onion root tip
3. Study of meiosis- Onion flower buds/Rheo flower buds/Chlorophytum.
4. Study of permanent slides of Mitosis and Meiosis.
5. Karyotype of *Allium cepa* / Salivary gland chromosome.
6. Isolation of DNA from Onion leaves.
7. Study of cell organelles/ Miller experiment (Photographs).
8. Study of Emasculation.
9. Genetic problems a) Dihybrid cross b) Incomplete dominance.
   c) Supplementary factor d) Complementary factor.
   e) Epistasis.
10. Preparation of slides.

Practical Question Paper- VI

Time: 3hrs **Max Marks-50**

1.	Prepare a temporary mitotic squash of material 'A'.	1x6=6
2.	Prepare a temporary meiotic squash of material 'B'.	1x6=6
3.	Identify and comment on slides C, D & E.	3x3=9
4.	Identify and comment on F, G, H, & I.	4x2=8
5.	Isolate DNA from Onion leaf 'J'.	1x6=6
6.	Solve the genetic problem 'K'.	1x5=5
7.	Vivo-voce+ Submissions.	3+2=5
8.	Class records	05

Scheme of valuation

1. Identification-1, Diagram-1, preparation-3, Reasons-1.
2. Identification-1, Diagram-1, Preparation-3, Reasons-1.
3. 1-Mitosis, 1- Meiosis, 1-Karyotype or Salivary gland chromosome.
   (Identification-1 , Diagram-1, Reasons-1).
4. 1-Fixative /stain, 1-Chloroplast/Mitochondria, 1-Miller experiment, 1-Emasculation.
   (Identification-1, Reasons-1).
5. Procedure-2, preparation-3, Comment-1.

6 .Genetic problem from a) Dihybrid cross b) Incomplete dominance.
c) Supplementary factor d) Complementary factor.
e) Epistasis.

7 Vivo-voce- Based on above topics, submissions-2 slides(1-Mitosis, 1- Meiosis)

8 Class records.

V Semester- Paper –VII

Plant Physiology and Metabolism

Theory-90 Marks **Credits 3** **45 Hrs**

Unit 1: Plant-water relations

Importance of water, water potential and its components;

A brief account of absorption of water [actve and passive] and Ascent of sap[transpiration pull theory]

Transpiration: Structure of stomata, Stomatal mechanism (Steward and K- ion theory) Factors affecting transpiration; Anti-transpirants . **6 Hrs**

Unit2: Mineral nutrition

Essential elements, macro and micronutrients; Role and deficiency symptoms of

Nitrogen, phosphorus, Potassium, Magnesium, Zinc, boron, and Molybdenum: Hydroponics **3 Hrs**

Unit 3: Photosynthesis

Photosynthetic apparatus, Photosynthetic Pigments (Chl a, b, xanthophylls, carotene); Photosystem I and II, reaction centre, antenna molecules; Electron transport and mechanism of ATP synthesis; C3 , C4 and CAM pathways of carbon fixation**.** **10 Hrs**

Unit 4: Respiration

Structure of mitochondrion, Glycolysis, anaerobic respiration, TCA cycle; Oxidative Phosphorylation, Pentose Phosphate Pathway**.** **6 Hrs**

Unit 5: Enzymes

Structure, Nomenclature, Properties, classification; Mechanism of enzyme action and enzyme inhibition.

5 Hrs

Unit 6: Nitrogen metabolism

Biological nitrogen fixation; Nitrate Metabolism, Synthesis of amino acids, Reductive and Transamination. **4 Hrs**

Unit 7 Plant growth regulators

Auxins, Gibberellins, Cytokinins, Ethylene ,ABA and their role in agriculture and horticulture.

4 Hrs

Unit 8: Plant response to light and temperature

Photoperiodism ,Phytochromes, Florigen concept, Vernalization. **4 Hrs**

Unit 9: Dormancy : a brief account of seed dormancy **1 Hour**

Unit 10: **Plant movements:** (phototropism, geotropism, hydrotropism and seismonasty)

2 Hrs

Practical – VII
Credits- 2

1. Determination of osmotic potential of plant cell sap by plasmolytic method.
2. Determination of rate of transpiration by Ganong's potometer.
3. Determination of stomatal index by Quickfix method.
5 . Determination of Rate of Photosynthesis at different wave lengths of light.
6. Determination of Rate of Photosynthesis at different Concentratios of Co2 .
7. Separation of Photosynthetic pigments by paper chromatography and measurement of *Rf* values

.

Demonstration experiments

1. Hydroponics
2. Study of any two mineral deficiency Symptoms.
3. Separation of photosynthetic pigments by solvent wash method.
4. Kuhne's experiment
5. Determination of Catalase activity.
6. Phototropism, geotropism and hydrotropism.

Suggested Readings

1. Taiz, L., Zeiger, E., (2010). Plant Physiology. Sinauer Associates Inc.,U.S.A 5th Edition. .
2. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.
3. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
4. Jain. Plant Physiology
5. Salisbury and Ross. Plant Physiology Wardsworth pub California. USA
6. H. Srivastava. Plant Physiology, S. Chand and Co.
7. Bidwell. RGS Plant Physiology.(Revised Edition)
8. Devlin and Witham. Plant Physiology
9, Verma Sk & Verma Mohit. T.B. of Plant Physiology, Biochemistry and Biotechnology,S. Chand & Co.
10. P.S. Gill Plant Physiology. S. Chand & Co.
11. Leninger AC. Principles of Biochemistry:

Practical Question Paper– paper –VII

Time: 3 Hrs **Max.marks: 50**

1. Separate the photosynthetic pigments from the sample 'A' by paper chromatography and measure their Rf values. 15

2. Determine the Osmotic potential of the cell sap by Plasmolytic method / Stomatal index of the material 'B'. 10

3. Comment on the experiments C, D and E 15

4. Viva voce 5

5. Class records 5

Scheme of valuation.

1. Requriments – 1 mark, Principle – 2 marks, Procedure – 5 marks, Conduction – 4 marks, Rf value- 3 marks.

2. Requirements – 1 mark, Principle- 1mark, , Procedure- 3 marks, Conduction – 4 marks, Calculation & result – 1 mark.

3. Identification – 1 mark, Principle -1mark, diagram – 1mark , comment – 2 marks.

Experiments : Any two of the following

1. Ganong's potometer
2. Hydroponics
3. Mineral deficiency Symptoms (specimen / photocopy)
4. Rate of photosynthesis at different wavelengths of light / different Concentrations of Co2 .
5. Kuhne's experiment
6. Phototropism
7. Geotropism
8. Hydrotropism

4. Viva-voce related to experiments given in the practical examination.

5. Class records

References:

1. Introduction to plant physiology: William G. Hopkins. John wiley and sons, Inc.
2. Cell biology: Gerald Karp.
3. T.B. of plant physiology , Biochemistry and Biotechnology : Verma SK & Verma Mohit. S.chand & co
4. Principles of Biochemistry: Leninger AC.
5. Plant physiology: RGS. Bidwell.
6. Plant physiology: Salisbury FB & Rose C.W.Wardsworth pub California. USA
7. Plant physiology: H. Srivastava. S.chand& co.
8. Fundamentals of plant physiology: V.K. Jain. S.chand & co

BOTANY –PAPER -VIII

Molecular Biology, Genetic engineering, Bioinformatics and Biotechnology

Theory -90 Marks **Credits-3** **45 Hrs**

Unit-1; **Molecular biology**

Genetic material: Introduction, identification of genetic material (Griffith's and Avery's experiments, Hershey-Chase experiment) ,

Chemical nature of genetic material: Nucleotides, nucleosides

DNA: structure, replication (Semi-Conservative and Rolling circle model)

RNA: Structure, genetic RNA and non genetic RNA (mRNA, rRNA, tRNA),

Biosynthesis of proteins: Genetic code, Transcription, RNA Splicing, Translation and Polysomes.

Regulation of gene expression: Prokaryotes: (Lac- Operon) and Eukaryotes (Britten and Davidson's model). **16 Hrs**

Unit-2: Bio-molecular Techniques

Blotting techniques: Northern, Southern and Western Blotting,

DNA finger printing; DNA sequencing (Sanger's method), PCR **6 Hrs**

Unit -3: **Genetic engineering**:

A concise account of methods used in recombinant DNA technology.

Tools of rDNA technology: Plasmids (PBR^{322}, $PUC^{18,}$ Ti-plasmid), Restriction endonuclease, DNA ligase, and Bioreactor.

Genomic and cDNA libraries, screening of genomic library.

Applications of Genetic Engineering technology in agriculture

(Transgenic plants- Bt-cotton, golden rice), in medicine (insulin synthesis, gene therapy), in environment (bioremediation and bio-mining). **12Hrs**

Unit-4: Bioinformatics

Introduction, Aim and scope

Biological Databases: DNA database and protein databases.

A brief account of NCBI, DNA Data Bank of Japan (DDBJ) and Protein Information Resource (PIR) **5 Hrs**

Unit 5; Biotechnology**:**

Fermentation technology: Production of Ethyl alcohol, production of antibiotics (Penicillin), production of single cell protein (*Spirulina)* :

Environmental technology: Waste water treatment process: primary, secondary and advanced treatment of sewage (domestic waste water), **6 Hrs**

Practicals-VIII

1. Quantitative estimation of protein by Lowry's method
2. DNA isolation from onion/banana/ cauliflower
3. Quantitative estimation of DNA by DPA method
4 Quantitative estimation of RNA by Orcinol method
5. Study of PBR^{322,} Northern, Southern and Western Blotting, DNA Fingerprinting and PCR by photographs
6. Gene data retrieval from NCBI
7. Estimation of chloride and dissolved oxygen in water sample.
8. *Spirulina* Cultivation
9. Visit to research institutes.
10. **A project work / dissertation work (related to Botany topic) / Tour report has tobe Submitted for evaluation at the time of practical examination (Duly certified by the Supervising teacher and Head of the Department)**

Suggested Readings

1. De Robertis: Cell and Molecular Biology
2. Essentials of Molecular Biology: Freifelder, D. & Malacinski, G.M. 1998 (or latest edition)
3. Lewin, B. Genes VI, 1997, Oxford Univ. Press, Oxford, New York, Tokyo.
4. Cell and Molecular biollogy, Harvay Lodish, David Baltimore, Arnold Beek,
5. Biotechnology : P.D. Sharma
6. Biotechnology : R.C. Dubey. s. Chand & co
7. Molecular Biology: Verma and Agarwal. S Chand & co
8. Concepts in molecular biology: Rastogi V.B.
9. Elements of Biotechnology: Gupta .PK
10. Biotechnology: Satyanarayana.
11. Experiments in microbiology: Aneja. Vishwa prakashan , New delhi.
12. Bioinformatics: principles and applications; Ghosh Z. and Bibekanand M Oxford University Press
13. Campbell A. M., Heyer L. J. (2006) Discovering Genomics, Proteomics and Bioinformatics.

Practical Examination - Paper – VIII

Time : 3 Hrs **Max marks :50**

*1.Estimate the protein content of the sample '**A**'by Lowry's method
Or 15
Estimate the RNA content of the sample 'A' by Orcinol method.
Or
Estimate the DNA content of the sample '**A**' by DPA method

2. Estimate the chloride / dissolved oxygen content in the given sample '**B**' 10

3. Comment on '**C**' and '**D**' 2x5= 10

4. Project report /Dissertation work/Tour Report 5

5. Viva voce 5

6. Class record 5

Scheme of valuation

1. Requirements – 1 mark, principle – 1marks, procedure -4, conduction – 5 marks, Calculation & result – 4 marks.
(* students should select one of the experiments 'A' by means of lottery chit)

(. Requirements – 1 mark, principle – 1marks, procedure -4, conduction – 3 marks, Calculation & result – 1 marks

2. Identification -1 mark, diagram – 1 mark , comment – 3 marks.

Experiments: 1 PBR322,
2 Northern, Southern and Western Blotting,
3 DNA Fingerprinting
4 PCR
(By photographs)

4. Project report / dissertation work / tour report - 5 marks

5. Viva based on the experiments given in the examination. -5 marks

6. Class Records. 5 marks