SEMESTER – V

CORE COURSE: BOTANY PAPER-5 (DSC:5)

Credits: Theory: 04; Practical: 02 (4h/week)Total No of Lectures: 60hrs

TitleofTheCourse: PLANT MORPHOLOGY AND TAXONOMY OF FLOWERING PLANTS (5A)

Course No.	Typeof Course	Theory/ Practical	Credits	Instruction hour per week	TotalNo. of Lectures/ Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks		Total Marks
BOT-T-5.1	DSC	Theory	04	04	60hrs	3hrs	20	80		100
BOT-P-3	DSC	Practical	02	04	30 hrs	2hrs	10	40		50

COURSE OUTCOME:

1. Understand the concept of Root, Shoot, Leaf, and their modification and Inflorescence

2. Understand the Reproductive Whorl, Flower and placentation

3. Understand importance of Morphological characters to identify the angiosperm plant

4. Summaries the contribution of Parashara, Theophrastus,

5. under the concept of Bionomical nomenclaturetwo-part scientific naming system works and its applications

6. able to Differentiate different systems of plant classifications,

7. Learn the concept of APG system of classification able to assign the plant to their respective families

7. Able to identify the angiosperm plants based on respective characters

8. Learn the technique of Herbarium preparations

9. Familiarize the Botanical Garden located in the Worlds/Indian and their importance

Unit 1	VEGETATIVE MORPHOLOGY	Teaching Hours
	Introduction to plant morphology: Study of Typical Angiosperm Plant **Root** (Tap root, adventitious root fibrous root) modification for storage, support, respiration **Stem**: Concept and modification: Underground (rhizome, tuber, corm, bulb), aerial (tendril, thorn, phylloclade/phyllode), sub-aerial (runner, stolon, offset, sucker). **Leaf:**Parts, Phyllotaxy and other modification:venation, stipules, simple vs. compound leaves. **Leaf Modifications**: For support, protection, storage, insectivore (e.g., pitcher plant, venus flytrap). **Inflorescence**: Types - Racemose, Cymose, and special types (cyathium, verticillaster, hypanthodium).	15 hrs
Unit II	**REPRODUCTIVE MORPHOLOGY**	15hrs
	Flower as a Modified Shoot: Floral whorls, concept of floral diagram and formula. **Detailed Structure of Androecium and Gynoecium**: Types of stamens, placentation, ovary types (superior, inferior). **Fruit Morphology**: Classification - simple (fleshy: berry, drupe, pepo; dry: dehiscent, indehiscent), aggregate, multiple. **Seed Structure**: Albuminous and exalbuminous seeds; endospermic vs. non-endospermic. Importance of Morphology in Plant identification and Future prospects of morphology in taxonomy	
Unit III	**SYSTEMS OF PLANT CLASSIFICATIONS**	15 hrs
	1. History of Plant classifications: Brief discussion about Ancient Systems: Parashara, Theophrastus and their contributions 2. **Systems of Classifications**: Brief Introduction * **Artificial System** Plant classification, Proposed by Linnaeus * **Natural System** Plant Classification Proposed by Bentham and Hooker * **Phylogenetic System** Plant Classification Proposed by Engler and Prantl * Merits and Demerits of these systems. 3. Outline of Current system of classification: APG IV system of classification of flowering plants published in 2016. 4. **Modern Approach to Taxonomy** and Sources of Taxonomic Evidences**:** i) Chemotaxonomy ii) Cytotaxonomy iii) Palynotaxonomy iv) Botanical & Numerical taxonomy	

Unit IV	**TAXONOMY OF FLOWERING PLANTS**	15 hrs
	Botanical nomenclature: BinomialSystems, Brief Outline of IUCN (Principles, Rules, Taxonomic ranks, type concept, principles and rules of priority) Critical study of flowering plants (Habit and Habitat, distribution, species, Important medicinal plants)and illustration of important characteristics of the following families: **DICOTYLEDONS**: A) **Polypetalae**: Brassicaceae (Cruciferae), Malvaceae, Rutaceae Leguminosae (Fabaceae) Papilionaceae, Caesalpinaceae, Mimosae), Combretaceae, Cucurbitaceae, Apiaceae **B) Gamopetalae**: Rubiaceae: Asteraceae (Palmae)Apocynaceae Solanaceae,Acanthaceae, Lamiaceae C) **Apetala**e (Monochlamadae) Amaranthaceae, Euphorbiacae **MONOCOTYLEDONS:** Lilliaceae, Arecaceae, Poaceae (Graminae) Botanical Gardens: Concept and importance: Botanical Gardens of India and world **Herbarium:** Herbarium techniques, importance of herbarium, **Floras**: Study of Regional flora and their importance.	
	Total	60

MODEL QUESTION PAPER FOR **THEORY**EXAMINATIONS

B.Sc.- V Semester Practical Examination
Sub-BOTANY

Course -DSC 5T: **PLANT MORPHOLOGY AND TAXONOMY OF FLOWERING PLANTS (5A)**

Time: 03Hours **Max. Marks: 80**

Instructions to candidates: 1. Answer all questions

2. Draw the diagrams wherever necessary

PART –A

Answer any TEN of the following in two to three sentences (02 x 10 = 20)

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PART –B

Answer any FOUR of the following on brief (04 x 05 = 20)

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PART –C

Answer any FOUR of the following in detail (04 x 10 = 40)

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LISTOFPRACTICALS to be CONDUCTED

Pract No.	Experiments
1	Study of Typical Morphological studies of Typical Angiosperm Plant
2	Specimen observations of Root, types and their modifications
3	Study of Stem and their modifications
4	Leaf type and their modifications
5	Study of Inflorescence and types
06	Study of Flower: Accessory whorls and reproductive whorls
7	Systematic study of plants, as per theory (1 or 2 plants from each family) using Regional flora
8	**DICOTYLEDONS**: A) **Polypetalae**: Brassicaceae (Cruciferae), Malvaceae, Rutaceae Leguminosae (Fabaceae) Papilionaceae, Caesalpinaceae
9	**B) Gamopetalae**: Rubiaceae: Asteraceae (Palmae) Apocynaceae Solanaceae,Acanthaceae, Lamiacea
10	C) **Apetala**e: Amaranthaceae, Euphorbiacae
11	**MONOCOTYLEDONS:**Lilliaceae, Arecaceae, Poaceae (Graminae)
12	Herbariums Technique: Practice of preparations of herbarium and submissions
13	Botanical and taxonomical study tour is compulsory (5-7 days)

Model Question Paper Pattern for practical Examination

Time : 03 hrs. **Max. Marks: 40**

1. Assign the plants A,B,C,D to their respective Families giving important Characters 16
2. Give the Floral Formula and Diagram of Specimen E 03
3. Identify and comment on Specimens F,G & H 09
4. Viva voce 03
5. Records and submissions (Herbarium) 06
6. Submission Study Tour Report 03

Total - 40

Instructions to the Examiners

Q1. Give the plant specimens from Dicotyledons: A) Polypetale B) Gamopetalae

C) Apetalae (Monochlamadeae) and D) Monocotyledon

Q: 2 Any Typical plant

Q:3Modification/Inflorescence/placentation/Fruit/seed etc.

Evaluation and Allotment of Marks:

1. Key Characters (02) Classification (01) and identification (01)

2. Floral diagram (02) Formula (01

3. Identification (01) Modifications/comments (02)

4. Two-Three Questions (Attending viva (01)

5. Herbarium Submission (03) Record (03)

6. Study Tour Report (03)

Study References:

1.	**Singh & Jain**	Taxonomy of Angiosperm	Rastogi Publication Meerut.
2.	**Saxena&Saxena**	Plant Taxonomy	Rastogi Publication Meerut
3.	O P Sharma Plant Taxonomy		

SEMESTER – V

CORE COURSE: BOTANY PAPER-5 (DSC:5)

Credits: Theory: 04; Practical: 02 (4h/week)Total No of Lectures: 56 hrs

TitleofTheCourse: CYTOLOGY GENETICS AND MOLECULAR BIOLOGY (5B)

Course No.	Typeof Course	Theory/ Practical	Credits	Instruction hour per week	TotalNo. of Lectures/ Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks		Total Marks
BOT-T-5.1	DSC	Theory	04	04	60 hrs	3hrs	20	80		100
BOT-P-3	DSC	Practical	02	04	30 hrs	2hrs	10	40		50

CO1: Describe the structure and function of cell organelles in prokaryotic and eukaryotic cells.

2. CO2: Explain the organization and ultra structure of the cell membrane and nucleus.

3. CO3: Understand the cell cycle, mitosis, and meiosis, and their significance in growth and heredity.

4. CO4: Analyze the structure, types, and functions of chromosomes and chromatin.

5. CO5: Explain the principles of classical (Mendelian) genetics and interpret the laws of inheritance.

6. CO6: Apply knowledge of genetic interactions such as incomplete dominance, codominance, epistasis, and linkage.

7. CO7: Describe the structure, replication, transcription, and translation processes of DNA and RNA.

8. CO8: Understand the genetic code, gene expression, and regulation in prokaryotes and eukaryotes.

9. CO9: Explain mutations, chromosomal aberrations, and their genetic consequences.

10. CO10: Demonstrate knowledge of molecular techniques used in modern biology such as PCR, electrophoresis, and DNA sequencing.

11. CO11: Correlate cytological and molecular bases of heredity and variation in living organisms.

12. CO12: Develop analytical and problem-solving skills through genetic cross analysis and molecular data interpretation.

Unit 1	CYTOLOGY	Teaching Hours
	The cell theory, Prokaryotic and eukaryotic cells, Ultra structure of cell wall, cell membrane (Fluid mosaic model), Cell components. Structure and function of mitochondria, chloroplast, ER, Golgi Body and Nucleus. Cell cycle, Mitosis and Meiosis, Mutation and Chromosomal Aberration (structural and numerical)	15hrs
Unit II	**GENETICS**	15hrs
	Genetics: Definition, Mendalian Genetics- brief history of Pre-Mendalian and Mendalian Genetics (mono and di-hybrid crosses, principle and terminology), Gene interaction- incomplete dominance, supplementary, complementary and epistatic interactions. **Cytoplasmic inheritance** (Leaf variegation in *Mirabilis jalapa*), Multiple allelesm, pleiotropism and polygenic inheritance in plant: Sex determination *Melandrium* and *Drosophila*, sex linked inheritance in *Drosophila*: Linkage and crossing over *(Zea Maize*). Brief account of Epigenetics.	
Unit III	**MOLECULAR BIOLOGY**	15hrs
	Introduction and pioneers of Molecular Biology **Nucleic acid structure**: Watson and Crick model of DNA and other forms of DNA (A and Z), Types, structure & functions of RNAs **DNA Replication**: Prokaryotic and Eukaryotic DNA replication, Theta model and Rolling circle model and application **DNA Repair**: Causes and mechanism –photo reactivation, excision repair, mismatch repair, SOS repair. Recombination in prokaryotes: Transformations, Conjugation and Transduction. Structure of Prokaryotic and Eukaryotic gene, genetic code, properties and Wobble hypothesis.	
Unit IV	**GENETIC ENGINEERING**	15hrs
	Regulation of Gene expression: Regulation of Gene expression in Prokaryotes-Operon concept (Lac and Tryp). Regulation of Gene expression in Eukaryotes –transcriptional activation, lactose metabolism in yeast. Gene organization and expression in Mitochondria andchloroplasts. Insertional elements and transposons, Transposable elements in *Maize* and	

	Drosophila.	
	Total	60

LISTOFPRACTICALS to be CONDUCTED

Pract No.	Experiments
1	Ultra structure of Prokaryotic (Bacteria) and Eukaryotic cell (Plant cell) by using photograph.
2	Cell count by using Micrometry
3	Study of Mitosis squash preparation by using onion.
4	Cell count Meiosis by smear preparation by using onion flower buds
5	Study of polytene and Lamp brush chromosome by photographs.
06	Isolation of DNA by EDTA/C-TAB.
7	Karyotyping and Ediogram.
8	Genetics problems – monohybrid, dihybrid text cross incomplete dominance.
9	Sex determination in Maize.
10	Demonstration of Agarose gel electrophoresis.
11	Estimation of RNA by Orcinol method

Model Question paper for practical examination

1. Make a squash/smear of material '**A'** Identify sketch and Label any two stages and show the preparation to the examiner. 08 Marks
2. Isolate the DNA from given material **'B'**. 06 Marks
3. Karyotyping '**C'**. 04 Marks
4. Solve the genetic problem 'D'. 04 Marks
5. Identify and comment on 'E', 'F', and 'G' (slides or photographs). 08 Marks
6. Record/submission. 05 Marks
   Viva. ` 05 Marks

Instruction to Examiners:

1. For preparation of 04 Marks
   Sketch and label of 2 stages. 04 Marks
2. Procedure 03 Marks
   Observation 03 marks
3. Karyotyping arrangement on answer sheet 04 Marks

4. Solve the genetic problem 04 Marks
5. For identification 01 Marks
   For comment 01 Marks

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Sub-BOTANY
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