

Bhakta Kavi Narsinh Mehta University



Choice Based Credit System (CBCS) Syllabus For Semester V & VI (B.Sc.) “BOTANY”

Semester – V

- Paper No.-501** : Biology of Seed Plants
Paper No.-502 : Ecology
Paper No.-503 : Instrumentation, Forest and Forestry, Micro-techniques, Medicinal Plants and Horticulture
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Semester – VI

- Paper No.-601** : Cryptogamic Botany and Gymnosperms
Paper No.-602 : Physiology, Biochemistry, Biostatistics, Microbiology and Plant Pathology
Paper No.- 603 : Cytogenetic, Molecular Biology, Genetic Engineering, Advance techniques
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INFORCE FROM JUNE – 2020

FOREWORD

The renewal and updating of the course curriculum are the ingredients to any vibrant academic institution. The revision of the curriculum in the different subjects should be a continuous process with a view to providing the updated and thorough education to the students as well. To meet the requirements in today's perspectives and in order to enhance the quality and standards of education, updating and restructuring the curriculum from time to time must be continued as a perpetual process. In recent past, our Saurashtra University has implemented the Choice Based Credit System (CBCS) which is the need of hour for the sake of the students. We, the member of study board in Botany have designed the new curriculum for the students of third year (i.e. Semester V and VI) Botany. For designing the curriculum we followed the guidelines of UGC with respect to model syllabus. The exercise would not have been possible without the support of our faculty members. We hope that the aims and the objectives of our university will be accomplished and the students will come to the expectations of our society.

**Members of Botany Study Board
Bhakta Kavi Narsinh Mehta University
Junagadh**

Bhakta Kavi Narsinh Mehta University, Junagadh

Revised syllabus of B.Sc. Botany as per UGC guidelines

Effective from June 2020

This curriculum consists of six theory papers and six practicals. Syllabus has been divided in to two semesters (i.e. semester – V and VI). Students have to study three papers in each semester and three practical's based on theory papers. The course is to be completed by assigning six periods for each theory and six periods for each practical per week. Practical periods are inclusive to field study.

GENERAL DETAILS OF TEACHING HOURS AND COURSE CREDIT

<i>Paper no.</i>	<i>Title of the papers</i>	<i>Lectures</i>	<i>Theory Credit</i>	<i>Practical Credit</i>	<i>Total Credit</i>
<i>B – 501</i>	Biology of Seed Plants	60	04	03	07
<i>B – 502</i>	Ecology	60	04	03	07
<i>B – 503</i>	Instrumentation, Forest and Forestry, Micro-techniques, Medicinal Plants and Horticulture	60	04	03	07
<i>B – 601</i>	Cryptogamic Botany and Gymnosperms	60	04	03	07
<i>B – 602</i>	Physiology, Biochemistry, Biostatistics, Microbiology and Pathology	60	04	03	07
<i>B – 603</i>	Cytogenetics, Molecular Biology, Genetic Engineering, Advance techniques	60	04	03	07

Pattern of Examination:

Students will have to attend theory and practical both during the semester and at the end of semester, University exams will be conducted. Examination contains 70% external and 30% internal marks. A student's performance during every practical session is assessed and marks for a maximum of 15 is recorded. External practical evaluation will carry 35 marks, so total 50 marks for each practical per paper examination will be counted. Internal assessment for theory can be following any one as mention below.

Total Scheme of evaluation

Semester	Theory					Practical			
	Internal				External	Total	Performance during practical sessions	External	Total
	Exam	Assignment	MCQ	Attendance					
V	10	10	05	05	70	100	15	35	50
VI	10	10	05	05	70	100	15	35	50

Distribution of three theory papers and three practicals for each semester is as follows

SEMESTER – V			
Papers	Title of the papers	Duration	Marks
<i>B – 501</i>	Biology of Seed Plants	150 min	70
<i>B – 502</i>	Ecology	150 min	70
<i>B – 503</i>	Instrumentation, Forest and Forestry, Micro-techniques, Medicinal Plants and Horticulture	150 min	70
SEMESTER – VI			
<i>B – 601</i>	Cryptogamic Botany and Gymnosperms	150 min	70
<i>B – 602</i>	Physiology, Biochemistry, Biostatistics, Microbiology and Pathology	150 min	70
<i>B – 603</i>	Cytogenetics, Molecular Biology, Genetic Engineering, Advance techniques	150 min	70

Practicals

SEMESTER – V			
Practicals	Title of the practicals	Duration	Marks
<i>P– 501</i>	Biology of Seed Plants	3 Hours	35
<i>P – 502</i>	Ecology	3 Hours	35
<i>P – 503</i>	Instrumentation, Forest and Forestry, Micro-techniques, Medicinal Plants and Horticulture	3 Hours	35
SEMESTER – VI			
<i>P – 601</i>	Cryptogamic Botany and Gymnosperms	3 Hours	35
<i>P – 602</i>	Physiology, Biochemistry, Biostatistics, Microbiology and Pathology	3 Hours	35
<i>P – 603</i>	Cytogenetics, Molecular Biology, Genetic Engineering, Advance techniques	3 Hours	35

QUESTION 1 – UNIT 1		
Q 1 A	Objective type questions	4 Marks
Q 1 B	Answer in brief(Any 1 out of 2)	3 Marks
Q 1 C	Write a note on(Any 1 out of 2)	7 Marks
QUESTION 2 – UNIT 2		
Q 2 A	Objective type questions	4 Marks
Q 2 B	Answer in brief (Any 1 out of 2)	3 Marks
Q 2C	Write a note on (Any 1 out of 2)	7 Marks
QUESTION 3– UNIT 3		
Q 3 A	Objective type questions	4 Marks
Q 3 B	Answer in brief (Any 1 out of 2)	3 Marks
Q 3 C	Write a note on (Any 1 out of 2)	7 Marks
QUESTION 4 – UNIT 4		
Q 4 A	Objective type questions	4 Marks
Q 4 B	Answer in brief (Any 1 out of 2)	3 Marks
Q 4 C	Write a note on (Any 1 out of 2)	7 Marks
QUESTION 5 – UNIT 5		
Q 5 A	Objective type questions	4 Marks
Q 5 B	Answer in brief (Any 1 out of 2)	3 Marks
Q 5 C	Write a note on (Any 1 out of 2)	7 Marks
TOTAL MARKS : 70 TOTAL TIME : 2½ HOURS		

Project work

Science is the field of experiment research and comprehensible reading. In order to fulfill these requirements our university has introduced the project work. So that student can have habit for reading research articles and able to understand the possible cause of current problems or can visualize the diverse nature of ecosystems and its organisms. Project work contains 100 marks. Project report (50 marks) should be submitted at the end of sixth semester and its viva voce and ppt presentation (50 marks) can be arranged during practical exams of sixth semester.

Submission work

1. Permanent slides (minimum 6)
Giant Chromosomes - 1, Mitosis -1, Meiosis-1, Double Stain- 2, Embryo- 1
2. Herbarium Sheets (minimum 10)
3. Rolling chart / project with academic value
4. During the academic year compulsorily arrange one study tour of rich biodiversity region of the state and students have to submit tour report.
5. The students should visit to one of the following institution for study purpose
 - Agriculture University – Junagadh
 - National Research Center for Ground nut (NRCG) – Junagadh
 - Ayurvedic College
 - Pharmaceutical college or Institute

Student Startup and Innovation Policy (SSIP)

Government of Gujarat has developed a policy for providing assistance to Startups/ Innovation. Under this scheme, any individual/ group of individuals having innovative idea/ Concept will be eligible and/ or Universities/ education institutions, Incubation Centre/ PSUs/ R&D Institutions/ Private and other establishments will be eligible as an institution to support and mentor to innovators as approved by Committee. Startups in an economy's technology sectors are an important indicator of technological performance for several reasons.

Key Objectives

The Student Startup & Innovation Policy of Government of Gujarat aims to create an integrated, state-wide, university-based innovation ecosystem to support innovations and ideas of young students and provide a conducive environment for optimum harnessing of their creative pursuit.

1. Developing student centric Innovation and Pre-incubation Ecosystem for Students (IPIES)
2. Creating environment for creativity to flourish and an end-to-end support system in educational institutions to allow ample support to ideas for better execution
3. Build internal capacity of educational institutions and key components of the innovation ecosystem to enable deployed processes to make sustainable impact at scale
4. Create pathways for mind to market by harnessing and handholding projects/ research/ innovation/ ideas of students in Gujarat
5. Creating and facilitating sectoral and regional innovation efforts in state around educational institutions
6. Create a common platform to showcase, support and upscale innovations for motivating stakeholders as well as for an opportunity to create value for money and value for many
7. Leverage public system initiatives at state and central level, academia, industries and by other ecosystem stakeholders / domain experts and institutions to make an inclusive effort

Key Goals

1. Empower all universities to set-up and execute the broad agenda of innovation and pre-incubation
2. Aim to create an environment that converts at least 1% graduates into job creators by innovation and allied means
3. Support at least 1,000 student-led innovations per year and aim to file 1000 patents from universities in the state every year.
4. Harness 500 student startups in the next 5 years, and upscale
5. Empower universities and educational institutes to build a robust Innovation and Pre-incubation support systems within

6. Create incentives, awards, appreciations and benchmarks for innovation and student startups and associated efforts at all layers.
7. Build capacity for at least 200 educational institutes in the state in the next five years, to have a robust preincubation support for student / alumni startups and Innovations
8. Undertake strategic interventions to empower all universities in the state to develop full-fledged preincubation ecosystem in the next 5 years
9. Ensure that the innovation processes link academia, society and SMEs through systematic ways so that students and faculty solve their challenges and create further entrepreneurial opportunities.

Under this scheme our **Bhakta Kavi Narsinh Mehta University, Junagadh** also provide facilities to fulfill objectives and goals of **SSIP**. Under this scheme following links are listed for online courses, which are available on portal. For each courses extra credit will provided.

- ✓ <https://swayam.gov.in>
- ✓ <https://onlinecourses.nptel.ac.in/>
- ✓ <https://www.edx.org/>
- ✓ <https://www.coursera.org/>

e-Resources

1. Cell Biology: <http://www.ignouhelp.in/ignou-lse-01-study-material/>
2. Ecology: <http://www.ignouhelp.in/ignou-lse-02-study-material/>
3. Genetics: <http://www.ignouhelp.in/ignou-lse-03-study-material/>
4. Plant Diversity: <http://www.ignouhelp.in/ignou-lse-12-study-material/>
5. Plant Diversity: <http://www.ignouhelp.in/ignou-lse-13-study-material/>
6. Sakshat-‘One Stop Education Portal’ (MHRD) <http://www.sakshat.ac.in/>
7. Swayam prabha Ch-08 (For Science students)
<https://www.youtube.com/channel/UCBMvdXXJ7BcZcTKGPj9WxKg>
8. Consortium for Educational Communication (CEC)
<http://cec.nic.in/Pages/Home.aspx>
9. SWAYAM: <https://swayam.gov.in/>
10. epg pathshala: <http://epgp.inflibnet.ac.in/index.php>
11. eGyanKosh- a National Digital Repository: <http://egyankosh.ac.in/>

Semester – V
New theory Syllabus
BOTANY PAPER: - 501
(BIOLOGY OF SEED PLANTS)

UNIT:-I	ANGIOSPERMS	[12 Hours]	0.8 Credit
I.1	Origin of Angiosperms		
I.2	Concept of taxon and taxonomy		
	I.2.1 Taxonomic categories		
	I.2.2 Concept of genus and species		
	I.2.3 Concept of families		
I.3	Classification systems of		
	I.3.1 Bentham and Hooker		
	I.3.2 Engler and Prantal		

UNIT: II& III TAXONOMIC STUDIES OF FOLLOWING FAMILIES
(According to Bentham and Hooker System) [24 Hours] 1.6 Credits

- II.1 Detailed studies of family of Polypetalae
 - II.1.1 Anonaceae
 - II.1.2 Capparidaceae
 - II.1.3 Cucurbitaceae
 - II.1.4 Tiliaceae
 - II.1.5 Lythraceae
- II.2 Detailed studies of family of Gamopetalae
 - II.2.1 Asteraceae
 - II.2.2 Asclepiadaceae
 - II.2.3 Convolvulaceae
 - II.2.4 Solanaceae
 - II.2.5 Bignoneaceae

II.3 Detailed studies of family of Monochlamydeae

II.3.1 Amaranthaceae

II.3.2 Polygonaceae

II.3.3 Moraceae

II.4 Detailed studies of family of Monocotyledon

II.4.1 Canaceae

II.4.2 Cypraceae

UNIT:- IV EMBRYOLOGY [12 Hours] 0.8 Credit

III.1 Endosperm

III.2 Embryo development in monocotyledons and dicotyledonos

III.3 Types of embryo

III.4 Embryo culture: Methods and Applications

III.5 Polyembryony

UNIT:- V ECONOMIC BOTANY [12 Hours] 0.8 Credit

IV.1 Tea

IV.2 Coffee

IV.3 Tobacco

IV.4 Fiber yielding plants

IV.5 Oil seeds

Reference Books:

Sr. No.	Title of the Books	Unit	Authors
1	Taxonomy of angiosperm	I	V. N. Naik
2	Plant Taxonomy	I	Saxena & Saxena
3	A textbook of Systematic Botany	II, III	R.N.Sutaria
4	Taxonomy of Angiosperm & utilization of plants	II, III	A. K. Sharma
5	Taxonomy of angiosperms	II, III	B.P.Pandey
6	Embryology	IV	P.Maheshwary
7	Embryology	IV	Bhojwani & Bhatnagar
8	Anatomy and embryology	IV	Singh, Pandey & Jain
9	A textbook of economic Botany	V	V.Verma
10	Economic Botany	V	B.P.Pandey
11	A phytochemical approach to economic botany	V	Dr. S. D. Sabnis

Semester – V
New theory Syllabus
BOTANY PAPER: - 502
(ECOLOGY)

UNIT:- I	ECOLOGY AND AUTECOLOGY	[12 Hours]	0.8 Credit
I.1	Basic concept of ecology		
I.2	Ecological factors		
	I.2.1 Climatic	I.2.2 Biotic (Interaction among organisms)	
I.3	Biological clocks		
I.4	Liebig's law of the minimum; Shelford's law of tolerance		
UNIT:- II	PLANT COMMUNITY	[12 Hours]	0.8 Credit
II.1	Characters of community		
II.2	Characters used in community structures		
II.3	Methods of ecological studies		
UNIT:- III	SUCCESSION& POPULATION	[12 Hours]	0.8 Credit
III.1	Plant succession: Causes, trends, types, process, examples of succession		
III.2	Population characteristics		
III.3	Ecological niche		
UNIT:- IV	ECOSYSTEM	[12 Hours]	0.8 Credit
IV.1	Structure of ecosystem		
IV.2	Types of ecosystems		
IV.3	Energy flow in ecosystem system		
IV.4	Productivity of ecosystem		
IV.5	Ecological pyramids		

UNIT:- V BIODIVERSITY

[12 Hours] 0.8 Credit

- V.1 Concepts of biodiversity and it's level
- V.2 Keystone species
- V.3 Measuring biodiversity
- V.4 Pytogeographical regions of India
- V.5 Conservation of Biodiversity

Reference Books:

Sr. No.	Title of the Books	Unit	Authors
1	Fundamentals of ecology	I	P. D. Sharma
2	A textbook of ecology	I	Vashistha & Gill
3	Ecology and Environment	II	P. D. Sharma
4	Ecology and Soil Science	II	Shukla & Sharma
5	Fundamentals of Ecology	III	E.P.Odum
6	A textbook of plant ecology	III	V. Verma
7	Cell bio. , mole. bio. , gen. , evo. & ecology	IV	N.Arumugam
8	Environmental biology	IV	H. R. Singh
9	Ecology and sustainable development	V	S. Ramkrishnan
10	Environmental studies	V	N. Arumugam
11	Biodiversity	V	S. Chakraborty

Semester – V
New theory Syllabus
BOTANY PAPER: - 503
(INSTRUMENTATION, FOREST AND FORESTRY, MICROTECHNIQUES,
MEDICINAL PLANTS AND HORTICULTURE)

UNIT:- I	INSTRUMENTATION	[12 Hours]	0.8 Credit
	Principle, design, function of following instruments		
I.1	Laminar-flow		
I.2	Autoclave		
I.3	Incubator		
I.4	Centrifuge		
I.5	Oven		
UNIT:- II	FOREST AND FOREST MANAGERMENTS	[12 Hours]	0.8 Credit
II.1	Forest management		
II.2	Importance of forest		
II.3	Silviculture, Afforestation, Agro-forestry		
II.4	Deforestation		
II.5	Endemism		
UNIT:- III	MICROTECHNIQUES	[12 Hours]	0.8 Credit
III.1	Techniques for preservation of plant materials.		
III.2	Teasing, smear preparation, squash methods, whole mounting.		
III.3	Microtomy.		
UNIT:-IV	MEDICINAL PLANTS	[12 Hours]	0.8 Credit
IV.1	Brief introduction, constituents and uses of following medicinal plants		
	IV.1.1 <i>Terminalia bellirica</i>		

Semester – VI
New theory Syllabus
BOTANY PAPER: - 601
(CRYPTOGAMIC BOTANY & GYMNOSPERMS)

UNIT:- I	ALGAE	[12 Hours]	0.8 Credit
I.1	Life history of following genus (Excluding development)		
	I.1.1 <i>Coleochetae</i>		
	I.1.2 <i>Caulerpa</i>		
	I.1.3 <i>Chara</i>		
	I.1.4 <i>Ectocarpus</i>		
I.2	General Accounts and economic importance of <i>Diatoms</i>		
I.3	Evolution of sex in algae		
UNIT:- II	FUNGI	[12 Hours]	0.8 Credit
II.1	Life history of following genus (Excluding development)		
	II.1.1 <i>Penicillium</i>		
	II.1.2 <i>Puccinia</i>		
II.2	Different types of spores in fungi		
II.3	Heterothallism in fungi		
UNIT:- III	BRYOPHYTES	[12 Hours]	0.8 Credit
III.1	Life history of following genus (Excluding development)		
	III.1.1 <i>Anthoceros</i>		
	III.1.2 <i>Sphagnum</i>		
III.2	Evolutionary trends of sporophyte		

UNIT:- IV PTERIDOPHYTES & GYMNOSPERM [12 Hours]

0.8 Credit

IV.1 Life history of following genus (Excluding development)

IV.1.1 *Ophioglossum*

IV.1.2 *Marsilea*

IV.2 Life history of following genus (Excluding development)

IV.1.1 *Ephedra*

IV.1.2 *Gnetum*

UNIT:- V PALEOBOTANY [12 Hours]

0.8 Credit

V.1 Nomenclature of fossils and types of fossils

V.2 Morphology and stem anatomy of following Pteridophytes fossils.

V.2.1 *Rhynia*

V.2.2 *Lepidodendron*

V.2.3 *Calamites*

V.3 Morphology and stem anatomy of following gymnosperm fossils.

V.3.1 *Lyginodendrone*

V.3.2 *Cycadeoidea*

V.3.3 *Cordites*

V.3.4 *Pentoxylon*

Reference books:

Sr. No.	Title of the Books	Unit	Authors
1	A text book of Algae	I	A.V.S.S.Sambamurty
2	Algae	I	Dr. A R Ragnald & et.al
3	Algae	I	B.R.Vashishta
4	Algae	I	G.L.Chopra
5	The fungi	II	B.P.Pandey
6	Introduction to fungi	II	Dayal & Raizada
7	Fungi	II	B. R. Vashishta
8	Bryophyta	III	B. R. Vashishta
9	Bryophytes	III	N. Arumugan & et.al
10	A text book of Botany	IV	Singh, Pande & Jain
11	Pteridophyta	IV	B. P. Panday
12	Gymnosperms	V	O. P. Sharma
13	Diversity of Ptrido., Gymno. & Paleobotany	V	Satish Kumar

Semester – VI
New theory Syllabus
BOTANY PAPER: - 602
(PHYSIOLOGY, BIOCHEMISTRY, BIOSTATISTIC, MICROBIOLOGY
AND PATHOLOGY)

UNIT:- I	PLANT PHYSIOLOGY	[12 Hours]	0.8 Credit
I.1	Ascent of cell sap		
I.2	Transpiration		
I.3	Physiology of flowering		
I.4	Stress physiology		
UNIT:- II	BIOCHEMISTRY	[12 Hours]	0.8 Credit
II.1	Carbohydrates – classification, properties and functions		
II.2	Proteins – classification and Structure and functions (Primary, secondary, tertiary and quaternary)		
II.3	Lipids – classification, structure and functions.		
II.4	Enzymes – inhibition		
II.5	Alkaloids- General properties and examples.		
UNIT:- III	BIOSTATISTIC	[12 Hours]	0.8 Credit
III.1	Measures of central tendency: Mean, Mode and Median		
III.2	Measures of dispersion: Standard deviation		
III.3	Chi-square test		
III.4	Variance		
UNIT:- IV	MICROBIOLOGY	[12 Hours]	0.8 Credit
IV.1	Ultra structure of <i>E.coli</i> and Bacteriophage		
IV.2	Gram Staining and sterilization methods		
IV.3	Culture media – Natural and synthetic media		
IV.4	Industrial application of microbes		
	IV.4.1 Alcohol fermentation		

- IV.4.2 Food processing
- IV.4.3 Antibiotic
- IV.4.4. Single Cell Protein
- IV.5 CoViD - 19 (CORONA) Virus
 - IV.5.1 Structure
 - IV.5.2 Spreading pattern, symptoms and infection cycle
 - IV.5.3 Diseases cussing mechanism
 - IV.5.4 Protection strategies and ethno medicine

UNIT:- V PLANT PATHOLOGY [12 Hours] 0.8 Credit

- V.1 Introduction and classification of plant diseases
- V.2 General symptoms of diseases
- V.3 Study of different diseases of plants
 - V.3.1 Tikka disease of ground nut
 - V.3.2 Red rot of sugarcane
 - V.3.3 Whip smut of sugarcane
 - V.3.4 Citrus canker
- V.4 Different methods of Plant disease control.

Reference Books:

Sr. No.	Title of the Books	Unit	Authors
1	Plant Physiology	I	P. L. Kocchar
2	Plant Physiology	I	Pandey & Sinha
3	Plant Physiology	I	Salisbury & Ross
4	Plant Physiology	I	V. K. Jain
5	Plant Physiology	I	V. Verma
6	Laboratory manual in Biochemistry	II	J. Jayraman
7	Instant Notes : Biochemistry	II	B. D. Hames
8	Fundamentals of Biochemistry	II	N. Arumugam
9	Introductory Biostatistics	III	Chap.T.Le
10	Biostatistics	III	P. Ramakrishnan
11	Introduction to Biostatistics	III	P. K. Banerjee
12	Microbiology Vol. – I & Vol. - II	IV	P. D. Sharma
13	Microbiology	IV	M. J. Pelczar, Chain & Krieg
14	Fungi& plant pathology	V	N. Arumugam

Semester – VI
New theory Syllabus
BOTANY PAPER: - 603
(CYTOGENETICS, MOLECULAR BIOLOGY, GENETIC
ENGINEERING AND ADVANCE TECHNIQUES)

UNIT:- I	CYTOLOGY	[12 Hours]	0.8 Credit
I.1	Cell wall		
I.2	Nucleus		
I.3	Chloroplast		
I.4	Mitochondria		
UNIT:-II	GENETICS	[12 Hours]	0.8 Credit
II.1	Linkage		
II.2	Crossing over		
II .3	Chromosome map		
II.4	Gene mutation		
II.5	Hardy-Weinberg's law		
UNIT: - III	MOLECULAR BIOLOGY	[12 Hours]	0.8 Credit
III.1	Structure of RNA		
III.2	Genetic code		
III.3	Isolation of DNA.		
III.4	Lac-operon concept		
III.5	DNA repair mechanism		
UNIT:-IV	GENETIC ENGINEERING	[12 Hours]	0.8 Credit
IV.1	Concept of Genetic Engineering		
IV.2	Tools used in Genetic Engineering		
	IV.2.1 Enzyme used in Genetic Engineering		
	IV.2.2 Gene cloning vector		
	IV.2.3 Coupling tools		

- IV.3 Methods' of Genetic Engenering
 - IV.3.1 Preparation of desired genes
 - IV.3.2 Isolation of DNA vector
 - IV.3.3 Construction of recombinant DNA
 - IV.3.4 Introduction of recombinant DNA in the host cell
 - IV.3.5 Selection and multiplication of recombinant host cell
 - IV.3.6 Expression of cloned gene
- IV.4 Transgenic plant

UNIT:-V ADVANCE TECHNIQUES IN BOTANY [12 Hours] 0.8 Credit

- V.1 Chromatography
 - V.1.1 TLC
 - V.1.2 GC
 - V.1.3 HPLC
- V.2 Electrophoresis
- V.3 PCR

Reference Books:

Sr. No.	Title of the Books	Unit	Authors
1	Cell Biology Anatomy and micro-techniques	I	Annie Ragland
2	Cell Biology	I	Singh & Tomar
3	Cell Biology and molecular Biology	I	N.Arumugam
4	A text book of genetics	II	V. B. Rastogi
5	Gene IX	II	Benzamin & lewin
6	Genetics Today	II	Jagjit Singh
7	Genetics	II	A. M. Winchester
8	Molecular biology	III	N.Arumugam
9	Molecular biology & tools & tech.	III	D. M. Singh
10	Genetic Engineering	IV	N. Arumugam
11	Elements of Biotechnology	IV	P. K. Gupta
12	Chromatography	V	B.K. Sharma
13	Principle & tech. of biophysics	V	N.Arumugam

BOTANY PRACTICAL – 1
Semester – V
(Based on paper – 501 – P)

1. To study the different plant families mentioned in theory paper (minimum two plants should be studied in each family).
2. To study the different types of ovules through permanent slides:
3. Dissection and mounting of various types of embryo.
4. Economic importance of plants mention in theory paper.

BOTANY PRACTICAL – 2
Semester – V
(Based on paper – 502 – P)

1. To determine the minimum size of the quadrat by species area curve.
2. To demonstrate the frequency of various species occurring in a given area.
3. To demonstrate the density and abundance of various species occurring in given area.
4. To demonstrate the vegetational cover in a given area.
5. To study the species composition of an area for analyzing the biological spectrum and comparison with Raunkiar's normal biological spectrum.
6. Comparison of dissolved oxygen (DO) content of polluted and non-polluted water by iodometric titration method.
7. Estimation of water hardness.
8. To study Bacteria in T.S. of root nodule.

BOTANY PRACTICAL – 3
Semester – V
(Based on paper – 503 – P)

1. To study the principle, functions and applications of the instruments mentioned in the theory.
2. To measure the height of the trees in college campus.
3. Find out the basal cover and canopy cover of the plants of college campus.
4. To create a design of residential land scape garden (minimum three).
5. To study medicinal properties of medicinal plants mention in theory syllabus.
6. Microtomy: Block preparation, sectioning, staining methods.
7. To study botanical uses of spices and condiments.
8. To demonstrate herbarium techniques.

BOTANY PRACTICAL – 4
Semester – VI
(Based on paper – 601 – P)

1. Studies of algal genera with reference to the genus mentioned in theory with the help of class work materials and permanent slides for their vegetative and reproductive structures.
2. Studies of fungal genera with reference to the genus mentioned in theory with the help of class work materials and permanent slides for their vegetative and reproductive structures.
3. Studies of morphology, anatomy and reproductive structure of representative bryophytes mentioned in theory paper.
4. Studies of morphology, anatomy and reproductive structure of representative Pteridophytes mentioned in theory paper.
5. Studies of morphology, anatomy and reproductive structure of representative gymnosperms mentioned in theory paper.
6. Studies of fossil genera through slides and specimens mentioned in theory papers.

BOTANY PRACTICAL – 5
Semester – VI
(Based on paper – 602 – P)

1. To study different type of stomata.
2. Qualitative analysis of carbohydrates (Fehling's test, Benedict's test, Barfoed's test, Molisch's test, Anthrone test).
3. Qualitative analysis of proteins (Xanthoproteic Reaction, Biuret test, Millon's test, Hopkin's test)
4. Qualitative test for lipid (Sudan-II, Acrolein test, Solubility test, Emulsification test)
5. Estimation of fatty acid by titration.
6. Calculation of central tendencies –mean, median and mode (minimum four exercise)
7. Calculation of standard deviation (minimum three exercise)
8. Calculation of Variance. (minimum three exercise)
9. Calculation of chi-square test (minimum three exercise)
10. To study the bacterial cell morphology through Gram's staining.
11. To study plat disease as per theory.

PRACTICAL – 6
Semester – VI
(Based on paper – 603 – P)

1. Demonstration of salivary gland chromosomes from *Chironomous* larva by Aceto orcein technique.
2. To detect presence of cell wall components.(Cellulose, Lignin, Mucilage & suberin)
3. To study chloroplast in plants.
4. To study the mitosis by Squash technique of onion root tip.
5. To study meiosis by smear technique
6. To prepare the TLC slides and separate the given biological mixture.
7. Double stain (Permanent slide) preparation.

Reference Books:

- | | |
|---|----------------|
| 1. A textbook of Practical Botany Vol.–I,II & III | Bendra & Kumar |
| 2. Modern Practical Botany Vol.I,II & III | B.P. Pandey |

B.Sc. – BOTANY PRACTICAL SKELETON

Semester – V

Practical – 1

(Based on paper – 501 – P)

Times:- 3 hours

Total Marks:- 35

- Question: 1** Identify and classify given Specimen A, B & C write floral formula and floral diagram [12]
- Question: 2** Identify the given family by dissect the flower and expose the floral parts show it to examiner Specimen D [04]
- Question: 3** Prepare the slide of given Specimen E. [03]
- Question: 4** Rotation: Identify & Describe Specimen F, G [06]
- Question: 5** Viva voce [05]
- Question: 6** Certified Journal [05]

B.Sc. – BOTANY PRACTICAL SKELETON

Semester – V

Practical – 2

(Based on paper – 502 – P)

Times:- 3 hours

Total Marks:- 35

- Question: 1** Measure the DO/Hardness of given water sample. [12]
- Question: 2** Find out frequency/ density/ abundance/ veg.cover of plant species [10]
- Question: 3** Prepare slide of given material and show to the examiner [05]
- Question: 4** Viva voce [04]
- Question:5** Certified Journal [04]

B.Sc. – BOTANY PRACTICAL SKELETON

Semester – V

Practical – 3

(Based on paper – 503– P)

Times:- 3 hours

Total Marks:- 35

Question: 1 Measure the Height / Canopy cover/Basel cover of the tree. [07]

Question: 2 Create a design of resident landscape garden [07]

Or

Question: 2 Take a thin section from given block and prepare the slide.

Question: 3 Rotation: Identify & Describe Specimen A, B & C [09]

Question: 4 Submission: Ten herbarium sheets [07]

Question: 5 Certified Journal [05]

B.Sc. – BOTANY PRACTICAL SKELETON

Semester – VI

Practical – 4

(Based on paper – 601– P)

Times:- 3 hours

Total Marks:- 35

Question: 1 Identify, classify& describe with labeled diagram Specimen A, B & C [12]

Question: 2 Identify & Describe Specimen D & E [08]

Question: 3 Expose and show the preparation of Specimen F to the examiner [03]

Question: 4 Rotation: Identify & Describe fossils Specimen G & H [08]

Question: 5 Certified Journal [04]

B.Sc. – BOTANY PRACTICAL SKELETON

Semester – VI

Practical – 5

(Based on paper – 602– P)

Times:- 3 hours

Total Marks:- 35

Question: 1	Two qualitative test for given sample(carbo./pro./lipid)	[06]
Question: 2	Quantitative estimation of given sample	[04]
Question: 3	Calculation of given exercise (any two can be ask)	[08]
Question:4	Prepare a slide of stomata of given specimen & show to examiner	[05]
Question: 5	Perform Gram's staining	[04]
Question: 6	Identify and describe plant disease specimen	[05]
Question: 7	Certified Journal	[03]

B.Sc. – BOTANY PRACTICAL SKELETON

Semester – VI

Practical – 6

(Based on paper – 603– P)

Times:- 3 hours

Total Marks:- 35

Question: 1	Prepare a slide from a given sample (giant chromosome/chloroplast) and show to examiner	[06]
Question: 2	Prepare a slide from a given sample (mitosis / meiosis) and show to examiner	[05]
Question: 3	To detect presence of cell wall component (cellulose/lignin/mucilage/suberin)	[06]
Question: 4	separate the given biological sample with TLC	[05]
Question: 5	Submission work: Permanent slide & chart	[06]
	tour report	[04]
Question: 6	Certified Journal	[03]

Project Work

- ✓ Project work may be on survey of particular area with reference to plant diversity.
- ✓ It may be on a medicinal value or properties of particular plant or group of plants.
- ✓ It can be including topic on Morphological, Anatomical, Biochemical, Physiological study of any plant / process / pathway.
- ✓ Review work can also be a topic of Project.
- ✓ Students must have to take a proper photograph of their project work.
- ✓ Project report must be hard bound and one copy must submitted in examination with duly signed by Project Guide and Head of the Department.
- ✓ Evaluation of Project work will be carried out during last session of semester – 6 practical examinations. Project carries 100 Marks and bifurcated in to two segments.
 - 50 marks are given for project work carried out during the whole year by the student (Proof of work must be provided by the student through Photographs, Results, or through Guide/Principal).
 - 50 marks for project report, presentation, content, depth and Application.