



Shri Vile Parle Kelavani Mandal's
**MITHIBAI COLLEGE OF ARTS, CHAUHAN INSTITUTE OF SCIENCE &
AMRUTBEN JIVANLAL COLLEGE OF COMMERCE AND ECONOMICS
(AUTONOMOUS)**

*NAAC Reaccredited 'A' grade, CGPA: 3.57 (February 2016),
Granted under RUSA, FIST-DST & -Star College Scheme of DBT, Government of India
Best College (2016-17), University of Mumbai*

Affiliated to the
UNIVERSITY OF MUMBAI

Program: M.Sc II Botany

Course: TECHNIQUES AND INSTRUMENTATION I

MOLECULAR BIOLOGY I

ANGIOSPERMS AND PHYTOCHEMISTRY -I

ANGIOSPERMS AND PHYTOCHEMISTRY -II

Semester III

**Choice Based Credit System (CBCS) with effect from the
Academic year 2020-2021**

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
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Preamble

M.Sc. semester 3 & 4 botany syllabus is designed with an objective to encourage and support the growing demands and challenging trends in the educational scenario. Our course-work focuses on an all- round development of the students in the field of plant science and inter-related arenas.

Department of Botany, Mithibai College (Autonomous) is committed to broad based knowledge imparting at the level of its Masters programme and encourages a multi-disciplinary approach to understanding plant science. The programme endeavours to promote knowledge on various aspects viz. techniques and instrumentation, molecular biology, angiosperm taxonomy, photochemistry, plant anatomy, plant physiology, medicinal botany, cladistics, forest ecology, ethnobotany with special emphasis to research methodology. These are a few topics broadly named in conjunction with the recent trends in plant sciences.

Evaluation Pattern

The performance of the learner will be evaluated in two components. The first component will be a Continuous Assessment with a weightage of 25% of total marks per course. The second component will be a Semester end Examination with a weightage of 75% of the total marks per course. The allocation of marks for the Continuous Assessment and Semester end Examinations is as shown below:

a) Details of Continuous Assessment (CA)-25% of the total marks per course:

Continuous Assessment	Details	Marks
Component 1 (CA-1)	Presentation	15 marks
Component 2 (CA-2)	Test	10 marks

b) Details of Semester End Examination

75% of the total marks per course. Duration of examination will be two and half hours.

Question Number	Sub-part	Description	Marks	Total Marks
Q1 A)	i) to ii)	Answer any 1 of 2 questions	10marks	10 Marks
Q1 B)		Compulsory	5 marks	5 marks
Q 2 to Q 4		Same as above		
		TOTAL OF 4 QUESTIONS		60 Marks
Q5)	i) to iv)	Short notes -Answer 3 out of 4	05 marks	15 Marks
			TOTAL	15 Marks
			NET TOTAL	75 Marks

Signature

Signature

Signature

HOD

Approved by Vice –Principal

Approved by Principal

SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
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Program: M.Sc. (2021-22)				Semester: III	
Course: Techniques and Instrumentation I				Course Code: PSMABO305	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutori al (Hour s per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
4	4		8	25	75
Learning Objectives:					
<p>This paper encompasses, basics of various types of techniques and instrumentation such as spectrophotometry, electrophoresis and centrifugation to carry out routine and advance research in Botany. The emphasis is on principle of the technique, methodology of sample preparation, preparation of various solutions, buffers and handling of equipment and application in the field of Botany.</p> <p>This paper also deals with various applications of histochemical and microscopic techniques to understand the structure and development of plants. Principles, instrumentation and applications of all microscopy is learnt</p>					
Course Outcomes:					
<p>After completion of the course, learners would be able to:</p> <p>CO1-Acquire the basic skills, required to perform computational analysis of biological data at various levels.</p> <p>CO2-Students would acquire specific practical skills regarding various sample preparations and imaging techniques which are essential for conducting advanced plant science research.</p>					
Outline of Syllabus: (per session plan)					
Module	Description				No of Hours
1	Biostatistics				1 hr
2	Bioinformatics				1 hr
3	pH and Buffers; Electrophoresis				1 hr
4	Microscopy & Spectroscopy				1 hr
	Total				4hr
PRACTICALS					4hr

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Unit	Topic	No. of Hours/Credits
Module 1	Biostatistics <ul style="list-style-type: none"> • Hypothesis testing: Theory of errors – Type I and Type II errors, Null Hypothesis, z-test, Test of significance. • Introduction to ANOVA, One-way & two way ANOVA, Dunett's test. • Randomized Block Design and Latin Square. (5 problems to be solved in each category) 	Credit 1
Module 2	Bioinformatics <ul style="list-style-type: none"> • Organization of biological data, databases (raw and processed), Queering in data bases. • Gene finding, motif finding and multiple sequence alignment. • Protein sequence analysis (theory and algorithms). Exploration of databases, retrieval of desired data, BLAST etc	Credit 1
Module 3	pH and Buffers; Electrophoresis <ul style="list-style-type: none"> • pH and buffer solutions, acids and bases, hydrogen ion concentration, dissociation of acids and bases, measurement of pH, titration curves. Physiological Buffers. • Electrophoresis: Theory and application, PAGE (Native & SDS) and AGE 2 D Electrophoresis 	Credit 1
Module 4	Microscopy & Spectroscopy <ul style="list-style-type: none"> • Principles, instrumentation, working and applications of Fluorescence microscope, TEM, SEM, Biological sample preparation for electron microscopy 	Credit 1

	<ul style="list-style-type: none"> • IR, AAS , Plasma Emission spectroscopy, NMR, MS 	

To develop scientific temper and interest by exposure through industrial visits and study/educational tours is recommended in each semester

PRACTICALS 4hr

- Hypothesis testing, Normal deviate test.
- ANOVA- one way & two way.
- Randomized block Design and Latin square
- Multiple alignments
- Phylogenetic tree.
- BLAST
- Motif finding
- Preparation of buffers (phosphate and acetate)
- Determination of pKa

Suggested Readings:

1. Glick B.R., Pasternak J.J. and Patten C.L. (2010) Molecular Biotechnology: Principles and Applications of Recombinant DNA. Fourth edition. ASM Press, USA.
2. Green M.R. and Sambrook J. (2012) Molecular Cloning: A Laboratory Manual. Fourth edition. CSHL Press, USA.
3. Metzler, D.E. (2003) Biochemistry. Second edition. Academic Press, USA.
4. Primrose, S.B. and Twyman, R.M. (2006) Principles of Genetic Manipulation and Genomics. Seventh Edition. Blackwell Publishing, UK.
5. Voet, D., Voet, J.G. and Pratt C.W. (2012) Principles of Biochemistry. Fourth edition. John Wiley & Sons, UK.
6. Wilson, K. and Walker, J. (2010) Principles and Techniques of Biochemistry and Molecular Biology, Seventh edition, Cambridge University Press, USA.
7. Daniel, C Liebler (2002) Introduction to Proteomics-Tools for New Biology. Humana Press, Totowa, NJ.
8. Twyman, R (2014) Principles of Proteomics. Second edition. Garland Science, Taylor and Francis group, UK
9. Comai, L; Katz J and Mallick, P (2017) Proteomics-Methods and Protocols, Springer Protocols, Springer New York.

Microscopy

1. Khasim S.M. (2002). Botanical Micro techniques: Principles and Practice. Capital Publishing Company.
2. Bisen P.S. Mathur S. (2006). Life Science in Tools and Techniques. CBS Publishers, Delhi.
3. Sass John E. (1984). Botanical Micro techniques. Tata McGraw-Hill Publishing Company Ltd.

Biostatistics:

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1. Biostatistics: A foundation For Analysis In Health Sciences (7th Edition 1999)
Wayne W. Daniel John Wiley & Sons Inc.
 - 2 Fundamentals of Biostatistics (2006) Veer Bala Rastogi Ane Books India
 - 3 Biostatistics- The Bare Essentials (Second Edition 2000) Nosman Streiner B. C. Decker Inc.
- Bioinformatics :**
1. Bioinformatics: Sequence and Genome Analysis (Second Edition 2004) David W. Mount
Coldspring Harbor Laboratory Press
 2. Bioinformatics and Functional Genomics (2003) Jonathan Pevsner John Wiley & Sons
Publications

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Program: M.Sc. (2021-22)				Semester: III	
Course: Molecular Biology I				Course Code: PSMABO306	
Teaching Scheme			Evaluation Scheme		
Lecture (Hours per week)	Practical (Hours per week)	Tutori al (Hour s per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
4	4		8	25	75
Learning Objectives: To learn molecular biology basics along with regulatory systems, from nuclear material to the protein cytoplasmic components.					
Course Outcomes: After completion of the course, learners would be able to: CO1: Explain the mechanism by which transcription is initiated in eukaryotic cells <ul style="list-style-type: none"> • Illustrate methods to identify key regulatory elements within a eukaryotic promoter • Explain how transcriptional control is achieved . • Outline the mechanisms by which post-transcriptional control is achieved. • Explain the structure, formation and function of microRNAs • Outline the mechanisms and factors that control the process of translation. CO2:					
Outline of Syllabus: (per session plan)					
Module	Description				No of Hours
1	DNA replication, repair and recombination				1 hr
2	RNA synthesis and processing				1 hr
3	Protein synthesis and processing				1 hr
4	Control of gene expression				1 hr
	Total				4hr
PRACTICALS					4hr

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Unit	Topic	No. of Hours/Credits
Module 1	<p>DNA replication, repair and recombination</p> <ul style="list-style-type: none"> • Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms, homologous and site-specific recombination. 	Credit 1
Module 2	<p>RNA synthesis and processing</p> <ul style="list-style-type: none"> • Transcription factors and machinery, formation of initiation complex, transcription activator and repressor, RNA polymerases, capping, elongation, and termination, RNA processing, RNA editing, splicing and polyadenylation, structure and function of different types of RNA, RNA transport 	Credit 1
Module 3	<p>Protein synthesis and processing</p> <ul style="list-style-type: none"> • Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, and translational proof-reading, translational inhibitors, post-translational modification of proteins. 	Credit 1
Module 4	<p>Control of gene expression</p> <ul style="list-style-type: none"> • Regulations of gene expression in bacteria– Concept of operon, lac operon, trp operon, ara operon Regulation of gene expression in bacteriophage λ. • Control of gene expression in eukaryotes, Transcriptional control, RNA processing control, 	Credit 1

	mRNA translocation control, mRNA degradation control, protein degradation control	

To develop scientific temper and interest by exposure through industrial visits and study/educational tours is recommended in each semester

PRACTICALS 4hr

- Aseptic techniques, safe handling of microorganisms.
- Establishing pure cultures, streak plate method (T-streak and pentagon method), Pour plate, spread plate.
- Maintenance of cultures - Paraffin embedding, Lyophilisation.
- Preparation of culture medium, stock solutions
- Determination of cell number, viable count method (using pour plate and serial dilution technique).
- Separation of seed proteins using PAGE.
- Analysis of proteins by one and two dimensional gel electrophoresis.
- Genomic DNA isolation and quantification.

Suggested Readings:

1. Pal and Ghaskadabi (2009). Fundamentals of Molecular Biology. Oxford Publishing Co.
2. De Robertis and De Robertis (2005). (8th edition) (Indian) Cell and Molecular Biology, Lippincott Williams, Philadelphia. [B.I Publications Pvt. Ltd. New Delhi].
3. Lodish S., Baltimore B., Bek C., Lawrence K. (1995). Molecular Cell Biology. 3 rd Edn. Scientific American Books, New York.
4. Lodish et al (2004). 5th Edn). Molecular Cell Biology, W H Freeman and company, New York.
5. David Freifelder (1996). Essentials of Molecular Biology, Panima Publishing Company, New Delhi.
6. Russel P. J. (2010). iGenetics-A Molecular Approach, Pearson Education Inc.
7. Gardner E. J., Simmons M. J., Snustad D. P. (1991). Principles of Genetics, John Wiley & Sons.
8. Strickberger M.W. (2008). Genetics, Pearson (Prentice Hall).
9. Acquaah G (2007). Principles of Plant Genetics and Breeding, Blackwell Publishing Ltd. USA.
10. Allard R. W. (1999). Principles of Plant Breeding, John Wiley and Sons.
11. Singh R. J. (2002). Plant Cytogenetics, CRC Press. Department of Botany, University of Delhi-16/
12. Hartwell L. H., Hood L., Goldberg M. L., Reynolds A. E., Silver L. M., Veres R. C. (2006). Genetics-From Genes to Genomes, McGraw Hill
13. Lewin B. (2008). Genes IX, Jones and Barlett Publishers.
14. Hartl D. L. and Jones E. W. (2007). Genetics-Analysis of Genes and Genomes, Jones and Barlett publishers.

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15. Karp, G. 1999. Cell and Molecular Biology : Concept and Experiments. John Wiley and Sons, Inc., USA.
 16. Lewin, B. 2000. Gene VII. Oxford University Press, New York, USA.
 17. Russel, P.J. 1998. Genetics (Fifth Edition). The Benjamin/Cummings Publishing Company IND., USA.
 18. Snustad, D.P and Simmons, M.J 2000. Principles of Genetics (Second Edition). John Wiley and Sons Inc., USA.
- Snustad, D.P and Simmons, M.J 2000. Principles of Genetics (Second Edition). John Wiley and Sons Inc., USA.

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Program: M.Sc. (2021-22)				Semester: III	
Course: ANGIOSPERMS AND PHYTOCHEMISTRY –I				Course Code: PSMABOAP307	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutori al (Hour s per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
4	4		8	25	75
Learning Objectives: This paper includes various aspects of taxonomy in relation to viz. anatomy, embryology & palynology. Various aspects to quality testing of drugs are emphasized.					
Course Outcomes: After completion of the course, learners would be able to: CO1: Learning Outcomes: CO2: After completion of the course, students would be able to : CO3: Identify families by learning typical specimens. CO4: Relate cambium with reference to its origin, position, structure, distribution, behavior and its importance in vascular plants. Understand venation patterns, stomatal types, senescence and significance of floral anatomy. Understand Role of Embryology and Palynology in Taxonomy. CO5:					
Outline of Syllabus: (per session plan)					
Module	Description				No of Hours
1	Angiosperm families/ Families				1 hr
2	Anatomy				1 hr
3	Embryology & Palynology				1 hr
4	Medicinal Botany				1 hr
	Total				4hr
PRACTICALS					4hr

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Unit	Topic	No. of Hours/Credits
Module 1	<p>Angiosperm Families</p> <ul style="list-style-type: none"> • Study the following families with reference to its systematic position, distribution, salient features, floral formula, floral diagram, morphological peculiarities, enlist economic important plants and their uses. A detailed study of present status, affinities, phylogeny and interrelationships of the mentioned families below: • Ranunculaceae, Annonaceae, Nymphaeaceae, Nyctaginaceae, Vitaceae, Onagraceae, Pedaliaceae, Scrophulariaceae, Acanthaceae, Orchidaceae 	Credit 1
Module 2	<p>Anatomy</p> <ul style="list-style-type: none"> • Study of cambium with reference to its origin, position, structure, distribution, behavior and its importance in vascular plants. • Study of Leaf Architecture Patterns in dicotyledonous plants and its significance. • A study on basic features on Node-petiole and Nodal anatomy. • Ontogeny of stomatal development. • Study of abscission zone in Plants. • Floral anatomy in hypogynous, perigynous and epigynous flowers and its significance. 	Credit 1
Module 3	<p>Embryology & Palynology</p> <p>Embryology:</p> <ul style="list-style-type: none"> • Role of embryology in taxonomy with respect to Caryophyllales, Helobiae, Orchidaceae, Podostemaceae, Onagraceae, Cyperaceae, Lemnaceae, Crassulaceae, Loranthaceae, Paeonia, Trapa, Exocarpus, Pentaphragma. <p>Palynology:</p> <ul style="list-style-type: none"> • Eurypalynous & Stenopalynous taxa. • Evolution of pollen aperture types • Pollinia in Orchidaceae & Asclepiadaceae 	Credit 1

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	Role of Palynology in Taxonomy.	
Module 4	<p>Medicinal Botany Methods in Evaluating Crude Drugs or powdered drugs</p> <ul style="list-style-type: none"> • Organoleptic • Microscopic <ul style="list-style-type: none"> ○ Leaf constants: palisade ratio and vein islet number. ○ Trichomes and Trichome density ○ Stomata structure and types, stomatal frequency & stomatal index. ○ Cell inclusions ○ Sclereids • Physico-chemical: <ul style="list-style-type: none"> ○ Ash content ○ Extractive values ○ Qualitative chemical analysis • Quantitative chemical analysis • Biological <ul style="list-style-type: none"> ○ Hepatoprotective ○ Anti-fertility ○ Anti-inflammatory ○ Anti-ulcer ○ Neuro-pharmacological 	Credit 1

To develop scientific temper and interest by exposure through industrial visits and study/educational tours is recommended in each semester

PRACTICALS 4hr

- Study of Angiosperm families mentioned for theory with reference to morphological peculiarities, floral diagrams and economic importance of its members with the help of locally available plants.
- Study of Cambium primary, secondary and cork cambia.
- Study of leaf architecture. Prepare permanent leaflet of Tamarind leaf architecture (submission).
- Study of Node petiole anatomy.
- Palynology ---- pollinia mounting --- Asclepiadaceae and Orchidaceae
- Macroscopic & Microscopic evaluation, Physico-chemical & Phytochemical analysis of the following crude drugs [TLC to be performed]: *Mimosa pudica* entire plant; *Boerhaavia diffusa* entire plant, *Saraca asoka* bark, *Asparagus* roots, *Glycyrrhiza glabra* rhizome

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Suggested Readings:

Angiosperm Families

1. Angiosperm Phylogeny Group (2016). An update of the Angiosperm Phylogeny Group Classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society* 181: 1-20. Department of Botany, University of Delhi-20.
2. Gurucharan Singh (2019). *Plant Systematics*, oxford and IBH Public.
3. Lawrence George H.M. (1967). *Taxonomy of Vascular Plants*, Oxford & IBH
4. Sharma O.P. (2009). *Plant Taxonomy* 2nd edition. Tata McGraw-Hill Education Pvt. Ltd. Publication.
5. Mondal A.K. (2009) *Advanced Plant Taxonomy*, New Central Book Agency (P) Ltd. London.
6. Vasudevan Nair R. (1997) *Plant Systematics*. Oxford & IBH.
7. Gangulee Das & Dutta (2011) *College Botany Vol. II*. New Central Book Agency (P) Limited
8. Sambamurthy A.V.S.S. (2010). *Taxonomy of Angiosperms*. I. K. International Pvt Ltd,
9. Vashishta P. C. (2001). *Taxonomy of Angiosperms* S. Chand Publication.
10. Michael G. Simpson. (2006) *Plant Systematics*. Elsevier Academy Press
11. Cooke T. (1901) *Flora of Bombay Presidency*. London: vol . 1, 2 & 3. Tayl

Plant Anatomy-

1. Carlquist, S.1961 *Comparative Plant Anatomy*. Holt, Rinehart and Winston N.W.
2. Eames .A.J. and MACDANIELS,L.H,1947, *An Introduction to Plant Anatomy*,McGrowHill,N.Y andLondon.
3. Easu,K, 1965. *Plant Anatomy*.WileyN.W
4. Fahn,A, 1997. *Plant Anatomy* 4th edition,Aditya BooksPvt Ltd,New-Delhi.
5. Metcalfe and Chalk,L1950, *Anatomy of DicotyledonsVol.I and IIClarendon Press,Oxford*

Embryology and Palynology

1. Davis,G.L.1966, *Systematic Embryology of the Angiosperms*,John Wiely and Sons,N.Y
2. Erdtman.G,1971, *Pollen Morphology and Plant Taxonomy*,Hafner.Publ.Co.N.Y
3. Faegri.K & Eversen.J,1989 *Text Book of Pollen Analysis* (4thedtn),John Wiley & Sons,N.Y
4. KashinathBhattacharya etc; 2011, *A text Book of Palynology(Basic and Applied)*New Central Book Agency (P)Ltd,London.
5. Maheswari.P. *An Introduction to the Embryology of Angiosperms*, McGraw Hill Book Co.Inc,N.W.
6. Nair.P.K.K. 1970, *Pollen Morphology of Angiosperms*, Scholar Publ.House, Lucknow.
7. Shivanna K.R.,2003, *Pollen Biology and Biotechnology-Special Indian Edition*, Oxford and IBH Publ.CoPvt.Ltd,New Delhi.
8. Shivanna.K.R.&Johri.B.M, 1985,*The Angiosperm Pollen:Structure and Function*,Wiley Eastern Ltd, New delhi.
9. Tilak.S.T,1982,*Aerobiology*,VaijayanthiPrakashan,Aurangabad,India.
10. Bhojwani S. S. and Bhatnagar S. P. (1999). *The embryology of angiosperms*. Vikas Pub. House.
11. Bhojwani S.S. and Soh W.Y. (2001). *Current Trends in Embryology of Angiosperms* Kluwer Academic Publishers. 4.

Medicinal Botany:

1. Mukherjee P.K, (2002). *Quality Control of Herbal Drugs-An approach to evaluation of Botanicals: Business Horizons Pharmaceutical Publishers, New Delhi*.

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2. Khandelwal KR. (2004). Practical Pharmacognosy. Nirali prakshan, 2004.
3. Anonymous, (1996) Pharmacopoeia of India, Ministry of health and family welfare, Govt. of India.
4. Trease & Evans (1996) Pharmacognosy. Sanders company ltd.
5. Wallis T.E. (1985) Textbook of Pharmacognosy. CBS PRESS.

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Program: M.Sc. (2021-22)				Semester: III	
Course: Angiosperms and Phytochemistry –II				Course Code: PSMABO308	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutori al (Hour s per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
4	4		8	25	75
Learning Objectives: The special paper encompasses of evolution of flower and its parts, phylogenetic studies and nomenclatural aspects. Research Methodology as a theory topic is introduced while it is already done in practical paper as a project proposal.					
Course Outcomes: After completion of the course, learners would be able to: CO1: Understand how to write a research proposal CO2: The basic concepts of classical taxonomy viz. classification, phylogeny etc.					
Outline of Syllabus: (per session plan)					
Module	Description				No of Hours
1	Evolution				1 hr
2	Cladistics				1 hr
3	Nomenclature				1 hr
4	Research Methodology				1 hr
	Total				4hr
PRACTICALS					4hr

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Unit	Topic	No. of Hours/Credits
Module 1	<p><u>Evolution</u></p> <ul style="list-style-type: none"> • The effects of evolutionary theory on systematic, monographic and floristic development <ul style="list-style-type: none"> ○ Primitive versus advanced ○ Homology and Analogy ○ Parallelism and Convergence. ○ Phylogeny, phylogenetic and phynetic ontogeny ○ Monophyly and Polyphyly • Character weighing 	Credit 1
Module 2	<p><u>Cladistics</u></p> <ul style="list-style-type: none"> • Numerical Taxonomy: Principles, OTU, Taxonomic characters, coding of characters • Use of cladistics in classification • Phylogenetic classification systems-Takhtajan, Cronquist, APGI, II, III <p>Patterns of variation and phylogenetic trees, cluster analysis; Building Trees-Rooting technique, Distance methods, Maximum likely hood methods, Bootstrapping using trees. Phylocode</p>	Credit 1
Module 3	<p><u>Nomenclature</u></p> <ul style="list-style-type: none"> • International code of Botanical Nomenclature 1830 – Paris Code to 2017 – Shenzhen Code. • Major adaptations considered in these International Botanical Congress • Nomenclatural terminology- <ul style="list-style-type: none"> ○ Important Rules of ICBN. ○ Typification; - Type concept - holotype, isotype, syntype, lectotype, paratype, neotype; Autonym, Basionym, Homonym, Synonym, Tautonym; alternative, ambiguous, 	Credit 1

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	<p>illegitimate, naked, rejected and superfluous names.</p> <ul style="list-style-type: none"> ○ Effective and Valid publication; Priority; Scientific names-Correct name, ● Exercises on plant nomenclature (problems to be asked in theory). 	
Module 4	<p><u>Research Methodology</u></p> <ul style="list-style-type: none"> ● Research: Definition. Identification of the problem, assessing the status of the problem, formulating the objectives, preparing design (experimental or otherwise), Actual investigation. ● Literature survey: References, Abstraction of a research paper, ● Documentation and scientific writing: Results and Conclusions, Preparation of manuscript for Publication of Research paper, Presenting a paper in scientific seminar, Thesis writing. ● Structure and Components of Research Report, Types of Report: research papers, thesis, Research Project Reports, Pictures and Graphs, citation styles, , Bibliography. 	Credit 1

To develop scientific temper and interest by exposure through industrial visits and study/educational tours is recommended in each semester

PRACTICALS 4hr

PROJECT PROPOSAL

Suggested Readings:

Plant Taxonomy

1. Angiosperm Phylogeny Group 2016. An update of the Angiosperm Phylogeny Group Classification for the orders and families of flowering plants: APG IV. Botanical Journal of the Linnean Society 181: 1-20. Department of Botany, University of Delhi-20.
2. Crawford, D.J. 2003. Plant Molecular Systematics. Cambridge University Press, Cambridge, UK.
3. Judd, W.S., Campbell, C.S, Kellogg, E.A., Stevens, P.A. and Donoghue, M.J. 2016. Plant

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Systematics: A Phylogenetic Approach. Sinauer Associates, Inc., Massachusetts.

4. Simpson, M.G. 2010. Plant Systematics. Elsevier, Amsterdam.
5. A. K. Mondal, 2005, Advanced Plant Taxonomy, New central Book Agency(P) Ltd, London.
6. Cole, A.J. 1969, Numerical Taxonomy, Academic Press, London.
7. Cronquist, A.,1981, An Integrated system of classification of flowering plants, Columbia University press, N.Y
8. Davis, P. Hand V.H. Heywood1963, Principles Of Angiosperm Taxonomy, Oliver and Boyd, Edinburgh.
9. Greuter. W, et. al,1988, International Code of Botanical Nomenclature, Konigstein.
10. Gurucharan Singh,1999, Plant Systematics, Oxford & IBH, Publs
11. Heywood, V.H,1967, Plant Taxonomy, Edward Arnold Publishers, London
12. Heslop-Harrison.J.1955, New Concepts in Flowering Plant Taxonomy, William HeinemannLtd
13. Samuel Jones,1987, Plant Systematics, Mc-Graw-Hill company.
14. Sivarajan, V.V,1991, Introduction to the Principles of Plant Taxonomy, Oxford & IBH, N. Delhi.
15. Sneath. R.H. A & R.R. Sokal,1973, Numerical Taxonomy, W.H. Freeman & Company, San Fransco.
16. St. John. H,1958, Nomenclature of Plants, Ronald, N.Y.
17. Vasudevan Nair. R,1997, Plant Systematics, Oxford & IBH
18. V.V. Sivrajan, 1991, Introduction to Principles of plant Taxonomy, Oxford & IBH.
19. Turland, N. J., Wiersema, J. H., Barrie, F. R., Greuter, W., Hawksworth, D.L., Herdeeen, P. S., Knapp, S., Kusber, W. H., De-Zhu Li, Marhold, K., May, T. W., McNeill, J., Monro, A. M., Prado, J., Price, M. J., Smith, G. F. (2018). International Code of Nomenclature For Algae, Fungi and Plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regum Vegetabile 159. Glashütten: Koeltz Botanical Books. DOI <https://doi.org/10.12705/Code.2018>

Research Methodology

1. Thesis & Assignment Writing–J Anderson, B.H.Dursten & M.Poole, Wiley Eastern, 1977
2. A Hand Book of Methodology of Research – P. Rajammal and P. Devadoss, R. M. M. Vidya Press, 1976.
3. The Craft of Scientific Writing by Michael Alley, (Springer).
4. Research Methodology by R. Panneerselvam, PHI, New Delhi 2005
5. Practical Research Methods, by Dawson, Catherine, 2002, UBS Publishers' Distributors New Delhi.
6. Research Methodology- A step by step Guide for Beginners, (2nd ed.) Kumar Ranjit, 2005, Pearson Education.
7. How to write and Publish by Robert A. Day and Barbara Gastel, (Cambridge University Press).
8. Survival skills for Scientists by Federico Rosei and Tudor Johnson, (Imperial College Press).
9. How to Research by Loraine Blaxter, Christina Hughes and Malcum Tight, (Viva Books).
10. The Craft of Scientific Writing by Michael Alley, (Springer).
11. A Student's Guide to Methodology by Peter Clough and Cathy Nutbrown, (Sage Publications).
12. Probability and Statistics for Engineers and Scientists" by Sheldon Ross, (Elsevier Academic Press).
13. Research methodology techniques and methods by C L Kothari, New age International publishers.



Shri Vile Parle Kelavani Mandal's
**MITHIBAI COLLEGE OF ARTS, CHAUHAN INSTITUTE OF SCIENCE &
AMRUTBEN JIVANLAL COLLEGE OF COMMERCE AND ECONOMICS
(AUTONOMOUS)**

*NAAC Reaccredited 'A' grade, CGPA: 3.57 (February 2016),
Granted under RUSA, FIST-DST & -Star College Scheme of DBT, Government of
India,*

Best College (2016-17), University of Mumbai

Affiliated to the
UNIVERSITY OF MUMBAI

Program: M.Sc II Botany

Course: TECHNIQUES AND INSTRUMENTATION II

MOLECULAR BIOLOGY II

ANGIOSPERMS AND PHYTOCHEMISTRY -III

ANGIOSPERMS AND PHYTOCHEMISTRY -IV

Semester IV

**Choice Based Credit System (CBCS) with effect from
the Academic year 2020-2021**

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
Jivanlal College of Commerce & Economics (AUTONOMOUS)**

Preamble

M.Sc. semester 3 & 4 botany syllabus is designed with an objective to encourage and support the growing demands and challenging trends in the educational scenario. Our course-work focuses on an all- round development of the students in the field of plant science and inter-related arenas.

Department of Botany, Mithibai College (Autonomous) is committed to broad based knowledge imparting at the level of its Masters programme and encourages a multi-disciplinary approach to understanding plant science. The programme endeavours to promote knowledge on various aspects viz. techniques and instrumentation, molecular biology, angiosperm taxonomy, photochemistry, plant anatomy, plant physiology, medicinal botany, cladistics, forest ecology, ethnobotany with special emphasis to research methodology. These are few topics broadly named in conjunction with the recent trends in plant sciences.

Evaluation Pattern

The performance of the learner will be evaluated in two components. The first component will be a Continuous Assessment with a weightage of 25% of total marks per course. The second component will be a Semester end Examination with a weightage of 75% of the total marks per course. The allocation of marks for the Continuous Assessment and Semester end Examinations is as shown below:

c) Details of Continuous Assessment (CA)-25% of the total marks per course:

Continuous Assessment	Details	Marks
Component 1 (CA-1)	Presentation	15 marks
Component 2 (CA-2)	Test	10 marks

d) Details of Semester End Examination-75% of the total marks per course. Duration of examination will be two and half hours.

Question Number	Sub-part	Description	Marks	Total Marks
Q1 A)	i) to ii)	Answer any 1 of 2 questions	10marks	10 Marks
Q1 B)		Compulsory	5 marks	5 marks
Q 2 to Q 4		Same as above		
TOTAL OF 4 QUESTIONS				60 Marks
Q5)	i) to iv)	Short notes -Answer 3 out of 4	05 marks	15 Marks
			TOTAL	15 Marks
			NET TOTAL	75 Marks

Signature

Signature

Signature

HOD

Approved by Vice –Principal

Approved by Principal

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
Jivanlal College of Commerce & Economics (AUTONOMOUS)**

Program: M.Sc.				Semester: IV	
Course: Techniques and Instrumentation II				Course Code: PSMABO405	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutori al (Hour s per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
4	4		8	25	75
Learning Objectives: This paper encompasses, basics of various types of techniques and instrumentation such as Centrifugation, Chromatography, Tracer techniques & PCR, Nanotechnology & IPR to carry out routine and advance research in Botany. The emphasis is on principle of the technique, methodology of sample preparation and handling of equipment and application in the field of Botany.					
Course Outcomes: After completion of the course, learners would be able to: CO1-Acquire the basic skills, required to perform computational analysis of biological data at various levels. CO2-Students would acquire specific practical skills regarding various chromatographic techniques , nanotechnology and patent filing process.					
Outline of Syllabus: (per session plan)					
Module	Description				No of Hours
1	Centrifugation				1 hr
2	Chromatography				1 hr
3	Tracer techniques & PCR				1 hr
4	Nanotechnology & IPR				1 hr
	Total				4hr
PRACTICALS					4hr

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
Jivanlal College of Commerce & Economics (AUTONOMOUS)**

Unit	Topic	No. of Hours/Credits
Module 1	Centrifugation <ul style="list-style-type: none"> • Basics principle of Sedimentation • Types of rotors • Differential & density gradient centrifugation • Preparative centrifugation & Applications; Analytical centrifugation & applications 	Credit 1
Module 2	Chromatography <ul style="list-style-type: none"> • General Principle of chromatography. • Techniques and applications of Ion exchange, Affinity Chromatography & HPLC Application of HPTLC & HPLC in validation of herbal drugs	Credit 1
Module 3	Tracer techniques & PCR <ul style="list-style-type: none"> • Pattern and rate of radioactive decay, Units of radioactivity, Stable Isotopes. • Principle, instrumentation & technique: Geiger-Muller counter, Liquid scintillation counters & Autoradiography. Applications of isotopes in biology: Tracer techniques & Autoradiography. PCR and its applications.	Credit 1
Module 4	Nanotechnology & IPR <ul style="list-style-type: none"> • Synthesis of nanoparticles using biological samples. • Characterization of nanoparticles (FTIR, SEM, TEM, STEM, Scanning Tunneling Microscope, Atomic Force Microscope, UV-Visible). • IPR: Objectives, process & scope 	Credit 1

To develop scientific temper and interest by exposure through industrial visits and study/educational tours is recommended in each semester

PRACTICALS 4hr

- Separation of proteins by Ion exchange chromatography
- Separation of amino acids by two dimensional chromatography.

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
Jivanlal College of Commerce & Economics (AUTONOMOUS)**

- Viscosity studies of proteins: standard BSA and varying concentrations of urea
- Synthesis of nanoparticles
- Characterization of nanoparticles by UV spectroscopy.
- Filing a patent
- Industrial visit and report submission.

Suggested Readings:

1. Ruzin, S.E. (1999) Plant Microtechnique and Microscopy. Oxford University Press, USA.
2. Yolanda, M. and Hartmann, H. (2017) Light Microscopy, Methods and Protocols. Humana Press, USA.
3. Sharma. B.K., 2007. Chromatography, Goel publishing house.
4. N. K. Acharya Textbook on intellectual property rights, Asia Law House (2001)
5. P. Ganguli, Intellectual Property Rights: Unleashing the knowledge Economy, Tata McGraw-Hill (2001)
6. Arthur Raphael Miller, Micheal H. David; Intellectual Property: Patents, Trademarks and Copyright in a Nutshell, West Group Publishers (2000)
7. Jayashree Watal, Intellectual property rights in the WTO and developing countries, Oxford University Press, Oxford.
8. Brown, T.A. (2016). Gene Cloning and Analysis: An Introduction. Seventh edition. WileyBlackwell Publishing, UK.
9. Dale J.W., Schantz M.V. and Plant N. (2011). From Genes to Genomes: Concepts and Applications of DNA Technology. Third edition. John Wiley & Sons, UK.
10. Glick, B.R., Pasternak, J.J. and Patten, C.L. (2010). Molecular Biotechnology: Principles and Applications of Recombinant DNA. Fourth edition. ASM Press, USA.
11. Green, M.R. and Sambrook, J. (2012). Molecular Cloning: A Laboratory Manual. Fourth edition. CSHL Press, USA.
12. Metzler, D.E. (2003). Biochemistry. Second edition. Academic Press, USA.
13. Primrose, S.B. and Twyman, R.M. (2006). Principles of Genetic Manipulation and Genomics. Seventh Edition. Blackwell Publishing, UK.
14. Voet, D., Voet, J.G. and Pratt, C.W. (2012). Principles of Biochemistry. Fourth edition. John Wiley & Sons, UK.
15. Wilson, K. and Walker, J. (2010). Principles and Techniques of Biochemistry and Molecular Biology, Seventh edition, Cambridge University Press, USA

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
Jivanlal College of Commerce & Economics (AUTONOMOUS)**

Program: M.Sc.				Semester: IV	
Course: Molecular Biology II				Course Code: PSMABO406	
Teaching Scheme			Evaluation Scheme		
Lecture (Hours per week)	Practical (Hours per week)	Tutori al (Hour s per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
4	4		8	25	75
Learning Objectives: This course aims to educate student on concepts of proteins, enzymes, basic bacterial and plant signaling mechanisms. This course will provide expertise in prokaryotic biology and gene expression, which is essential to lay a strong foundation for understanding the molecular biology of plant systems.					
Course Outcomes: After completion of the course, learners would be able to: CO1- Acquire deeper insight into the various aspects of gene regulation. CO2- Relate the knowledge of cell signalling to the various metabolic reactions and effects on human body and thus believe in leading a healthier life. CO3- Critically evaluate and discuss original research articles in the area of gene regulation..					
Outline of Syllabus: (per session plan)					
Module	Description				No of Hours
1	Gene regulation I				1 hr
2	Gene regulation II				1 hr
3	Cell signaling				1 hr
4	Cancer biology				1 hr
	Total				4hr
PRACTICALS					4hr

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
Jivanlal College of Commerce & Economics (AUTONOMOUS)**

Unit	Topic	No. of Hours/Credits
Module 1	Gene regulation I <ul style="list-style-type: none"> • Regulation of the expression of phages, viruses, prokaryotic and eukaryotic genes, role of chromatin in gene expression and gene silencing. 	Credit 1
Module 2	Gene regulation II <ul style="list-style-type: none"> • Genetic regulation of development in Drosophila Developmental stages in Drosophila – embryonic development, imaginal discs, homeotic genes. • Genetic regulation of development in Plants. 	Credit 1
Module 3	Cell signaling <ul style="list-style-type: none"> • Forms of signaling, Hormones and their receptors, cell surface receptor, intracellular receptor, signaling through G-protein coupled receptors, signal relay pathways-signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component systems, light signaling in plants, bacterial chemotaxis and quorum sensing. 	Credit 1
Module 4	Cancer biology <ul style="list-style-type: none"> • Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth. 	Credit 1

To develop scientific temper and interest by exposure through industrial visits and study/educational tours is recommended in each semester

PRACTICALS 4hr

- Isolation of plasmid DNA
- Quantification of plasmid DNA
- Agarose gel electrophoresis separation of plasmid DNA
- Restriction enzyme digestion and separation of fragments
- Southern blot transfer technique
- Transformation of E. coli cell by plasmid DNA
- β -galactosidase expression and assay

Suggested Readings:

1. Genes VI - Benjamin Lewin, Oxford University Press Oxford, 1997
2. Genes VII – Benjamin Lewin, Oxford University Press Oxford, 2000
3. Molecular Biology of the cell (1998) Edt. Alberts, Bray, Lewin, Raff et al
4. Molecular Cell Biology 3rd edn, (1995) Lodish, Baltimore, Berk, Lawrence, et al, Scientific American Books, N.Y.
5. Cell and Molecular Biology (1988), 8th edn. De Robertis and De Robertis, Info-Med, Hong Kong
6. Biochemistry and Molecular Biology of Plants (2000) Edt. Buchanan, Grissem and Jones, American Soc. Plant Biologists, Waldorf
7. Genes (2000), edn7, Lewin B, Oxford Univ. Press, Oxford
8. Practical Biochemistry: Principles and Techniques, 4th Edition, Wilson K and Walker J, Cambridge University Press, Cambridge, 1994
9. Physical Biochemistry, Freifielder D, Buchanan B, Gruissem G and Jones R. (2000) Biochemistry and Molecular Biology of Plants, American Society of Plant Physiologists, USA.
10. Davies P J. (2004) Plant Hormones: Biosynthesis, Signal Transduction, Action. 3rd Edition, Kluwer Academic Publisher, Dordrecht, The Netherlands.
11. Jordan BR. (2006) The Molecular Biology and Biotechnology of Flowering, 2nd Edition, CAB International, Oxfordshire, U.K.
12. Lehninger, A. L., Nelson, D. L. 1., & Cox, M. M. (2008). Lehninger principles of biochemistry (5th ed.). New York
13. Taiz, L. and Zeiger, E. (2010) Plant Physiology. 5th Edition
14. Hans-Walter Heldt Birgit Piechulla (2010) Plant Biochemistry

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
Jivanlal College of Commerce & Economics (AUTONOMOUS)**

Program: M.Sc.				Semester: IV	
Course: Angiosperms and Phytochemistry –III				Course Code: PSMABOAP407	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutori al (Hour s per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
4	4		8	25	75
Learning Objectives: To learn plant families, fruit and seed anatomy, mangrove and wetland vegetation. Some specific crude drug study and few adulterants.					
Course Outcomes: After completion of the course, learners would be able to: CO1- Understand mangrove and wetland vegetation CO2- Contribute towards restoration and sustainability of natural habitats. CO3- Identify the different kinds of therapeutics and addictives.					
Outline of Syllabus: (per session plan)					
Module	Description				No of Hours
1	Plant Families				1 hr
2	Anatomy				1 hr
3	Mangrove and wetland taxonomy				1 hr
4	Medicinal Botany				1 hr
	Total				4hr
PRACTICALS					4hr

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
Jivanlal College of Commerce & Economics (AUTONOMOUS)**

Unit	Topic	No. of Hours/Credits
Module 1	<p>Angiosperm Families/ Families</p> <ul style="list-style-type: none"> • Study the following families with reference to its systematic position, distribution, salient features, floral formula, floral diagram, morphological peculiarities, enlist economic important plants and their uses. A detailed study of present status, affinities, phylogeny and interrelationships of the mentioned families below: <ul style="list-style-type: none"> • Caryophyllaceae, Anacardiaceae, Sapotaceae, Plumbaginaceae, Oleaceae, Bignoniaceae, Loranthaceae, Casuarinaceae, Urticaceae, and Araceae 	Credit 1
Module 2	<p><u>Anatomy</u></p> <ul style="list-style-type: none"> • Fruit and seed anatomy. • Evolution of Tracheary elements • Types of stomata (Follow Dilcher's Classification) 	Credit 1
Module 3	<p><u>Mangrove & Wet land Biodiversity</u></p> <p><u>Mangrove</u></p> <ul style="list-style-type: none"> • Definition of Mangrove, distribution, biogeography of Indian mangrove, East and West coast mangrove, mangrove shore and forest. • Sailable features of important mangrove plants with respect to morphology and anatomical characters of – Rhizophoraceae, Sonneratiaceae, Avicenniaceae, Myrsinaceae, Acanthaceae. Traditional and medicinal uses of mangroves. • Wetland plant diversity, legal protection to coastal wetlands, Conservation of wetlands. 	Credit 1
Module 4	<p>Medicinal Botany</p> <ul style="list-style-type: none"> • History, origin, characteristics, uses, present status and varieties of Ginger, Chilly, and Eucalyptus. 	Credit 1

	<ul style="list-style-type: none"> • Psychoactive drugs: Narcotics, Hypnotics and Hallucinogens: Introduction to Narcotics, Hypnotics and Hallucinogens; biological source, chemical constituents and uses, effects; cultivation, collection, processing of <i>Erythroxylum coca</i>, Opium & <i>Cannabis</i> • Fumitories and Masticatories: Introduction to Fumitories & masticatories, biological source, chemical constituents and uses & effects; cultivation, collection, processing of tobacco; Betel leaves & areca nut • Mild stimulants: tea, coffee, cocoa • Detection of adulterants. 	

To develop scientific temper and interest by exposure through industrial visits and study/educational tours is recommended in each semester

PRACTICALS 4hr

- Study of Angiosperm families mentioned for theory with reference to morphological peculiarities using technical terms, floral diagrams and economic importance of its members with the help of locally available plants.
- Study of Mangrove plant families - Rhizophoraceae, Sonneratiaceae, Avicenniaceae, Myrsinaceae, Acanthaceae with respect to morphology & anatomy.
- Study of dehiscent fruit: , Phaseolus, .
- Study of indehiscent fruit: Lycopersicon, Maize, wheat, Punica.
- Study of fleshy fruit: Citrus
- Study of Pome: Apple
- Study of seed coat structure in Cotton, , Castor, Pumpkin, Canna.
- Detection of adulterants in the following samples on the basis of organoleptic, microscopic and physico-chemical evaluation.
- Tobacco leaves (adulterant Diospyros leaf)
- Pepper fruits (adulterant lantana fruits/papaya seeds)
- Extraction and detection of alkaloids from tobacco using TLC.
- Extraction and detection of tannins from Areca nut using TLC.

Suggested Readings:

Taxonomy

1. Angiosperm Phylogeny Group (2016). An update of the Angiosperm Phylogeny Group Classification for the orders and families of flowering plants: APG IV. Botanical Journal of the Linnean Society 181: 1-20. Department of Botany, University of Delhi-20.
2. Gurucharan Singh (2019). Plant Systematics, oxford and IBH Public.
3. Lawrence George H.M. (1967). Taxonomy of Vascular Plants, Oxford & IBH

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4. Sharma O.P. (2009). Plant Taxonomy 2nd edition. Tata McGraw-Hill Education Pvt. Ltd. Publication.
5. Mondal A.K. (2009) Advanced Plant Taxonomy, New Central Book Agency (P) Ltd. London.
6. Vasudevan Nair R. (1997) Plant Systematics. Oxford & IBH.
7. Gangulee Das & Dutta (2011) College Botany Vol. II. New Central Book Agency (P) Limited
8. Sambamurthy A.V.S.S. (2010). Taxonomy of Angiosperms. I. K. International Pvt Ltd,
9. Vashishta P. C. (2001). Taxonomy of Angiosperms S. Chand Publication.
10. Michael G. Simpson. (2006) Plant Systematics. Elsevier Academy Press
11. Cooke T. (1901) Flora of Bombay Presidency. London: vol . 1, 2 & 3. Taylor and Francis

Plant Anatomy-

1. Carlquist, S. 1961 Comparative Plant Anatomy. Holt, Rinehart and Winston N.W.
2. Eames. A.J. and MacDaniels, L.H, 1947, An Introduction to Plant Anatomy, McGrawHill, N.Y and London.
3. Easu, K, 1965 Plant Anatomy. Wiley N.W
4. Fahn, A, 1997 Plant Anatomy 4th edition, Aditya Books Pvt Ltd, New-Delhi.
5. Metcalfe and Chalk, L. 1950, Anatomy of Dicotyledons Vol. I and II Clarendon Press, Oxford.

Medicinal Botany

1. Pharmacognosy, Willium C. Evans, Saunders publications.
2. Textbook of Pharmacognosy, P. E. Wallis, CBS publishers and distributors.
3. Text book of Pharmacognosy, S. B. Gokhale, C. A. Kokate, A. P. Purohit, Nirali Publications

Mangrove & Wet land Biodiversity

1. Leela J. Bhosale (2005). Mangroves of Maharashtra, Shivaji University, Kolhapur.
2. Philip Barry Tomlinson (1994). The Botany of Mangroves. Cambridge University Press.
3. Banerjee L.K., Sastry A.R.K., Nayar M.P. (1989). Mangroves in India – Identification Manual. BSI
4. Bandaranayake, W.M., (1998). Traditional and medicinal uses of mangroves. *Mangroves and Salt Marshes* 2: 133-148.
5. R.N. Mandal & K.R. Naskar (2008). Diversity and classification of Indian mangroves: a review. *Tropical Ecology* 49(2): 131-146.

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
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Program: M.Sc.				Semester: IV	
Course: Angiosperms and Phytochemistry –IV				Course Code: PSMABOAP408	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutori al (Hour s per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
4	4		8	25	75
Learning Objectives: This paper encompasses ethnic plant diversity study including sacred groves and various tools of taxonomy. Applied taxonomy includes Remote Sensing, Plant quarantine and green-belt planning.					
Course Outcomes: After completion of the course, learners would be able to: CO1: Understand biodiversity better. CO2: Use the taxonomic tools, have knowledge about remote sensing technology and understand green – belt planning.					
Outline of Syllabus: (per session plan)					
Module	Description				No of Hours
1	Ethnobotany				1 hr
2	Tools of Taxonomy				1 hr
3	Tools for classification				1 hr
4	Applied Taxonomy				1 hr
	Total				4hr
PRACTICALS					4hr

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
Jivanlal College of Commerce & Economics (AUTONOMOUS)**

Unit	Topic	No. of Hours/Credits
Module 1	<p>Ethnobotany:</p> <ul style="list-style-type: none"> • Introduction; a brief history of ethnobotanical studies in the world and in India; scope of ethnobotany. Sub disciplines of ethnobotany. Interdisciplinary approaches, Knowledge of sociological and anthropological terms. Distribution of tribes in India. Knowledge of tribes of Maharashtra; Ethnobotanical works on these tribes. • Methods in ethnobotanical research. Research design and cautions in data collections, Practical and field skills; Prior Informed Consent, Participatory Rural Appraisal (PRA) techniques, interviews and questionnaire methods. • Ethnobotanical knowledge and communities: Ethnobotanical classification; Folk Taxonomy of Plants. Bioprospecting and commercial use of traditional knowledge. Medical ethnobotany, ethnopharmacology and the search of plant based drugs. Developing research partnerships: Code of Ethics and research guidelines in ethnobotany. Equitable Benefit sharing models of the world. 	Credit 1
Module 2	<p>Tools of Taxonomy</p> <ul style="list-style-type: none"> • Library- Literature: definition,origin, History and Evolution of Literature of Taxonomy in India. Classification of Taxonomic Literature: Checklist, Catalogue, Floras, Monographs, Revisions, Encyclopedias, Indices, Dictionaries, Journals. • Museum (Herbarium)- Definition, Steps involved in development of a herbarium, Maintenance of Herbarium, General account of Herbaria in India. Role of B.S.I in Herbaria, Private herbaria, Herbarium of KEW, Utility and importance of Herbaria in Taxonomy. 	Credit 1

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	<ul style="list-style-type: none"> • Garden- Origin, History and Development of gardens in India, Types of Gardens, Role of gardens in taxonomic studies, Preservation of germ-plasm techniques and its importance in taxonomy. • Internet- Taxonomic databases (KEW, IPNI, the plant list, Tropicos, eflora indica etc) 	
Module 3	<p><u>Tools for classification</u></p> <ul style="list-style-type: none"> • Morphological characters with respect to study of Root, Stem, fruit, seed and seed germination • Types of keys <ul style="list-style-type: none"> ○ Single access and multi access keys, preparation of keys for Taxon based on exomorphic characters <p>Global Positioning System in vegetation studies</p>	Credit 1
Module 4	<p><u>Applied Taxonomy</u></p> <ul style="list-style-type: none"> • Remote Sensing- History, Principles and types of Remote sensing, Advantages and limitations of remote sensing. Applications of Remote Sensing in Vegetation Classification and Forest resource Management. Remote sensing of soil and water. • Plant quarantine- Purpose, Historical account, Plant protection organization, Exclusive quarantine, Regular quarantine, Domestic quarantine, Certification of plant materials • Green -belt planning- Concept and recommendations, Utility of GBP, List of plants (ornamental, Flowering, shade loving), Importance of Green Belt in the current environmental conditions in India 	Credit 1

To develop scientific temper and interest by exposure through industrial visits and study/educational tours is recommended in each semester

PRACTICALS 4hr

PROJECT REPORT

Suggested Readings:

Ethnobotany:

1. Jain S.K. (1987). A manual of Ethnobotany. Sci. Publ. Jodhapur.
2. Jain S.K. & Mundal V. (1999). A hand book of Ethnobotany. Bishen Singh Mahendra Pal Singh, Dehradun.
3. Jain S.K. (1986). Ethnobotany Interdisciplinary Sci. Rev 11 (3) 285-292.
4. Jain A.K. (2016). Indian Ethnobotany: Emerging Trends. Scientific Publishers

Tools of Taxonomy:

1. Gurucharan Singh (2019). Plant Systematics, oxford and IBH Public.
2. Michael G. Simpson. (2006) Plant Systematics. Elsevier Academy Press
3. Anonymous, Botanical Survey of India. Ministry of Environment, Forestry and Climate Change.
4. Bridson D. & Forman L. (2000) Herbarium Handbook 3rd edition. Royal Botanic Gardens Kew.
5. Paramjit Singh and Sudhansu S. Dash (2009) Indian Botanic Gardens: Role in Conservation. Vedams ebook pvt . ltd.
6. Pandey D.S. & Chowdhery H.J. (2007). Plants of Indian Botanic Garden, M/s Bishen Singh Mahendra Pal Singh publisher.
7. <http://www.theplantlist.org>
8. <http://www.plantsoftheworldonline.org>
9. <http://linnean-online.org/>
10. <https://apps.kew.org/herbcat/navigator.do>
11. <https://www.ipni.org>
12. <http://powo.science.kew.org/taxon/527035-1>

Tools of Classification:

1. Michael G. Simpson. (2006) Plant Systematics. Elsevier Academy Press
2. Sharma O.P. (2009). Plant Taxonomy 2nd edition. Tata McGraw-Hill Education Pvt. Ltd. Publication.
3. Gurucharan Singh (2019). Plant Systematics, oxford and IBH Public.
4. Gangulee Das & Dutta (2011) College Botany Vol. II. New Central Book Agency (P) Limited
5. Mondal A.K. (2009) Advanced Plant Taxonomy, New Central Book Agency (P) Ltd. London.

Green Belts

1. Certified Six sigma Green Belt Hand Book first edition, Daniel J. Zrymiak et al., ASQ 2008
2. Urban Green Belts in the twenty-first century, MacroAmati, Macquarie University, Sydney

Plant Quarantine

1. Ministry of Agriculture, Plant Quarantine Organisation of India.
2. <http://plantquarantineindia.org>

**SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben
Jivanlal College of Commerce & Economics (AUTONOMOUS)**

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