



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: F.Y.B.Sc Botany

**Course: Plant diversity-I (USMABO103)
Cytogenetics & Ecology (USMABO104)**

Semester I

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

PROGRAMME SPECIFIC OUTCOMES (PSO'S)

On completion of the B.Sc Botany, the learners should be enriched with knowledge and be able to-

- PSO1:** Identify different groups of Botany and appreciate Plant Biodiversity.
- PSO2:** Understand the current developments in the different areas of Botany.
- PSO3:** Analyze and apply the methodologies and techniques learnt during the course of studying Botany.
- PSO4:** Integrate the knowledge acquired in botany to solve problem, take real time decisions and innovate, while working with plants.
- PSO5:** Share social and environmental consciousness with their fellow citizens.
- PSO6:** To develop better understanding of good laboratory practices and safety .
- PSO7:** Synthesize the scientific character of observation, reasoning and apply the knowledge in designing experiments.
- PSO8:** Develop skills to pursue career in the arena related to plant sciences namely Medicinal Botany, forestry and floristic pursuits
- PSO9:** To Acquire technological and analytical skills needed for industrial support services.

Preamble

With the introduction of Credit Based Semester & Grading System (CBSGS) and evaluation system consisting of components of continuous assessment and evaluation (CAE) & term end evaluation (TEE) under one hour-one credit system by the academic council of Mithibai College under autonomy from the academic year 2020-21 at F.Y.B.Sc. level, the earlier existing syllabus of F.Y.B.Sc. Botany has been revised. The new syllabi will be effective from academic year 2020-21.

Keeping this in mind, the committee has taken utmost care to maintain the continuity in the flow of information of higher level from FYBSc to T.Y.B.Sc. Hence ,some of the modules of the earlier syllabus of F.Y.B.Sc. have been upgraded with the new modules in order to make the learners aware about the recent developments in various branches of Botany like Algae, Fungi, Bryophyta, Pteridophyta, Gymnosperms, Angiosperms, Genetics, Molecular Biology, Anatomy, Physiology, Biotechnology with an objective to raise the students awareness in interdisciplinary courses such as Biostatistics, Bioinformatics, instrumentation, Palynology, Embryology, Medicinal Botany & Cosmetology.

These courses are :-

1. USMABO103 and USMABO104
2. USMABO203 and USMABO204

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)	Test/ Assignment	15 marks
Component 2 (CA-2)	Test/ Assignment	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
Q.1	i) to iii)	Answer any 2 out of 3 questions	10	20
Q.2	i) to iii)	Answer any 2 out of 3 questions	10	20
Q.3	i) to iii)	Answer any 2 out of 3 questions	10	20
Q.4	i) to vi)	Short notes. Answer any 3 out of 6	05	15
			Total Marks	75

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: B.Sc (2020-21)				Semester: I	
Course: PLANT DIVERSITY-I				Course Code: USMABO103	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutori al (Hours per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
3	3		2	25	75
Learning Objectives: Plant Diversity is an undergraduate F.Y.B.Sc. Botany course that deals with both conceptual and practical tools for identifying, classifying & studying the life cycles of Algae, Fungi & Bryophytes. It develops knowledge of the ecological status, economic importance & outline of their classification in general. It also gives students hands-on competence of studying them in nature & identifying them based on their morphological & anatomical features. This course will help students to build on the basic information regarding classification of plant kingdom groups like algae, fungi & bryophytes.					
Course Outcomes: After completion of the course, learners would be able to: CO1: Understand Chlorophyta among algae along with the life-cycles, range of thallus, economic importance of algae. CO2: Understand how to identify and classify Phycomycetes from Fungi based on general characters & life cycles. CO3: Understand basic concepts of economic importance of fungi & their modes of nutrition & significance in nature. CO4: Understand Hepaticae from Bryophytes along with life cycles.					
Outline of Syllabus: (per session plan)					
Module	Description				Duration
1	Algae				48 mins
2	Fungi				48 mins
3	Bryophyta				48 mins
	Total				2hrs 24 mins
PRACTICALS					2hrs 24 mins

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Unit	Topic	2 Credits
Module 1	Algae <ul style="list-style-type: none"> • Outline classification of Chlorophyta according to G.M. Smith (1955) & Cyanophyta up to orders, Distribution; cell structure; pigments; reserve food; range of thallus; reproduction- vegetative, asexual and sexual. • Structure, life cycle and systematic position of <i>Nostoc</i> and <i>Ulothrix</i>. 	15L
Module 2	Fungi <ul style="list-style-type: none"> • Outline classification of Fungi according to G.M. Smith (1955) up to classes. • General characters of Phycomycetes with respect to Occurrence; hyphal structure; reproduction. • Structure, life cycle and systematic position of <i>Rhizopus</i> and <i>Albugo</i> • Economic importance of Fungi. • Modes of nutrition in Fungi (Saprophytism and Parasitism-Facultative & Obligate). 	15L
Module 3	Bryophyta <ul style="list-style-type: none"> • Outline classification of Bryophyta with special reference to Hepaticae, according to G.M. Smith (1955). • General characters of Hepaticae. • Structure, life cycle and systematic position of <i>Riccia</i> & <i>Targionia</i> 	15L

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

**PRACTICAL I
MODULE CODE: USMABOP134**

- Study of Dissecting and Compound Microscope
- Study of stages in the life cycle of *Nostoc* from fresh/ preserved material and permanent slides.

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- Study of stages in the life cycle of *Ulothrix* from fresh/ preserved material and permanent slides.
- Economic importance of algae: *Ulva* (Biofuel), *Spirulina* (Neutraceutical), *Gelidium* (Agar)
- Study of stages in the life cycle of *Rhizopus* from fresh/ preserved material and permanent slides.
- Study of stages in the life cycle of *Albugo* from fresh/ preserved material and permanent slides.
- Economic importance of Fungi: Mushroom, Yeast, wood rotting fungi (any bracket fungus).
- Study of stages in the life cycle of *Riccia* from fresh/ preserved material and permanent slides.
- Study of stages in the life cycle of *Targionia* from fresh/ preserved material and permanent slides.

Suggested Readings

1. A Textbook on Algae by H. D. Kumar and H. N. Singh, original publication 1971.
2. A Text book on Algae by Sanjay Kumar Singh, Seema Srivastava, Campus Book International, 2008 -
3. A text book on Fungi by O.P. Sharma, Tata McGraw-Hill Publications, 1989
4. An introduction to Fungi 4th edition by H.C. Dube, 2013.
5. Cryptogamic Botany Volume I and II by G M Smith McGraw Hill. 1951 (Vol I) & 1955 (Vol II)
6. College Botany Volume I and II Gangulee, Das and Dutta latest edition. Central Education enterprises, January 2011.
7. Botany for Degree Students: Algae, Paperback by Vashishta B.R. et al December 2010.
8. The Book of Fungi: A Life-Size Guide to Six Hundred Species from around the world by Peter Roberts, Shelley Evans, 2014.
9. The Fungi by Michael J. Carlile, Sarah C. Watkinson, G. W. Gooday, Elsevier, 2008.
10. Fungi: Biology and Applications edited by Kevin Kavanagh, John Wiley and sons Ltd, 2005
11. Morphology of Fungi by S.R. Mishra, Discovery Publishing House, 2005.
12. The Biology of Fungi edited by C.T. Ingold and H.J. Hudson, Chapman & Hall, 1993.
13. Taxonomy and Ecology of Indian Fungi by K. G. Mukerji, C. Manoharachary, I.K International, 2010.
14. Biology of Bryophytes by R.N. Chopra New Age International, 2005.
15. Bryophyte Biology by Bernard Goffin, Cambridge Univ. Press, 2010
16. Diversity of Cryptogams by O.P. Sharma, McGraw-Hill, 2010
17. Botany for Degree Students: Bryophyta By Anupama Krishna, S.Chand and Company, 2010.
18. Introduction to Bryophytes by Alain Vanderpoorten, Bernard Goffinet, Cambridge University Press, 2009.
19. Bryophytes: Morphology, Growth and Differentiation by Prem Puri, Atma Ram & Sons, 1981.
20. Bryophytes: The Closest Living Relatives of Early Land Plants By Matt von Konrat, Magnolia Press, 2010.

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Program: B.Sc (2020-21)				Semester: I	
Course: CYTOGENETICS & ECOLOGY				Course Code: USMABO104	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutori al (Hours per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
3	3		2	25	75
Learning Objectives: Form and Function is an undergraduate F.Y. B. Sc. Botany course that deals with both conceptual and practical tools for identifying, classifying & studying the Cell Biology, Ecology & Genetics. It develops knowledge of the cell as a unit of life & as a tool to study plants, ecology & role of genetics in everyday life & its importance. It also gives students an insight into ecological features in plants. This course will help students to build on the basic information regarding cells, environmental biology & importance of genetics.					
Course Outcomes: After completion of the course, learners would be able to: CO1: Understand the basic components of cells, the structure, function & importance of cell components CO2: Understand basic concepts of importance of producers & consumers, energy flow in ecosystem & productivity of an ecosystem CO3: Understand Basics of genetics, genetic variations, Mendelian genetics and its modified ratios CO4: Importance of plants in breeding experiments & their importance in agriculture.					
Outline of Syllabus: (per session plan)					
Module	Description				Duration
1	CELL BIOLOGY				48 mins
2	ECOLOGY				48 mins
3	GENETICS				48 mins
	Total				2hrs 24 mins
PRACTICALS					2hrs 24 mins

Unit	Topic	2 Credits
Module 1	CELL BIOLOGY <ul style="list-style-type: none"> • Introduction to Plant Cell, Ultra structure and functions of the cell wall, Plasma membrane (bilayer lipid structure, fluid mosaic model) • Ultra structure and functions of the following cell organelles: <ul style="list-style-type: none"> ○ Endoplasmic reticulum ○ Nucleus and ○ Chloroplast 	15L
Module 2	ECOLOGY <ul style="list-style-type: none"> • Laws of Thermodynamics, Energy pyramids, energy flow in an ecosystem. • Types of ecosystems: aquatic and terrestrial, Biotic interactions. • Biomes of India. 	15L
Module 3	GENETICS <ul style="list-style-type: none"> • Mendelian Genetics: Genotype and Phenotype, monohybrid, dihybrid crosses & Mendel's Principles (segregation & independent assortment) • Multiple alleles, Modifications of dominance relationships, Gene interactions and Modified Mendelian ratios (Epistasis). 	15L

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

PRACTICAL II

MODULE CODE: USMABOP134

- Examining various stages of mitosis in root tip cells (*Allium*)
- Cell inclusions: Starch grains (Potato and Rice); Aleurone Layer (Maize)
- Cystolith (*Ficus*); Raphides (*Pistia*); Sphaeraphides (*Opuntia*).
- Identification of cell organelles with the help of photomicrograph: Plastids: Chloroplast, Amyloplast, Endoplasmic Reticulum and Nucleus
- Study of plants adapted to different environmental conditions: Hydrophytes: Floating: Free floating (*Pistia, Eichhornia*); Rooted floating (*Nymphaea*); Submerged (*Hydrilla*) and sectioning of any one Hydrophyte

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- Mesophytes (any common plant); Hygrophytes (*Typha/Cyperus*) & sectioning of any one Mesophyte and any one Hygrophyte
- Xerophytes: Succulent (*Opuntia*); Woody Xerophyte (*Nerium*); Halophyte (*Avicennia pneumatophore*). Sectioning of any one Xerophyte
- Identification, study of morphological adaptations and sectioning as mentioned.
- Frequency distribution, graphical representation of data: frequency polygon, histogram, pie chart.
- Study of Karyotypes: Human: Normal male and female, *Allium cepa*.

Suggested Readings

1. Cell and Molecular Biology Textbook by Gerald Karp and Nancy L Pruitt 6 Ed (Pb 1979)
 2. Cell Biology by De Robertis 8Ed (Pb 2017)
 3. The Cell: Textbook by Geoffrey M. Cooper 2 Ed (Pb 2015)
 4. Essential Cell Biology by Bruce Alberts, Dennis Bray, Karen Hopkin, Alexander D.Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter 4 Ed (Pb 2013)
 5. Cell Biology, Genetics, Molecular Biology by P.S. Verma 1 Ed (Pb 2016)
 6. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology Book by P.S. Verma 2 Ed (Pb 2004)
 7. Cell-biology, Genetics, Evolution and Ecology P.K. Gupta 1 Ed (Pb 2011)
 8. Cell Biology, Molecular Biology, Genetics, Evolution and Ecology N. Arumugam, R.P. Meyyan (Pb 2011)
 9. Botany An Introduction to Plant Biology James D Mauseth 7 Ed (Pb 2001)
 10. The Gene Book by Siddhartha Mukherjee 3 Ed (Pb 2011)
 11. Mendel's principles of heredity Textbook by William Bateson 1 Ed (Pb 1913)
 12. Mendel's Legacy Book by Elof Axel Carlson 1 Ed (Pb 2004)
 13. Epistasis and the Evolutionary Process (1st Edition)by Jason B. Wolf Edmund D.Brodie III Michael J. Wade (2007)
 14. Genetics by Russel. Wesley Longman inc publishers. (5th edition) (Pb 2017)
 15. Principle of genetics is a genetics textbook authored by D. Peter Snustad & Michael J. Simmons 1 Ed (Pb 1999)
 16. Plant ecology by E. D. Schulze 1 Ed (2005)
 17. Functional Plant Ecology by FI Pugnaire & F. Valladares 2Ed (Pb 2000)
 18. Fundamentals of Ecology by E P Odum and G W Barrett. Thompson Asia Pvt Ltd. Singapore Vol 87 (Pb 2005)
 19. Physiological Plant Ecology by Walter Larcher 4 Ed (Pb 2003)
 20. Introduction to Biomes Book by Susan L. Woodward Vol 8 (Pb 2009).
 21. A New Course in Botany by Vikas V. Golatkar et al, Seth Publications
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UNIVERSITY OF MUMBAI

Program: F.Y.B.Sc Botany

Course: Plant diversity-II (USMABO203)

Plant Anatomy & Phytochemistry (USMABO204)

Semester II

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

PROGRAMME SPECIFIC OUTCOMES (PSO'S)

On completion of the B.Sc Botany, the learners should be enriched with knowledge and be able to-

- PSO1:** Identify different groups of Botany and appreciate Plant Biodiversity.
- PSO2:** Understand the current developments in the different areas of Botany.
- PSO3:** Analyze and apply the methodologies and techniques learnt during the course of studying Botany.
- PSO4:** Integrate the knowledge acquired in botany to solve problem, take real time decisions and innovate, while working with plants.
- PSO5:** Share social and environmental consciousness with their fellow citizens.
- PSO6:** To develop better understanding of good laboratory practices and safety.
- PSO7:** Synthesize the scientific character of observation, reasoning and apply the knowledge in designing experiments.
- PSO8:** Develop skills to pursue career in the arena related to plant sciences namely Medicinal Botany, forestry and floristic pursuits
- PSO9:** To Acquire technological and analytical skills needed for industrial support services.

Preamble

With the introduction of Credit Based Semester & Grading System (CBSGS) and evaluation system consisting of components of continuous assessment and evaluation (CAE) & term end evaluation (TEE) under one hour-one credit system by the academic council of Mithibai College under autonomy from the academic year 2020-21 at F.Y.B.Sc. level, the earlier existing syllabus of F.Y.B.Sc. Botany has been revised. The new syllabi will be effective from academic year 2020-21.

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These courses are :-

1. USMABO103 and USMABO104
2. USMABO203 and USMABO204

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)	Test/ Assignment	15 marks
Component 2 (CA-2)	Test/ Assignment	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
Q.1	i) to iii)	Answer any 2 out of 3 questions	10	20
Q.2	i) to iii)	Answer any 2 out of 3 questions	10	20
Q.3	i) to iii)	Answer any 2 out of 3 questions	10	20
Q.4	i) to vi)	Short notes. Answer any 3 out of 6	05	15
			Total Marks	75

Signature

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HOD

Approved by Vice –Principal

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

Program: B.Sc (2020-21)				Semester: II	
Course: PLANT DIVERSITY-II				Course Code: USMABO203	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutori al (Hours per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
3	3		2	25	75
Learning Objectives: Plant Diversity is an undergraduate F.Y.B.Sc. Botany course that deals with both conceptual and practical tools for identifying, classifying & studying the life cycles of Pteridophytes, Gymnosperms & Angiosperms. It develops knowledge of the ecological status, economic importance & outline of their classification in general. It also gives students hands-on competence of studying them in nature & identifying them based on their morphological & anatomical features. This course will help students to build on the basic information regarding classification of plant kingdom groups like Pteridophytes, Gymnosperms & Angiosperms..					
Course Outcomes: After completion of the course, learners would be able to: CO1: Understand stellar evolution among Pteridophytes along with the life-cycles of & economic importance of Pteridophytes. CO2: Understand how to identify and classify fossil Pteridophytes from the remains that are available as study material. CO3: Understand basic concepts of economic importance of Gymnosperms & the modes of nutrition & significance in nature. CO4: Understand Angiosperm classification. CO5: To understand the diversity of plants & their parts and be able to describe & identify them in the field along with their economic importance					
Outline of Syllabus: (per session plan)					
Module	Description				Duration
1	Pteridophytes				48 mins
2	Gymnosperms				48 mins
3	Angiosperms				48 mins
	Total				2hrs 24 mins
PRACTICALS					2hrs 24 mins

Unit	Topic	2 Credits
Module 1	Pteridophytes <ul style="list-style-type: none"> • Structure, life cycle, systematic position and alternation of generations in <i>Nephrolepis</i> & <i>Adiantum</i>. • Stellar evolution in pteridophytes • Study of fossil-<i>Rhynia</i> 	15L
Module 2	Gymnosperms <ul style="list-style-type: none"> • Structure life cycle systematic position and alternation of generations in <i>Cycas</i> • Economic importance of Gymnosperms • Fossilization and <i>Cordaites</i> 	15L
Module 3	Angiosperms <ul style="list-style-type: none"> • Inflorescence: Racemose: simple raceme, spike, catkin, spadix, panicle. Cymose: monochasial, dichasial, polychasial. Compound: corymb, umbel, cyathium, capitulum, verticillaster, hypanthodium. • Study of following families: Magnoliaceae, Malvaceae, Leguminosae Convolvulaceae, Amaryllidaceae. 	15L

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

PRACTICAL I MODULE CODE: USMABOP234

- Study of stages in the life cycle of *Nephrolepis* & *Adiantum*: Mounting of ramentum, hydathode, T.S. of rachis, T.S. of pinna passing through sorus.
- Study of Form genera *Rhynia*
- Stellar evolution of Pteridophytes with the help of permanent slides
- *Cycas*:
 - T.S of leaflet (*Cycas* pinna)
 - Megasporophyll, microsporophyll, coralloid root, microspore, L.S. of ovule of *Cycas* – all specimens to be shown.
- Economic importance of Gymnosperms.

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- Types of fossils, Fossil-*Cordaites*.
- Leaf morphology: Leaf: simple leaf, types of compound leaves, Incisions of leaf, venation, phyllotaxy, types of stipules, leaf apex, leaf margin, leaf base, leaf shapes. Modifications of leaf: spine, tendril, hooks, phyllode, pitcher, *Drosera* or insectivorous plants.
- Types of inflorescence: as per theory
- Study of following families: Magnoliaceae, Malvaceae, Leguminosae Convolvulaceae, Amaryllidaceae.

Suggested Readings

1. A concise textbook of Botany (Cryptogams and Gymnosperms) by SS Choudhary and Prabha Choudhary. C.B.S Publishers, (1997).
2. A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany by A. V. S. S. Sambamurthy. I. K. International Pvt Ltd, (2010).
3. A Textbook Of Botany Angiosperm Paperback by Dk Jain V Singh, Pc Pande, (2018)
4. A Textbook of Botany: Angiosperms by B.P. Pandey, S.Chand Publications, (2010)
5. Botany for Degree students-Pteridophytes- by B.R. Vashistha, Dr. Sinha and Dr. Singh. S.Chand Publishing, (1971).
6. Botany for Degree: Pteridophyta by Anil Kumar S. Chand Publishing, (2006)
7. Pteridophyta by O. P. Sharma, Macmillan India Limited, (2006).
8. The morphology of pteridophytes: the structure of ferns and allied plants K. R. Sporne, Hutchinson University Library, (1962).
9. Indian Fossil Pteridophytes Krishna Rajaram Surange , C.S.I.R (1966)
10. The Gymnosperms Handbook: A practical guide to extant families and genera of the world by James W. Byng, JSTOR (2015).
11. Gymnosperms by S.P. Bhatnagar. New age International, (2013)
12. The Gymnosperms by Chhaya Biswas, B. M. Johri, Springer-Verlag, (1997)
13. Gymnosperms of India by Botanical survey of India (2013).
14. A Text Book of Gymnosperms by G. L. Chopra,; S. Nagin Publishers, 1978
15. Plant Systematics by Gurucharan Singh , Oxford and IBH Public (2019).
16. Taxonomy of Vascular Plants by Lawrence George H.M., Oxford & IBH (1967).
17. Plant Taxonomy 2nd edition by Sharma O.P.Tata McGraw-Hill Education Pvt. Ltd. Publication. . (2009).
18. Advanced Plant Taxonomy by Mondal A.K., New Central Book Agency (P) Ltd. London. (2009)
19. Plant Systematics by Vasudevan Nair R. Oxford & IBH, (1997).
20. College Botany Vol. II by Gangulee Das & Dutta ,New Central Book Agency (P) Limited, (2011).
21. Taxonomy of Angiosperms by Sambamurthy A.V.S.S. I. K. International Pvt Ltd, (2010).
22. Taxonomy of Angiosperms by Vashishta P. C. S. Chand Publication, (2001)
23. Plant Systematics by Michael G. Simpson. Elsevier Academy Press (2006)
24. Flora of Bombay Presidency. London: vol . 1, 2 & 3 by Cooke T., Taylor and Francis (1901).

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Jivanlal College of Commerce & Economics (AUTONOMOUS)**

Program: B.Sc (2020-21)				Semester: II	
Course: PLANT ANATOMY & PHYTOCHEMISTRY				Course Code: USMABO204	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Assessment (CA) (Marks - 25)	Semester End Examinations (SEE) (Marks- 75 in Question Paper)
3	3		2	25	75
Learning Objectives:					
<u>Learning Objectives:</u>					
<p>Form and Function is an undergraduate F.Y. B. Sc. Botany course that deals with both conceptual and practical tools for identifying, classifying & studying the Plant Anatomy, Plant physiology & Medicinal Botany. It develops knowledge of anatomy as a tool to study plants, to understand the physiological mechanisms in plants & importance of medicinal plants in everyday life. It also gives students an insight into anatomical & physiological features in plants. This course will help students to build on the basic information regarding anatomy, physiology & importance of plants as medicine.</p>					
Course Outcomes:					
After completion of the course, learners would be able to:					
CO1: Understand the basic anatomical features of plants and identify them based on these features.					
CO2: To be able to understand the physiology of plants & its importance & implications to human life.					
CO3: Importance of enzymes, their functions & mode of action in plants.					
CO4: Understand basic concepts of importance of secondary metabolites produced by plants.					
CO5: Importance of medicinal plants to humans & their usage in everyday life.					
Outline of Syllabus: (per session plan)					
Module	Description				Duration
1	ANATOMY				48 mins
2	PHYSIOLOGY				48 mins
3	MEDICINAL BOTANY				48 mins
	Total				2hrs 24 mins
PRACTICALS					2hrs 24 mins

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

Unit	Topic	2 Credits
Module 1	ANATOMY <ul style="list-style-type: none"> • Simple tissues, complex tissues. • Primary structure of dicot and monocot root, stem and leaf. • Epidermal tissue system: types of hair, monocot and dicot stomata. 	15L
Module 2	PHYSIOLOGY <ul style="list-style-type: none"> • Photosynthesis: Light reactions, photolysis of water, photophosphorylation (cyclic and non cyclic), carbon fixation phase (C3, C4 and CAM pathways), photorespiration. • Enzymes - Classification, mode of action, enzyme specification and inhibition. Factors affecting enzyme activity. 	15L
Module 3	MEDICINAL BOTANY <ul style="list-style-type: none"> • History of Medicinal Botany. Concept of Metabolites-primary and secondary, types of secondary metabolites –isoprenoides, nitrogen containing and phenolic secondary metabolites with examples, differences between primary and secondary metabolites. • Grandma's pouch: Following plants have to be studied with respect to botanical source, part of the plant used, active constituents present and medicinal uses: <i>Ocimum sanctum</i>, <i>Adhathoda vasica</i>, <i>Zingiber officinale</i>, <i>Curcuma longa</i>, <i>Santalum album</i>, <i>Aloe vera</i>. 	15L

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

PRACTICAL II
MODULE CODE: USMABOP234

- Primary structure of dicot and monocot root.
- Primary structure of dicot and monocot stem.
- Study of stomata in dicots and monocots.
- Epidermal outgrowths: with the help of mountings
 - Unicellular: *Gossypium*/Radish
 - Multicellular: *Lantana*/Sunflower
 - Glandular: *Drosera* and Stinging: *Urtica* – only identification with the help of permanent slides.
 - Peltate: *Thespesia*
 - Stellate: *Erythrina*/*Sida acuta*/*Solanum*/*Helecteris*
 - T-shaped: *Avicennia*
- Separation of chlorophyll pigments by strip paper chromatography.
- Study of enzyme amylase
- Immobilization of enzymes
- Change in color because of change in pH: Anthocyanin: black grapes/Purple cabbage
- Test for tannins and alkaloids
- Identification of plants or plant parts for grandma's pouch as per theory.

Suggested Readings

- 1 A New Course in Botany by Vikas V. Golatkar et al, Seth Publications
- 2 Plant Anatomy, Pijush Roy 2 Ed (Pb 2012)
- 3 Plant anatomy: an applied approach a Textbook by David F. Cutler, Dennis W. Stevenson, and Ted Botha 1 Ed (Pb 2008)
- 4 Plant Anatomy Book by James D. Mauseth 1 Ed (Pb 1987)
- 5 Plant Anatomy and Physiology Book by Aslam Khan 1 Ed (Pb 2001)
- 6 Plant Anatomy Book by B.P. Pandey Revised Ed (Pb 2001)
- 7 College Botany Volume I and II Gangulee, Das and Dutta latest edition. Central Education enterprises 1 Ed (Pb 1998)
- 8 Introduction to plant physiology Book by William Hopkins 4 Ed (Pb 2009)
- 9 Plant Physiology Book by Cleon W. Ross and Frank B. Salisbury 1 Ed (Pb 1992)
- 10 Fundamentals of Biochemistry by J L Jain , Sunjay Jain and Nitin Jain 2 Ed (Pb 2016)
- 11 Medical Botany: Plants Affecting Human Health by Memory P. F. Elvin-Lewis and Walter Hepworth Lewis; John Wiley & sons Inc (Pb 2003).
- 12 Handbook of Medicinal Plants 1st Edition by Zohara Yaniv, Uriel Bachrach, CRC Press, (Pb 2005).
- 13 Let Thy Food Be Thy Medicine: Plants and Modern Medicine by Kathleen Hefferon Oxford University Press, (Pb 2012).
- 14 Medicinal Plants: Their Role in Health and Biodiversity by Timothy R. Tomlinson; Olayiwola Akerele University of Pennsylvania Press, (Pb1998).
- 15 Herbal Landscape: The Perception of Landscape as a Source of Medicinal Plants by Soukand, Renata; Kalle, Raivo Trames, Vol. 14, No. 3, September (Pb2010)
- 16 The Cultural History of Plants by Ghilleen Prance; Mark Nesbitt Routledge, (Pb 2005)

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- 17 Flower Power: The Medicinal Properties of Popular Plants by Izakson, OrnaE Magazine, Vol. 17, No. 4, (Pb 2006).
 - 18 Power Plants by Brace, Metthew Geographical, Vol. 73, No. 3, (Pb 2001).
 - 19 The Anthropology of Medicine: From Culture to Method by Lola Romanucci-Ross; Daniel E. Moerman; Laurence R. Tancredi Bergin & Garvey, 1997 (3rd edition)
 - 20 Medicinal Plants Book by P.C. Trivedi 1 Ed (Pb 2006)
 - 21 Indian Medicinal Plants - 8 Volumes by K. R. Kirtikar and B. D. Basu 2 Ed (Pb 2017)
 - 22 Plant Secondary Metabolites Makkar, Harinder P.S., Sidhuraju, P., Becker, Klaus1 Ed (Pb 2002)
 - 23 Plant Secondary Metabolites, Three-Volume Set Mohammed Wasim Siddiqui, Kamlesh Prasad, Vasudha Bansal 1 Ed (Pb 2016)
 - 24 Plant Secondary Metabolites, Volume Two: Stimulation, Extraction, and Utilization by Mohammed Wasim Siddiqui Vasudha Bansal , Kamlesh Prasad 2Ed (Pb 2017)
 - 25 Secondary Metabolites by K.G. Ramawat, J.M. Merillion 1 Ed (Pb 2000)
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