



The Kelkar Education Trust's
Vinayak Ganesh Vaze College of Arts, Science & Commerce
AUTONOMOUS

Mithaghar Road, Mulund East, Mumbai-400081, India

College with Potential for Excellence

Phones :022-21631421, 221631423, 221631004 Fax : 022-221634262, e mail :
vazecollege@gmail.com



Syllabus for Program S.Y. B. Sc.

Botany Major & Minor

Syllabus as per Choice Based Credit System (NEP-2020)

(June 2024 Onwards)

Submitted by

Department of Botany

Vinayak Ganesh Vaze College of Arts, Science and Commerce

Mithagar Road, Mulund (East) Mumbai-400081. Maharashtra, India.

Tel: 022-21631004, Fax: 022-21634262

E-mail: vazecollege@gmail.com Website : www.vazecollege.net

The Kelkar Education Trust's
Vinayak Ganesh Vaze College of Arts, Science & Commerce
(AUTONOMOUS)

❖ **Syllabus as per Choice Based Credit System (NEP-2020)**

| | | |
|--|--|--------------------------------------|
| Name of the Programme | ❖ S. Y. B. Sc. Botany : CBCS (NEP-2020) | |
| <p>The F. Y. B. Sc. in Botany course is a one Year Full Time Course consisting of two semesters, to be known as Semester I and Semester II. Each semester consists of one major course and one minor course along with other courses- OE, VSC/SEC, AEC, VEC, FP, CEP and CC</p> | | |
| 1. Course Code | | |
| 2. Course Title | Plant Diversity III : Paper - I | Forms and Functions III : Paper - II |
| | Applied Botany I : Paper - III | |
| 3. Semester wise Course Contents | Copy of the detailed syllabus Enclosed | |
| 4. References and additional references | Enclosed in the Syllabus | |
| 5. No. of Credits per Semester | 22 | |
| 6. No. of lectures per Unit | 10 Hrs. | |
| 7. No. of lectures per week | 12 | |
| 8. No. of Tutorial per week | -- | |
| 9. Scheme of Examination | Semester End Exam: 60 marks (4 Questions of 15 marks each) | |
| | Internal Assessment : 40 marks | |
| | Class Test : 15 marks | |
| | Project/ Assignment : 15 marks | |
| | Class Participation : 10 marks | |
| 10. Special notes, if any | No | |
| 11. Eligibility, if any | As laid down in the College Admission brochure / website | |
| 12. Fee Structure | As per College Fee Structure specifications | |
| 13. Special Ordinances / Resolutions, if any | No | |

The Kelkar Education Trust's

Vinayak Ganesh Vaze College of Arts, Science & Commerce, (AUTONOMOUS)

Programme Structure and Course Credit Scheme :

| Semester | Major | | Minor | OE | VSC/SEC | AEC,VEC,IKS | OJT, FP,CEP,C C, RP | Total |
|--------------|---|-----------|--|------------------------------------|----------------------------------|-----------------------------------|--|-----------|
| | Mandatory | Elective | | | | | | |
| III | 8 Credit (6L+2P) (Three Paper) | -- | 4 Credit (2L+2P) (One Paper) | 2Credit (2L) (One Paper) | 2Credit VSC (2P) Practical | AEC - 2 Credit (One Paper) | FP (2 Credits) - CC (2 Credits) | 22 |
| IV | 8 Credit (6L+2P) (Three Paper) | - | 2 Credit (2L) (One Paper) | 2Credit (2L) (One Paper) | 2Credit SEC (2P) Practical | AEC - 2 Credit (One Paper) | CC(2 Credit) + CC (2 Credit) CEP (2 Credit) | 22 |
| TOTAL | 16 | NA | 6 | 4 | 4 | 4 | 2+6 | 44 |

Programme: S. Y. B. Sc.

| Semester | Course | Course Title | Course Code | Credits |
|----------|-------------|--|-------------|---------|
| III | Major | Course 1 : Plant Diversity - III | VGVUSMBO301 | 2 |
| | | Course 2 : Forms and Function III | VGVUSMBO302 | 2 |
| | Major/Minor | Course 3 : Applied Botany - I (NOTE: Course 3 is common for Major and Minor) | VGVUSMBO303 | 2 |
| | Minor | Other than Chemistry(Physics /Botany /Zoology) | NA | 2 |

| | | | | |
|-----------------------|-----------------------------------|--|---------------------|-----------|
| | Major(practical) | Major (Practical) | VGUSMNBOP304 | 2 |
| | Minor (practical) | Minor (practical) | VGUSMNBOP303 | 2 |
| | Open Elective (OE) | 1.Naval Battles and Strategies - I | VGUOE301 | 2 |
| | | 2. Understanding Mental Health and Illness | VGUOE302 | 2 |
| | Vocational skill Courses (VSC) | Horticulture II | VGUSVSBOP305 | 2 |
| | Ability Enhancement Courses (AEC) | 1. मराठी भाषेतील संवाद कौशल्ये (Dept. of Marathi) | VGVAE301 | 2 |
| | | 2. हिंदी भाषा कौशल (Dept. of Hindi) Student will select any one from AEC Courses | VGVAE302 | |
| | Field Project | Field Project related to major will be offered | VGUSBOFP301 | 2 |
| | Co-curricular Courses | Community Engagement Activities | VGUCC301 | 2 |
| | | Cultural Activities | VGUCC302 | 2 |
| | | National Service Scheme (NSS) | VGUCC303 | 2 |
| | | Sports Activities | VGUCC304 | 2 |
| | | Yoga | VGUCC305 | 2 |
| | | Student will select any one from Co-curricular Courses | | |
| | Total Credits | | | 22 |
| s IV | Major | Course 1 : Plant Diversity - III | VGUSMBO401 | 2 |
| | | Course 2 : Forms and Function IV | VGUSMBO402 | 2 |
| | Major/Minor | Course 3 Applied Botany -II (NOTE: Course 3 is common for Major and Minor) | VGUSMBO403 | 2 |
| | Minor | Other than Chemistry(Physics /Botany /Zoology) | NA | 2 |
| | Major(practical) | Major (Practical) | VGUSMNBOP404 | 2 |

| | | | | | | | | | |
|----------------------|-------|------|-----|--------|-----------------------|------|-------|-------|-----|
| Major P-I | 02 | --- | 2.0 | 15 | 15 | 10 | 60 | 100 | 100 |
| Major P-II | 02 | --- | 2.0 | 15 | 15 | 10 | 60 | 100 | 100 |
| Major P-III | 02 | --- | 2.0 | 15 | 15 | 10 | 60 | 100 | 100 |
| Minor | 02 | --- | 2.0 | 15 | 15 | 10 | 60 | 100 | |
| Major (Practical) | ---- | 4 | 2.0 | -- | --- | --- | --- | 100 | 100 |
| Minor (Practical) | | 4 | 2.0 | --- | ----- | --- | 60 | 100 | 100 |
| VSC | ----- | 4 | 2.0 | --- | -- | --- | ----- | 100 | 100 |
| OE | 02 | --- | 2.0 | 15 | 15 | 10 | 60 | --- | 100 |
| AEC | 02 | ---- | 2.0 | 15 | 35 | ---- | NA | NA | 50 |
| FP | ---- | 4 | 2.0 | report | prese ntatio ns | ---- | ---- | ----- | 50 |
| CC | ----- | 4 | 2.0 | 15 | 15 | 20 | ---- | ---- | 50 |
| Total | 12 | 20 | 22 | --- | ---- | --- | ---- | ----- | 850 |

CIA-II : Assignment/Project

CIA-III : APICID &A

Max. Time, End Semester Exam (Theory) : 2.00 Hrs.

Semester - IV

| Teaching Scheme (Hrs/Week) | | | Continuous Internal Assessment (CIA) 40 marks | | | End Semester Examination Marks | | Total | |
|----------------------------|----------|----------|--|-------|-------|--------------------------------|--------|-------|-----------|
| Course | L Hrs | P Hrs | Credit | CIA-1 | CIA-2 | CIA-3 | Theory | | Practical |
| Major P-I | 02 | --- | 2.0 | 15 | 15 | 10 | 60 | 100 | 100 |
| Major P-II | 02 | --- | 2.0 | 15 | 15 | 10 | 60 | 100 | 100 |

| | | | | | | | | | |
|----------------------|-------|------|-----|--------|-----------------------|------|------|-------|-----|
| Major P-III | 02 | --- | 2.0 | 15 | 15 | 10 | 60 | 100 | 100 |
| Minor | 02 | --- | 2.0 | 15 | 15 | 10 | 60 | 100 | |
| Major (Practical) | ---- | 4 | 2.0 | -- | --- | --- | --- | 100 | 100 |
| Minor (Practical) | NA | NA | NA | --- | ---- | --- | NA | NA | NA |
| SEC | ----- | 4 | 2.0 | --- | -- | --- | ---- | 100 | 100 |
| OE | 02 | --- | 2.0 | 15 | 15 | 10 | 60 | --- | 100 |
| AEC | 02 | ---- | 2.0 | 15 | 35 | ---- | NA | NA | 50 |
| CEP | ---- | 4 | 2.0 | report | prese ntatio ns | ---- | ---- | ----- | 50 |
| CC-I | ----- | 4 | 2.0 | 15 | 15 | 20 | ---- | ---- | 50 |
| CC-II | ----- | 4 | 2.0 | 15 | 15 | 20 | ---- | ---- | 50 |
| Total | 12 | 20 | 22 | --- | ---- | --- | ---- | ----- | 900 |

CIA-II : Assignment/Project

CIA-III : APICID &A

Max. Time, End Semester Exam (Theory) : 2.00 Hrs.

- L - Lectures
- T - Tutorials
- P - Practical
- C - Credits

PROGRAM OUTCOMES

Bachelor of Science (B.Sc.) offers theoretical as well as practical knowledge about different subject areas which includes Physics, Chemistry, Mathematics and Biology. This programme course is most beneficial for students who have a strong interest and background in Science and Mathematics. The program outcomes expected from this course can be predicted as follows:

PO1-Academic expertise: Exhibit knowledge of the discipline, Identify and explain seminal pieces of work in the area, Conduct guided academic inquiries in various areas of interest in the chosen discipline.

PO2-Foundational Understanding: Develop a foundational understanding of core scientific principles and theories across various disciplines of science.

PO3-Analytical Skills: Develop analytical and problem-solving skills to critically analyse scientific problems and apply scientific methodologies.

PO4-Global Perspective: Gain a global perspective by understanding diverse scientific issues and incorporating ethical considerations in scientific practices.

PO5-Research Awareness: Gain awareness of research methodologies and techniques, preparing for future research endeavours.

PO6-Holistic Development: Experience holistic development by embracing values of humanism, empathy, and social responsibility in scientific pursuits.

PO7-Continuous Learning: Develop a commitment to lifelong learning and staying updated with advancements in science.

PO8-Ethical Practices: Understand and adhere to ethical standards in scientific research and practice.

PROGRAM SPECIFIC OUTCOMES FOR BACHELOR OF SCIENCE (B.Sc.)

DEPARTMENT OF BOTANY

Program: S. Y. B. Sc
Course: PLANT DIVERSITY III

Semester: III
Course Code: VGVUSMBO301

| Teaching Scheme (Hrs/Week) | | | | Continuous Internal Assessment (CIA) 40 marks | | | | | Semester End Examination | Total |
|--|---|---|---|---|-------|--------|-------|-----|--------------------------|-------|
| L | T | P | C | CIA-1 | CIA-2 | CI A-3 | CIA-4 | Lab | Written | |
| 6 | - | 2 | 8 | 15 | 15 | 10 | | - | 60 | 100 |
| Max. Time: Semester End Examination (Theory). | | | | | | | | | 2Hrs | |

Course Objectives:

To understand the morphology, structure, life cycle and economic importance of the organisms of respective groups of plants

To acquaint the concept of Systematics and Nomenclature and their objectives.

To understand the principle, working and applications of various techniques like Microscopy Chromatography and electrophoresis techniques.

| Unit No. | Module No | Content | Lectures |
|-----------|------------|---|-----------|
| 1. | | Thallophyta (Algae) & Bryophyta | 10 |
| | I | General Characters and economic importance of Division Phaeophyta. | |
| | II | Structure, life cycle and systematic position of <i>Sargassum</i> . | |
| | III | General characters of Class Anthocerotae | |
| | IV | Structure, life cycle and systematic position of <i>Anthoceros</i> | |
| 2. | | Angiosperms | 10 |
| | I | Introduction to Plant Systematics: Objectives and Goals of Plant systematics | |
| | II | Botanical Nomenclature: History, Principles, Introduction to ICBN | |
| | III | With the help of Bentham and Hooker's system of Classification for flowering plants study the vegetative, floral characters and economic importance of the following families: <ul style="list-style-type: none"> ● Magnoliaceae ● Papilionoideae ● Rutaceae ● Solanaceae ● Amaranthaceae ● Palmae (Arecaceae) | |

| | | | |
|-----------|---|--|-----------|
| 3. | Modern Techniques to Study Plant Diversity | | 10 |
| | I | Preservation methods: Dry and wet methods of preservation | |
| | II | Microscopy – Principle and working of Light, and electron microscope (TEM and SEM) | |
| | III | Chromatography- Principles and techniques in paper and thin layer chromatography and HPTLC | |
| IV | Principles and techniques of Horizontal and Vertical electrophoresis. | | |

| |
|--|
| Course Outcomes: |
| The students will be able to identify and differentiate among the various Thallophytes and Bryophytes studied. |
| The students will be able to differentiate among various taxonomic groups studied. This will also help in differentiating among the types of fruit. |
| The understanding of Microscopy, Chromatography and electrophoresis will help in handling such techniques on an individual basis which will help for research and industry need. |

PRACTICALS BASED ON PAPER I (MAJOR BOTANY)

Program: B. Sc

Semester: III

Course: BOTANY

Course Name: Plant Diversity III

| Sr. no | Title of Experiments |
|--------|---|
| 1. | Algae and Bryophyta |
| | <ul style="list-style-type: none"> i. Study of stages in the life cycle of <i>Sargassum</i> from fresh/ preserved material and permanent slides. ii. Economic importance and range of thallus in Phaeophyta iii. Study of stages in the life cycle of <i>Anthoceros</i> from fresh/ preserved material and permanent slides. |
| 2. | Angiosperms |

| | |
|-----------|--|
| | <ul style="list-style-type: none"> i. Fruit Morphology (True and False fruits, Types of fruits and their subtypes) ii. Study of one plant from each family prescribed for theory: Morphological peculiarities and economic importance of the members of these families. (As per Theory) |
| 3. | Techniques to Study Plant Diversity |
| | <ul style="list-style-type: none"> i. Preparation of herbarium and wet preservation technique ii. Separation of amino by circular paper chromatography iii. Separation of Carotenoids by thin layer chromatography iv. Horizontal and Vertical Gel Electrophoresis – Demonstration |

| |
|--|
| Course Outcomes: |
| The students will be able to identify and differentiate among the various Thallophytes and Bryophytes studied. |
| The students will be able to differentiate among various taxonomic groups studied. This will also help in differentiating among the types of fruit. |
| The understanding of Microscopy, Chromatography and electrophoresis will help in handling such techniques on an individual basis which will help for research and industry need. |

REFERENCES:

1. Sharma, O.P. (1986) Textbook of Algae.
2. Pandey, B. P. (1994) Textbook of Botany – Algae.
3. Vashista, B. R. (1995) Botany for degree students-Algae.
4. Smith, G. M. (1955): Cryptogamic Botany Vol. II.
5. Vashista, B.R. (1996): Botany for degree students -Bryophytes.
6. Chopra, R. N. and P. K. Kumar (1988): Biology of Bryophytes.
7. Plant Systematics. An Integrated Approach. Third edition. Gurcharan Singh. University of Delhi, Delhi, INDIA. Science Publishers.
8. Taxonomy of Angiosperms by S. N. Pandey and A. P. Mishra. ANE books publications.

Program: S. Y. B. Sc
Course: Form and Function III

Semester: III
Course Code: VGVUSMBO302

| Teaching Scheme (Hrs/Week) | | | | Continuous Internal Assessment (CIA) 40 marks | | | | | Semester End Examination | Total |
|--|---|---|---|---|-------|-------|-------|-----|--------------------------|-------|
| L | T | P | C | CIA-1 | CIA-2 | CIA-3 | CIA-4 | Lab | Written | |
| 6 | - | 2 | 8 | 15 | 15 | 10 | | - | 60 | 100 |
| Max. Time: Semester End Examination (Theory). | | | | | | | | | 2Hrs | |

Course Objectives:

To understand the structure and functioning of cell organelles, their mechanism, role and importance of cell division.

To recognize the importance of cytogenetics in understanding concepts of variations in chromosomal aberrations, chromosome number and their adverse effects in humans and the concept of sex determination and sex-linked traits.

To understand the fundamental life processes like DNA replication and protein synthesis

| Unit No. | Module No | Content | Lectures |
|----------|-----------|---|-----------|
| 1. | | Cell Biology | 10 |
| | I | Ultra Structure and functions of the following Cell organelles: <ul style="list-style-type: none"> • Mitochondrion (membranes, cristae, F1 particles and matrix) • Peroxisomes and Glyoxysomes • Ribosomes (prokaryotic, eukaryotic and subunits) | |
| | II | Cell Division and its significance: <ul style="list-style-type: none"> • Cell Cycle, structure of Interphase Nucleus (nuclear envelope, nucleolus, nucleoplasm and chromatin network) • Mitosis and meiosis. | |
| | III | Nucleic Acids: Types, structure and functions of DNA and RNA | |
| 2. | | Cytogenetics | 10 |
| | I | Variation in Chromosome structure (Chromosomal Aberrations) Definition, Origin, Cytological and Genetic Effects of the following: Deletions, Duplications, Inversions and Translocations. | |
| | II | Variation in Chromosome number and its effect Changes in one or few chromosomes: Aneuploidy (Nullisomy, Monosomy, Trisomy, Tetrasomy). Changes in complete set of chromosomes: Monoploidy, Polyploidy (Autopolyploidy, Allopolyploidy) | |
| | III | Sex Determination: Chromosomal Methods: heterogametic males and heterogametic females. Lyon's Hypothesis of X chromosome inactivation. | |
| 3. | | Molecular Biology | 10 |

| | | |
|------------|---|--|
| I | DNA replication: | |
| | Modes of Replication, Messelson and Stahl Experiment | |
| II | DNA replication in prokaryotes: Enzymes involved and molecular mechanism of replication | |
| III | DNA replication in eukaryotes: Enzymes involved and molecular mechanism of replication | |

PRACTICALS BASED ON PAPER II (MAJOR)

Program: S. Y. B. Sc

Semester: III

Course: BOTANY

Course Name: FORM AND FUNCTION III

Course Objectives:

To evaluate the amount of DNA and RNA in the given plant samples, and to understand the ultrastructure of various cell organelles.

To study the genetic basis of change in chromosome number and structure.

To understand the molecular basis of sequencing of DNA.

| Sr. No | Title of Experiments | |
|-----------|--|--|
| 1. | Cell Biology | |
| | i. Study of the ultrastructure of cell organelles prescribed for theory from Photomicrographs | |
| | ii. Estimation of DNA from plant material (one Std & one Unknown, No Std Graph) | |
| | iii. Estimation of RNA from plant material (one Std & one Unknown, No Std Graph) | |
| 2. | Cytogenetics | |
| | i. Study of cytological consequences of chromosomal aberrations (Laggards, Chromosomal Bridge, Ring chromosome, Chromosomal ring) from permanent slides or photomicrographs. | |
| | ii. Chromosomal Aberrations: Cri-du-chat Syndrome, Down Syndrome (Trisomy) | |
| | iii. Study of mitosis and meiosis from suitable plant material | |
| 3. | Molecular Biology | |
| | i. DNA sequencing- Sanger's method | |
| | ii. Determining the sequence of amino acids in the protein molecule synthesized from the given m- RNA strand (prokaryotic and eukaryotic) | |
| | iii. Extraction and visualization of DNA by Electrophoresis (Demonstration) | |

Course Outcomes:

The students will be able to distinguish among the various cell organelles, elaborate the process of cell division.

The students will be able to understand the importance of genetic effects on plants and humans.

The students will be able to understand the structure of nucleic acids and evaluate the amount of DNA and RNA content.

REFERENCES:

1. Glick. B.R. & Thompson. J.E. 1993. Methods in Plant Molecular Biology and Biotechnology. CRC Press, Boca Raton, Florida.
2. Sybenga. J. 1973. General Cytogenetics. American Elsevier Pub. Co., New York.
3. Swanson, Merz & Young. 1967. Cytogenetics. Prentice Hall India.
4. Lewis. K.R. & John. B. 1963. Chromosome Marker. J & A Churchill Co., London.
5. Alberts. B., Breyer. D., Hopkin. K., Johnson. A.D., Lewis. J., Raff M., Roberts. K. Watter. P. 2014. Essential Cell Biology. 4th Edition. Garland Publishers, New York.
6. Karp. G. 2013. Cell and Molecular Biology – Concepts and Experiments. 7th Edition. Wiley Global Education, USA.
7. De Robertis and De Robertis 2005 (Eight edition) (Indian) Cell and Molecular Biology, Lippincott Williams, Philadelphia. [B.I Publications Pvt. Ltd. New Delhi].
8. Sadava David – 2004 (First Indian Edition). Cell Biology, New Delhi.
9. Albert et al 2002 (Fourth Edition). Molecular Biology of the cell, Garland Science +(Taylor and Francis) New York Group (wt).

Program: S. Y. B. Sc
Course: Applied Botany I

Semester: III
Course Code: VGVUSMNBO303

| Teaching Scheme (Hrs/Week) | | | | Continuous Internal Assessment (CIA) 40 marks | | | | Semester End Examination | | Total |
|--|---|---|---|---|-------|-------|-------|--------------------------|---------|-------|
| L | T | P | C | CIA-1 | CIA-2 | CIA-3 | CIA-4 | Lab | Written | |
| 6 | - | 2 | 8 | 15 | 15 | 10 | | - | 60 | 100 |
| Max. Time: Semester End Examination (Theory). | | | | | | | | 2Hrs | | |

Course Objectives:

To understand the importance of different pharmacopoeia used in herbal medicines, importance of various secondary metabolites, its functions, applications and also evaluation of different drugs as adulterants and substituent.

To recognize the importance of forests, their location and importance of forest products along with the significance of forestry and its types.

To evaluate the significance of different fibers, spices and paper yielding plants

To make students aware of the importance of plants in aromatherapy, nutraceuticals and in enzyme industry.

| Unit No. | Module No | Content (Major and Minor) | Lectures |
|----------|-----------|--|-----------|
| 1. | | Pharmacognosy and Phytochemistry | 10 |
| | I | Introduction to pharmacopoeia Study of Monograph from pharmacopoeia. | |
| | II | Secondary Metabolites: Types; Sources, properties, uses of Alkaloids, tannins, glycosides, gums and resins, volatile oils | |
| | III | Adulterants: <i>Saraca asoca</i> and <i>Polyalthia longifolia</i> <i>Centella asiatica</i> and <i>Bacopa monnieri</i> | |
| 2. | | Forestry and Economic Botany | 10 |
| | I | Forestry: Introduction of Forestry, Methods of Classification of forest. Forestry: Social forestry, Agro-forestry, Urban forestry, Silviculture, organic farming | |
| | II | Economic Botany: Botanical sources, plant part used, properties, processing and uses. <ul style="list-style-type: none"> ● Types of fibres: Jute and cotton, ● Types of Papers: Paper yielding plants, Process of pulping and paper making Botanical sources, plant part used, properties, active constituents, processing and uses <ul style="list-style-type: none"> ● Spices and condiments: Saffron and cardamom | |
| | III | Status of Commercial market for spices in India | |
| 3. | | Industry based on plant products | 10 |
| | I | Aromatherapy: Introduction, source and types Uses with few examples. Coconut, lemon, Jasmine Botanical and nutraceuticals - Algae: Spirulina Chlorella Plants: Vanillin, Garcinia indica/ Garcinia cambogia Kale. | |
| | II | Enzymes industry: Cellulases, Papain, Bromelain | |
| | III | Biofuels with reference to algae (Bioethanol, Biomethanol): Production of biofuels, generations of biofuels. | |
| | IV | Functional Foods: Definition, source, types and health benefits | |

PRACTICALS BASED ON PAPER III

Program: S. Y. B. Sc

Semester: III

Course: BOTANY

Course name and Code: (Applied Botany I) (Major+Minor) VGVUSMNBOP304

| Sr. no | Title of Experiments (For Major and Minor) | |
|--------|---|--|
| 1. | Pharmacognosy and Phytochemistry | |
| | i. Study of macroscopic and microscopic and chemical characteristic <ul style="list-style-type: none"> ● <i>Phyllanthus amarus</i> ● <i>Saraca asoka</i> ● <i>Bacopa monieri</i> HPTLC (Demo) | |
| 2. | Forestry and Economic Botany | |
| | i. Visit different types of forests /Botanical gardens. | |
| | ii. Sources of Fibers, Paper, Spices & condiments | |
| 3. | Industry based on plant products | |
| | v. Preparation of herbal cosmetics (Face pack/ De-tanning cream) | |
| | vii. Evaluation of nutraceutical value of mushroom/ wheat germ <ul style="list-style-type: none"> a. Estimation of Proteins from Mushrooms/Wheat germ by Lowrys/ Biuret method b. Estimate the Vitamin C content from the plant material. | |
| | For Minor Paper ONLY | |
| 1. | Separation of amino by circular paper chromatography | |
| 2. | Separation of Carotenoids by thin layer chromatography | |
| 3. | Study of Mitosis from suitable plant material. | |
| 4. | Estimation of DNA from suitable plant material. | |
| 5. | Study of different types of forest found in India. | |

Course Outcomes:

Students will be able to explain the importance of different pharmacopeia used in herbal medicines, importance of various secondary metabolites, its functions, applications and also evaluation of different drugs as adulterants and substituent.

Students will be able to differentiate among the forest types, their location and importance of forest products along with the significance of forestry and its types.

Students will learn to differentiate between fibers, spices and paper yielding plants.

Students will gain knowledge of plants used in aromatherapy, nutraceuticals and in enzyme industry.

REFERENCES:

1. Pharmacognosy by Trease and Evans
2. Pharmacognosy by Kokate, Purohit and Gokhale
3. Pharmacognosy & Pharmacobiotechnology by Ashutosh Kar
4. Essential of Pharmacognosy by Dr. S. H. Ansari.
5. Economic Botany by Kocchar.
6. Cosmetics- Formulation, Manufacturing and Quality control – P.P. Sharma
7. Herbal Cosmetics Hand Book- H. Panda
8. Herbal Cosmetics by P. K Chattopadhyay
9. The Complete Technology Book on Herbal Perfumes and Cosmetics by H. Panda
10. Cosmetics – Formulation, Manufacturing and Quality Control, P.P. Sharma, 4th edition, VandanaPublications Pvt. Ltd., Delhi.
11. Wilkinson, Moore, seventh edition, George Godwin. Poucher's Perfumes, Cosmetics, and Soaps

| | |
|--|--|
| Semester III (Plant Diversity III) | (Internal Class Test Paper Pattern) |
| Duration: 30 mins | Marks: 15 |
| Q. 1. Fill in the blanks: | 05 marks |
| Q. 2. Answer the following (Any two out of three question) | 10 marks |
| Semester III (Plant Diversity) Paper I | (Theory Paper Pattern) |
| Duration: 02 hrs | Marks: 60 |
| Q1A. Answer the following (Unit 1) 1. <p style="text-align: center;">Or</p> 2. | 7 Marks 7 Marks |
| Q1B. Answer any two of the following 1. 2. 3. | 8 Marks |
| Q2A. Answer the following (Unit 2) 1. <p style="text-align: center;">Or</p> 2. | 7 Marks 7 Marks |
| Q2B. Answer any two of the following 1. 2. 3. | 8 Marks |
| Q3A. Answer the following (Unit 3) 1. <p style="text-align: center;">Or</p> 2. | 7 Marks 7 Marks |
| Q3B. Answer any two of the following 1. 2. 3. | 8 Marks |
| Q4. Answer the following (All questions compulsory) 1. 2. 3 | 15 Marks |

| | |
|---|--|
| Program: S. Y. B. Sc Course: Botany | Semester III Course Code: |
| (Internal Assessment) | Marks: 40 |
| 1. Class Test: (Based on Theory Unit 1, 2 and 3) | 15 marks |
| 2. Internal Assignment: | 15 marks |
| 3. Attendance/Class Participation and Overall conduct | 10 Marks |

Syllabus Prepared by:

1. Prof. (Dr.) Ajit Kengar: Member, Syllabus Committee

Head, Dept. of Botany,
KET's V.G. Vaze College (Autonomous), Mulund (East), Mumbai.

2. Dr. Supriya Thale: Member, Syllabus Committee

Assistant Professor,
KET's V.G. Vaze College (Autonomous), Mulund (East), Mumbai.

3. Mr. Jatin Vaity: Member, Syllabus Committee

Assistant Professor,
KET's V.G. Vaze College (Autonomous), Mulund (East), Mumbai.

4. Dr. Rajani Shirsat: Member, Syllabus Committee

Assistant Professor,
KET's V.G. Vaze College (Autonomous), Mulund (East), Mumbai.

5. Ms. Siddhi Baskaware: Member, Syllabus Committee

Assistant Professor,
KET's V.G. Vaze College (Autonomous), Mulund (East), Mumbai.

6. Ms. Nupoor Telawane: Member, Syllabus Committee

Assistant Professor,
KET's V.G. Vaze College (Autonomous), Mulund (East), Mumbai.

7. Dr. Jayshri Jagtap: Member, Syllabus Committee

Assistant Professor,
KET's V.G. Vaze College (Autonomous), Mulund (East), Mumbai.

Semester IV

Program: S. Y. B. Sc.

Semester: IV

Course: Plant Diversity IV

Course Code: VGVUSMBO401

| Teaching Scheme (Hrs/Week) | | | | Continuous Internal Assessment (CIA) | | | | Semester End Examination | Total | |
|--|---|---|---|--------------------------------------|-------|-------|-------|--------------------------|-------------|-----|
| L | T | P | C | CIA-1 | CIA-2 | CIA-3 | CIA-4 | Lab | Written | |
| 6 | - | 2 | 8 | 15 | 15 | 10 | | - | 60 | 100 |
| Max. Time: Semester End Examination (Theory). | | | | | | | | | 2Hrs | |

Course Objectives:

To study the general characters, morphology, structure, life cycle and economic importance of the organisms belonging to Fungi, Pteridophytes and Gymnosperms

To understand the basic terminology of plant pathology, symptoms and control measures of plant diseases.

To understand the basics of Palaeobotany and the formation of fossils and its types.

| Unit No. | Module No | Content | Lectures |
|----------|-----------|---|-----------|
| 1. | | Thallophyta: Fungi, Plant Pathology and Lichens | 10 |
| | I | General characters of Ascomycetae with reference to <i>Aspergillus</i> and <i>Xylaria</i> . Structure, life cycle and systematic position of <i>Aspergillus</i> and <i>Xylaria</i> | |
| | II | Plant Pathology- Introduction to Plant Diseases, General Symptoms & control measures of Plant Diseases, Symptoms, causative organism, disease cycle and control measures of Powdery mildew of Pea | |
| | III | Lichens- Classification, Structure, Method of Reproduction, Economic Importance and Ecological Significance of Lichens. Lichens as a Biomonitoring: Introduction and their applications. | |
| 2. | | Pteridophyta and Paleobotany - | 10 |
| | I | Salient features and classification upto orders (with examples of each) of Psilophyta and Lepidophyta (G. M. Smith's system of classification to be followed) | |
| | II | Structure, life cycle and systematic position of <i>Psilotum</i> Structure, life cycle and systematic position of <i>Selaginella</i> | |
| | III | Paleobotany: Formation and types of fossils; | |
| | IV | Structure and systematic position of form genus <i>Rhynia</i> | |
| 3. | | Gymnosperms | 10 |

| | | | |
|--|-----------|---|--|
| | I | Salient features and economic importance of Coniferophyta (Chamberlain's system of classification to be followed) | |
| | II | Structure, life cycle and systematic position of <i>Pinus</i> Structure and systematic position of the form genus <i>Cordaites</i> | |

PRACTICALS BASED ON PAPER I

Program: B. Sc

Semester: IV

Course: BOTANY

Course Name: Plant Diversity IV

| Sr. no | Title of Experiments |
|--------|--|
| 1. | Fungi and Plant Pathology i. Study of stages in the life cycle of <i>Aspergillus</i> from fresh/ preserved material and permanent slides. ii. Study of stages in the life cycle of <i>Xylaria</i> from fresh/ preserved material and permanent slides. iii. Study of fungal diseases as prescribed for theory. iv. Study of Lichens (crustose, foliose, & fruticose). |
| 2. | Pteridophyta and Palaeobotany i. Study of stages in the life cycle of <i>Selaginella</i> from fresh/ preserved material and permanent slides. ii. Study of stages in the life cycle of <i>Psilotum</i> from fresh/ preserved material and permanent slides. iii. Study of form genera <i>Rhynia</i> with the help of permanent slides/ photomicrographs. |
| 3. | Gymnosperms i. Study of stages in the life cycle of <i>Pinus</i> from fresh/ preserved material and permanent slides. ii. Study of the form genus <i>Cordaites</i> with the help of permanent slide/ photomicrographs |

Course Outcomes:

Students will be able to study the general characters, morphology, structure, life cycle and economic importance of the organisms belonging to Fungi, Pteridophytes and Gymnosperms

Students will be able to understand the basic terminology of plant pathology, symptoms and control measures of plant diseases.

Students will be able to understand the basics of Palaeobotany and the formation of fossils and its types.

REFERENCE:

1. Rashid, A. (1978) - An introduction to pteridophytes
2. Vashishta, B.R. (1996) - Botany for degree students – Pteridophytes
3. Chamberlein, C.J. (1966) - Gymnosperms, Structure and Evolution
4. Ramanujan, C.G.K. (1979) - Indian Gymnosperms in Time and Space
5. Vashishta, P.C. (1976) - The Gymnosperms
6. A Textbook of Botany: Angiosperms - Taxonomy, Anatomy, Embryology and Economic Botany - Publisher: S Chand & Co Ltd
7. Sharma, O. P. 1993. Plant Taxonomy. Tata McGraw Hill Publishing Co. Ltd.; NewDelhi
8. Sambamurty, A. V. S. S. 2005. Taxonomy of Angiosperms. I. K. International Pvt.Ltd., New Delhi

Program: S. Y. B. Sc

Semester: IV

Course: FORM AND FUNCTION IV

Course Code: VGVUSMBO402

| Teaching Scheme (Hrs/Week) | | | | Continuous Internal Assessment (CIA) 40 marks | | | | | Semester End Examination | Total |
|--|---|---|---|---|-------|-------|-------|-------------|--------------------------|-------|
| L | T | P | C | CIA-1 | CIA-2 | CIA-3 | CIA-4 | Lab | Written | |
| 6 | - | 2 | 8 | 15 | 15 | 10 | | - | 60 | 100 |
| Max. Time: Semester End Examination (Theory). | | | | | | | | 2Hrs | | |

Course Objectives:

To understand the concept of secondary growth, mechanical tissue system and their importance, different terminologies related to secondary growth and mechanical tissue system of plants.

To understand the process and mechanism of respiration and its significance.

To understand the concept of biogeochemical cycle, difference between gaseous and sedimentary cycles. Basics of Pedology, importance of various ecological factors

| Unit No. | Module No | Content | Lectures |
|----------|-----------|--|----------|
| | | Paper II Course: FORM AND FUNCTION II | |
| 1. | | Anatomy | 10 |
| | I | Normal Secondary Growth in Dicotyledonous stem and root. | |
| | II | Growth rings, periderm, lenticels, tyloses, heart wood and sap wood | |
| | III | Mechanical Tissue system <ul style="list-style-type: none"> Tissues providing mechanical strength and support and their disposition I-girders in aerial and underground organs | |
| 2. | | Plant Physiology and Plant Biochemistry | 10 |
| | I | Respiration: Aerobic: Glycolysis, TCA Cycle, ETS & Energetic of respiration; Anaerobic respiration | |
| | II | Photorespiration: Site of Photorespiration and photorespiration in C3 Plants and its significance. | |
| 3. | | Ecology and Environmental Botany. | 10 |
| | I | Biogeochemical Cycles- Carbon, Nitrogen and Water | |
| | II | Ecological factors: Concept of environmental factors Soil as an edaphic factor, Soil composition, types of soil, soil formation, soil profile. Water: States of water in the environment, Precipitation types Light and Temperature: Variation, Optimal and limiting factors, Shelford law of tolerance | |
| | III | Community ecology- Characters of community – Quantitative characters (Density, Frequency and Abundance) | |

| | | |
|--|--|--|
| | Qualitative characters (Growth forms, Phenology, Physiognomy, Stratification) | |
|--|--|--|

PRACTICALS BASED ON PAPER II

Program: B. Sc

Semester: IV

Course: Botany

Course Name: FORM AND FUNCTION IV

| Sr. no | Title of Experiments |
|-----------|--|
| 1. | Anatomy |
| | i. Study of normal secondary growth in the stem and root of a Dicotyledonous plant |
| | ii. Types of mechanical tissues, mechanical tissue system in aerial, underground organs |
| | iii. Study of conducting tissues- Xylem and phloem elements in Gymnosperms and Angiosperms as seen in LS and through maceration technique. |
| | iv. Growth rings, periderm, lenticels, tyloses, heart wood and sap wood. |
| 2. | Plant Physiology and Plant Biochemistry |
| | i. Q ₁₀ - germinating seeds using Phenol red indicator. |
| | ii. NR activity – <i>in-vivo</i> |
| | iii. Estimation of proteins by Lowry's method (Prepare standard graph). |
| 3. | Ecology and Environmental Botany |
| | i. Study of the working of the following Ecological Instruments- Soil thermometer, Soil testing kit, Soil pH, Wind anemometer. |
| | ii. Mechanical analysis of soil by the sieve method & pH of soil. |
| | iii. Quantitative estimation of organic matter of the soil by Walkley and Blacks Rapid titration method. |
| | iv. Study of vegetation by the list quadrat method |

Course Outcomes:

Students will be able understand the concept of secondary growth, mechanical tissue system and their importance, different terminologies related to secondary growth and mechanical tissue system of plants.

Students will be able to understand the process and mechanism of respiration and its significances.

Students will be able to understand the concept of biogeochemical cycle, difference between gaseous and sedimentary cycles. Basics of Pedology, importance of various ecological factors

REFERENCES:

1. Bidwell, R.G.S. 1974. *Plant Physiology*. Macmillan Pub. Co., N.Y.
2. Taiz, L. and Zeiger, E. 2006. *Plant Physiology*. 4th Edition. Sinauer Associates, Sunderland, Massachusetts, USA
3. Salisbury F.B. and Ross C.B. 2005. *Plant Physiology*. 5th Edition. Wadsworth Publishing Co. Belmont CA.
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5. Kirkham, M.B. 2004. *Principles of Soil and Plant Water Relations*. Elsevier, Amsterdam, Netherlands.
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7. Fitter, A. and Hay, R.K.M. 2001. *Environmental Physiology of Plants*. Academic Press, UK.
8. Press, M.C., Barker, M.G., and Scholes, J.D. 2000. *Physiological Plant Ecology*, British Ecological Society Symposium, Volume 39, Blackwell Science, UK.
9. Sayyed Iliyas, 2020. *Steps in Plant Physiology*, Lambert Academic Publishing, Mauritius.
10. Devlin, R.M. and F.H. Witham. 1983. *Plant Physiology*. Willard Grant Press. U.S.A.
11. Hans-Walter Heldt. 1997. *Plant Biochemistry and Molecular Biology*. Oxford University Press, New York.
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13. Raman, K. 1997. *Transport Phenomena in Plants*. Narosa Publishing House. New Delhi.
14. Jain, V.K. 2000: *Fundamentals of Plant Physiology*. S. Chand & Co, New Delhi.
15. Pandey, S.N. 1991: *Plant Physiology*, Vikas Publishing House (P) Ltd., New Delhi, India.

Program: B. Sc

Semester: IV

Course: Botany

Course Name: Applied Botany II

| Teaching Scheme (Hrs/Week) | | | | Continuous Internal Assessment (CIA) 40 marks | | | | | Semester End Examination | Total |
|--|---|---|---|---|-------|-------|-------|-------------|--------------------------|-------|
| L | T | P | C | CIA-1 | CIA-2 | CIA-3 | CIA-4 | Lab | Written | |
| 6 | - | 2 | 8 | 15 | 15 | 10 | | - | 60 | 100 |
| Max. Time: Semester End Examination (Theory). | | | | | | | | 2Hrs | | |

Course Objectives:

To acquaint the basics of horticulture features and types of landscape gardening.

To introduce the plant tissue culture as non-conventional method of propagation of plants.

To acquaint the importance of techniques, vectors and enzymes involved in r-DNA technology.

To generate and test hypotheses, make observations, collect data, analyze and interpret results, derive conclusions, and evaluate their significance within a broad scientific context, using suitable statistical techniques

| Unit No. | Module No | Content | Lectures |
|----------|-----------|---|----------|
| 1. | | Horticulture and Gardening | 10 |
| | I | Introduction to Horticulture: Branches of Horticulture Gardening: Features in the garden- edges, hedges, Arches & pergolas lawn, flower beds, avenue, (with names of two plants for each category). | |
| | II | Types of gardens Formal and informal gardens Concept of Nakshatra Garden | |
| | III | Botanical Garden: Veer Mata Jijabai Udyan (Victoria Garden). | |
| 2. | | Biotechnology | 10 |
| | I | Introduction to plant tissue culture Laboratory organization and techniques in plant tissue culture Media composition and types of MS medium, Woody Plants Medium (WPM), Gamborg's B5 medium | |
| | II | Totipotency, Organogenesis and its types (Root, Anther and Pollen, Meristem culture and Embryo Culture) | |
| | III | R-DNA technology Gene cloning Enzymes involved in Gene cloning Vectors used for Gene cloning (Plasmids, Phage and Ti Plasmid) | |
| 3. | | Biostatistics and Bioinformatics | 10 |
| | I | Biostatistics: Chi square test. Correlation – Calculation of coefficient of correlation | |
| | II | Bioinformatics | |

| | | |
|--|---|--|
| | Information technology: History and tools of IT, Internet and its use in Biological Sciences Introduction to Bioinformatics- goal, need, scope Aims & Objectives of Bioinformatics: Data organization. Tools of Bioinformatics- tools for web search, Data retrieval tools- Entrez, BLAST Bioinformatics programs & Centers in India | |
|--|---|--|

PRACTICALS BASED ON PAPER III (Major + Minor)

Program: B. Sc

Semester: IV

Course: Botany

Course Name: Applied Botany II

| Sr. no | Title of Experiments |
|-----------|---|
| 1. | Horticulture |
| | i. Study of five examples of plants for each of the garden locations as prescribed for theory. |
| | ii. Preparation of garden plans – formal and informal gardens |
| 2. | Biotechnology |
| | i. Various sterilization techniques |
| | ii. Preparation of Stock solutions, Preparation of MS medium. |
| | iii. Seed sterilization and inoculation of explant. |
| | iv. Identification of the cloning vectors – pBR322, pUC 18, Ti plasmid |
| 3. | Biostatistics and Bioinformatics |
| | i. Chi square |
| | ii. Calculation of coefficient of correlation |
| | iii. Web Search – Google, Entrez. |
| | iv. p-BLAST |
| | Practicals for Minor only |
| 1. | Study of normal secondary growth in the stem and root of a Dicotyledonous plant. |
| 2. | Study of conducting tissues- Xylem and phloem elements in Gymnosperms and Angiosperms as seen in LS and through maceration technique. |
| 3. | Q ₁₀ - germinating seeds using Phenol red indicator. |
| 4. | Quantitative estimation of organic matter of the soil by Walkley and Blacks Rapid titration method. |
| 5. | Study of vegetation by the list quadrat method |

Course Outcomes:

Students will be able to acquaint the basics of horticulture features and types of landscape gardening.

Students will be able to introduce the plant tissue culture as non-conventional method of propagation of plants.

Students will be able to acquaint the importance of techniques, vectors and enzymes involved in r-DNA technology.

Students will be able to generate and test hypotheses, make observations, collect data, analyse and interpret results, derive conclusions, and evaluate their significance within a broad scientific context, using suitable statistical techniques

REFERENCES:

1. Chadha K L (2002). Handbook of Horticulture ICAR
2. Peter K V (2008). (Ed.) Basics of Horticulture New India Publication agency
3. Bose T K., Maiti R G., Duha R S and Das P (1999). Floriculture and Landscaping, Naya Prakash
4. Sudheer K P and Indira V (2007) Post harvest technology of Horticultural crops, New India Publication agencies
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6. Arora J S (1999). Introduction to ornamental horticulture Kalyani Publishers, Ludhian
7. B.D. Singh (4th Edn 2012) Biotechnology-expanding horizons, Kalyani Publishers.
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9. M.K. Razdan (2002) Introduction to Plant Tissue Culture. Oxford and IBH Publishing Co., New Delhi.
10. H.S. Chawla (2005) Introduction to Plant Biotechnology. Oxford and IBH Publishing Co. New Delhi.

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|---|--|
| Program: S. Y. B. Sc Course: Botany | Semester III Course Code: |
| (Internal Assessment) | Marks: 40 |
| 1 Class Test : (Based on Theory Unit 1, 2 and 3) | 15 marks |
| 2 Assignment: 15 marks | 15 marks |
| 3 Class Participation and Overall conduct 05 Marks | 10Marks |

| | |
|--|--|
| Semester IV | (Internal Class Test Paper Pattern) |
| Duration: | Marks: 15 |
| Q. 1. Fill in the blanks: | 05 marks |
| Q. 2. Answer the following (Any two out of three question) | 10 marks |

| | |
|---|-------------------------------|
| Semester IV | (Theory Paper Pattern) |
| Duration: 02 hrs | Marks: 60 |
| Q.1. A. Answers the following. 1. OR 2. | 07 Marks |
| Q.1.B. Answer the following (Any two) 1. 2. 3. | 08 Marks |
| Q.2.A. Answer the following 1. OR 2. | 07 Marks |
| Q.2.B. Answer the following (Unit 2) (Any 2 Two) 08 Marks 1. 2. 3. | |
| Q.3. A. Answers the following. 1. OR 2. | 07 Marks |
| Q.3.B. Answers the following (Unit 3) (Any 2) 1. 2. 3. | 08 Marks |
| | |
| Q.5. Answers the following | 15 Marks |

Syllabus Prepared by:

1. Prof. (Dr.) Ajit Kengar: Member, Syllabus Committee

Head, Dept. of Botany,
KET's V.G. Vaze College (Autonomous), Mulund (East), Mumbai.

2. Dr. Supriya Thale: Member, Syllabus Committee

Assistant Professor,
KET's V.G. Vaze College (Autonomous), Mulund (East), Mumbai.

3. Mr. Jatin Vaity: Member, Syllabus Committee

Assistant Professor,
KET's V.G. Vaze College (Autonomous), Mulund (East), Mumbai.

4. Dr. Rajani Shirsat: Member, Syllabus Committee

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KET's V.G. Vaze College (Autonomous), Mulund (East), Mumbai.

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