Appendix- A

AC –

Item No. –

As per NEP 2020

**S. R. D. S. P. Mandal’s**

**SHRI PANCHAM KHEMRAJ MAHAVIDYALAYA,**

**SAWANTWADI**



Title of the Programme: Science

**B.Sc. (Botany)**

A: Certificate in Botany: 2023-2024

B: Diploma in Botany: 2024-2025

C: Degree in Botany: 2025-2026

Syllabus for

Sem-I and Sem-II

Reference GR dated 16th May 2023 for Credit structure

**S. R. D. S. P. Mandal’s**

**SHRI PANCHAM KHEMRAJ MAHAVIDYALAYA,**

**SAWANTWADI**



### (As per NEP 2020)

|  |  |  |
| --- | --- | --- |
| **Sr. No.** | **Headings** | **Particulars** |
| 1 | Title of the Program | Science- Botany |
| 2 | Eligibility | H.S.C. Science |
|  | Duration of the Programme | 1. Certificate 2. Diploma 3. Advance Diploma 4. Research Degree |
|  | Scheme of Examination | External : 60  Internal: 40  Separate passing in External and Internal examination |
|  | Standard of Passing | 40.00% |
|  | Program Academic Level | * 1. Certificate  1. Diploma   5.5 Advance Diploma  6.0 Research Degree |
|  | Pattern | Semester Pattern |
|  | Status | New |
|  | To Be Implemented from the academic year | * 1. Certificate 2023-2024  1. Diploma 2024-2025   5.5 Advance Diploma 2025-2026  6.0 Research Degree 2026-2027 |

**Preamble**

Shri Pancham Khemaraj Mahavidyalaya, Sawantwadi (Autonomous) believes in implementing several measures to bring equity, efficiency and excellence in higher education system in conformity to the guidelines laid down by the University Grants Commission (UGC). In order to achieve these goals, all efforts are made to ensure high standards of education by implementing several steps to enhance the teaching- learning process, examination and evaluation techniques and ensuring the all-round development of learners.

The four-year course in B.Sc. Botany has been designed to have a progressive and innovative curriculum in order to equip our learners to face the future challenges in the field of higher education.

In response to the rapid advancements in science and technology and the evolving approaches in various domains of Botany and related subjects, the Board of Studies in Botany at S. P. K. Mahavidyalaya, Sawantwadi (Autonomous) has developed the curriculum for the first semester of F.Y. B.Sc. Botany which goes beyond traditional academic boundaries. The syllabus is aligned with the NEP 2020 guidelines to ensure that students receive an education that prepares them for the challenges and opportunities of the 21st century. This syllabus has been designed under the framework of the Choice Based Credit System (CBCS), taking into consideration the guidelines set forth by the National Education Policy (NEP) 2020, LOCF (UGC), NCrF, NHEQF, Prof. R.D. Kulkarni's Report and Government of Maharashtra's General Resolution dated 20th April and 16th May 2023.

A Botany Post Graduates degree equips students with the knowledge and skills necessary for a diverse range of fulfilling career paths. Post Graduates in Botany find opportunities in various fields, including urban planning, teaching, environmental science, all plant sciences, organic farming, nursery management, entrepreneurship Mushroom cultivation, medicinal plant, floriculture, horticulture, propagation methods and plant tissue culture method and many other domains. Throughout their three-year degree program, students explore the significance of plant in life of each and every living organism on Earth. They learn tool, techniques, process which is required to set up agencies including pickles, jam, and jelly medicinal plant, fruit processing, vegetable processing, organic product, organic fertilizer and pesticides producing industries also the can earn the knowledge to produce natural remedies for varies diseases. They became expert in discovery and development of many new therapeutic compounds which are now used in pharmaceutical herbal cosmetics and other compound based industries.

Overall, revising the Botany syllabi in accordance with the NEP 2020 ensures that students receive an education that is relevant, comprehensive, and prepares them to navigate the dynamic and interconnected world of today. It equips them with the knowledge, skills, and competencies needed to contribute meaningfully to society and pursue their academic and professional goals in a rapidly changing global landscape.

**Aims and Objective**

* To recognize the principles behind and importance of many botanical phenomena.
* To conduct experiments to understand the plants and environment relationship.
* To use the knowledge and abilities gained to solve nutrition related real time problems.
* To develop and use a broad view for environmental problem-solving abilities.

**Program Outcomes**

After Completing the Programme, Students will be able to,

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| --- | --- | --- |
| PO1 | Demonstrate comprehensive knowledge and grasp of science that form a component of an undergraduate plan of study. | Disciplinary knowledge |
| PO2 | Exhibit the ability to read and write critically, listen intently, use appropriate media, confidently express oneself, communicate scientific knowledge, concepts, and ideas both orally and in writing, and explain difficult material to a variety of audiences. | Communication Skills |
| PO3 | Apply analytical thinking to a corpus of information; identify relevant presumptions or implications; study and evaluate arguments, evidence, claims, and opinions in light of empirical evidence. Develop logical arguments. Analyze theories, policies, and practices critically while using a scientific approach to information collection. | Critical thinking |
| PO4 | Extrapolate from what one has learned and apply their competencies to solve other types of non-familiar challenges, rather than duplicating curricular core knowledge; and apply one’s learning to real world scenarios. | Problem solving |
| PO5 | Evaluate the dependability and relevance of evidence; uncover logical errors and holes in the arguments of others; evaluate and synthesise data from a range of sources; draw valid results and back them with facts and examples, and addressing opposing perspectives. | Analytical reasoning |
| PO6 | Enquire, ask appropriate questions, to recognise cause and effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; Plan, execute and report the results of an experiment or investigation. | Research-related skills |
| PO7 | Work successfully and respectfully with multiple teams; create cooperative or coordinated group effort; operate as a group or team in the interests of a common cause; and work efficiently as a team member. | Cooperation/Team work |
| PO8 | Analyse, interpret and derive conclusions from Quantitative/Qualitative data; and critically assess ideas, evidence and experiences from a open-minded and reasoned perspective. | Scientific reasoning |
| PO9 | Examine and evaluate one's own sensitivity to life experiences, as well as one's own and society's reflexivity. | Reflective thinking |
| PO10 | Use ICT in a variety of learning scenarios; exhibit, access, evaluate, and apply a variety of relevant information sources; and analyze data using appropriate tools. | Information/digital  literacy |
| PO11 | Work autonomously, identify the resources needed for a project, and see it through to completion. | Self-directed learning |
| PO12 | Maintain comprehension of other cultures' values and beliefs, as well as a global worldview. Participate in a multicultural culture and engage politely with different groups. | Multicultural competence |
| PO13 | Adopt moral and ethical values in your life, take a position on moral matters and give reasons from multiple angles, and incorporate morality into all you do.Recognize moral issues, refrain from unethical behavior such as fabricating, falsifying, or misrepresenting that plagiarism has occurred, respect intellectual property rights, and recognize environmental and sustainability issues; and act impartially, objectively, and truthfully in all aspects of work. | Moral and ethical awareness/reasoning |
| PO14 | Map out the tasks that a team or organization must complete, establish direction, develop an inspiring vision, assemble a team to help achieve the vision, encourage and inspire team members to participate in that vision, and use management techniques to lead people effectively and efficiently. | Leadership readiness/qualities |
| PO15 | Acquire knowledge and skills, including 'learning how to learn', that are required for participating in learning activities throughout life through self-paced and self-directed learning aimed at personal development, meeting economic, social, and cultural objectives, and adapting to changing trades and workplace demands through knowledge/skill development/reskilling. | Lifelong learning |

**Program Specific Outcome:** After successful completion of this programme (Botany) learners are able to

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| PSO1 | Explain how Plant perform various functions at the level of the gene, cell, tissue,  organ and organism as collective. |
| PSO2 | Compare and contrast the characteristics of plant groups, Identify and classify plants  of various division up to class level on basis of basic knowledge of plant morphology, anatomy etc. in real life observations. |
| PSO3 | Apply scientific methods to questions in botany by formulating testable  hypotheses, collecting data that address these hypotheses, and analysing those data to assess the degree to which their scientific work supports their hypotheses. |
| PSO4 | Demonstrate proficiency in the experimental techniques and analytical methods for  Various areas and current trends in plant science. |

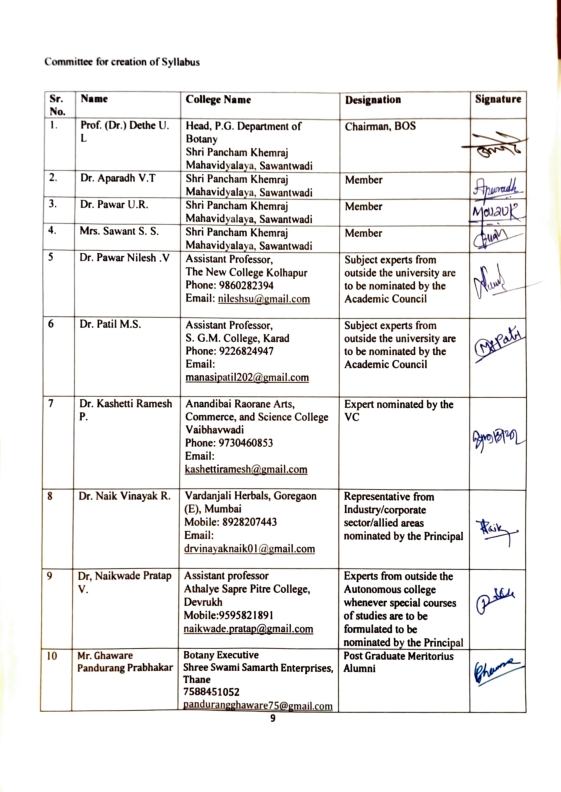
Proposed First Year Credit Structure as per NEP 2020

**Department of Botany**

**Proposed Structure for CORE/OE/VSE/SEC/VEC/IKS/VEC**

**Academic year:2024-25**

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| --- | --- | --- | --- | --- |
| **Semester** | **Paper Code** | **Paper Title** | **Type** | **Credits** |
| **I**  **(Level 4.5)** | S101BOT | Plant Science and Human Welfare | **Theory** | **2** |
| S102BOP | Practical I | **Practical** | **2** |
| BOTSEC01(SEC) | Mushroom Cultivation | **Skill** | **2** |
| BOTVSC01 (VSC) | Experimental Botany-I | **Voc. Skill** | **2** |
| BOTVEC01 | Environmental Botany-I |  | **2** |
| BOTIK01 | Botany in Ayurveda | **IKS** | **2** |
| **II**  **(Level 4.5)** | S103BOT | Cytogenetics, Ecology and Environment Conservation | **Theory** | **2** |
| S104BOP | Practical II | **Practical** | **2** |
| BOTSEC02(SEC) | Fruit processing | **Skill Enh.** | **2** |
| BOTOE01(GE/OE) | Nursery Management (रोपवाटिका व्यवस्थापन) | **Generic Elective** | **2** |
| BOTVSC02 (VSC) | Experimental Botany-II | **Voc. Skill** | **2** |



Committee for creation of Syllabus

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| --- | --- | --- | --- |
| **Sr. No.** | **Name** | **College Name** | **Designation** |
| 1. | Prof. (Dr.) Dethe U. L | Head, P.G. Department of Botany  Shri Pancham Khemraj Mahavidyalaya, Sawantwadi | Chairman, BOS |
| 2. | Dr. Aparadh V.T | Shri Pancham Khemraj Mahavidyalaya, Sawantwadi | Member |
| 3. | Dr. Pawar U.R. | Shri Pancham Khemraj Mahavidyalaya, Sawantwadi | Member |
| 4. | Mrs. Sawant S. S. | Shri Pancham Khemraj Mahavidyalaya, Sawantwadi | Member |
| 5 | Dr. Pawar Nilesh .V | Assistant Professor,  The New College Kolhapur  Phone: 9860282394  Email: [nileshsu@gmail.com](mailto:nileshsu@gmail.com) | Subject experts from outside the university are to be nominated by the Academic Council |
| 6 | Dr. Patil M.S. | Assistant Professor,  S. G.M. College, Karad  Phone: 9226824947  Email: [manasipatil202@gmail.com](mailto:manasipatil202@gmail.com) | Subject experts from outside the university are to be nominated by the Academic Council |
| 7 | Dr. Kashetti Ramesh P. | Anandibai Raorane Arts, Commerce, and Science College Vaibhavwadi  Phone: 9730460853  Email: [kashettiramesh@gmail.com](mailto:kashettiramesh@gmail.com) | Expert nominated by the VC |
| 8 | Dr. Naik Vinayak R. | Vardanjali Herbals, Goregaon (E), Mumbai  Mobile: 8928207443  Email: [drvinayaknaik01@gmail.com](mailto:drvinayaknaik01@gmail.com) | Representative from Industry/corporate sector/allied areas nominated by the Principal |
| 9 | Dr, Naikwade Pratap V. | Assistant professor  Athalye Sapre Pitre College, Devrukh  Mobile:9595821891  [naikwade.pratap@gmail.com](mailto:naikwade.pratap@gmail.com) | Experts from outside the Autonomous college whenever special courses of studies are to be formulated to be nominated by the Principal |
| 10 | Mr. Ghaware Pandurang Prabhakar | Botany Executive  Shree Swami Samarth Enterprises, Thane  7588451052  [pandurangghaware75@gmail.com](mailto:pandurangghaware75@gmail.com) | Post Graduate Meritorius Alumni |

Syllabus Subcommittee:-

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr. No.** | **Name** | **College Name** | **Designation** |
| 1. | Prof. (Dr.) Dethe U. L | Head, P.G. Department of Botany  Shri Pancham Khemraj Mahavidyalaya, Sawantwadi | Chairman, BOS |
| 2. | Dr. Aparadh V.T | Shri Pancham Khemraj Mahavidyalaya, Sawantwadi | Member |
| 3. | Dr. Pawar U.R. | Shri Pancham Khemraj Mahavidyalaya, Sawantwadi | Member |
| 4. | Mrs. Sawant S. S. | Shri Pancham Khemraj Mahavidyalaya, Sawantwadi | Member |
| 5 | Dr. Dhansahree Sagar Patil | Head, Department of Botany,  Br. Balasaheb Khardekar College, Vengurla. | Member |
| 6 | Mr. Nagesh Sharad Daptardar | Shri S.H. Kelkar College, Devgad | Member |
| 7 | Dr. R. Y. Thakur | Head Department of Botany,  Sant Rawool Maharaj Mahavidyalaya,  S. N. Desai Chowk, Udyamnagar, Kudal | Member |
|  |  |  |  |

Letter Grades and Grade points

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| --- | --- | --- |
| **Semester GPA/Program CGPA/Semester Program** | **Percentage of Marks** | **Alpha- sign / letter grade result** |
| 9.00-10.00 | 90.00-100 | O (Outstanding) |
| 8.00-9.00≥ | 80.0-90.0 | A+ (Excellent) |
| 7.00-8.00 | 70.0-80.0 | A(Very Gppd) |
| 6.00-7.00 | 60.0-70.0 | B+(Good) |
| 5.50-6.00 | 55.0-60.0 | B(Above Average) |
| 5.00-5.50 | 50.0-55.0 | C(Average) |
| 4.00-5.00 | 40.0-50.0 | P(Pass) |
| Below 4.00 | Below 40.0 | F(Fail) |
| AB (absent) |  | Absent |

**Course Code and Title: S101BOT (CORE): Plant Science and Human Welfare**

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| **Level: 4.5** | **Credits: 02** | **Number of Lectures: 30** | **Semester-I** |

**Learning Objectives:**

* To know the basics of cryptogams.
* To understand the plant diversity with special reference to cryptogams diversity.
* To give knowledge of identification of cryptogams.
* To understand the scope of the cryptogams diversity with special reference Algae,
* Fungi, Bryophytes

**Learning Outcomes:**

After Completing the course, Student will be able to

* Explain Occurrence, structure, reproduction of *Nostoc, Spirogyra, Rhizopus, Aspergillus* and *Riccia*
* Identify and classify Algae, Fungi and bryophytes on basis of general characters and principles of taxonomy
* Differentiate modes of nutrition in fungi
* Evaluate economic importance of algae, fungi and bryophytes
* Justify different stages in the life cycle of *Nostoc, Spirogyra, Rhizopus, Aspergillus* and *Riccia*.

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| **Unit - I : Plant Science (15 Lectures)** | | |
| 1. | Biodiversity and Significance of Plants  1.1. General classification of plants.  1.2. Various plants types: Herb, Shrub, Tree, Climbers, Creepers.  1.3. Botanical marvels: Pitcher plant (*Nepenthes*), Sun dew (*Drosera*), Touch-me-not (*Mimosa*), *Rafflesia*, *Cuscuta* |  |
| 2. | Interesting Facts about plants:  1.2.1. Do plants talk? (Communication in plants)  1.2.2. Plant movements (example- flower, tendrils etc.)  1.2.3. Plant Defense and mimicry. |
| 3. | Aesthetic and Traditional Aspects of Plants 5 Lectures  1.3.1. Aesthetic Botany: Concept, Significance  1.3.2. Gardens and landscapes (Indoor gardening, Terrace and gallery  gardening)  1.3.3. Traditional practices involving plants (Example- Banana leaves, coconut, Rice etc.) |
| **Unit – II Plants in Human Welfare 15 Lectures** | | |
| 1. | **Plants as Food**  2.1.1. Plants as Food (Root, stem, leaves, tuber, corm, flower, rhizome, fruit, seed used as food with one example)  2.1.2. Microgreens (Fenugreek, Wheatgrass etc.)  2.1.3. Plant derived beverages (Tea, Coffee and Squash) |  |
| 2. | **Plants in Daily Life**  2.2.1. Plants used for cosmetics, perfumes, ecofriendly colours, fabrics, soap, shampoo, toothpaste.  2.2.2. Plants used in sports and musical instruments, building infrastructure, furniture, writing- drawing.  2.2.3. Importance of Medicinal Plants - Amla, Brahmi, Chakramuni (Multivitamin plant) and Stevia (Madhuparni). |
| 3. | **Next Generation Plant Cultivation**  2.3.1. Hydroponics and Aeroponics  2.3.2. Vertical gardening  2.3.3. Spirulina farming |

**References:**

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| --- |
| 1. “Botany for the Future” by Peter H. Raven  2. “Medicinal Plants: A Comprehensive Guide” by S. K. Jain  3. “Plant Physiology” by Lincoln Taiz and Eduardo Zeiger  4. “The Physiology of Flowering Plants: Their Growth and Development” by Roger F. E. Schumacher –  5. “Edible Medicinal and Non-Medicinal Plants: Volume 1, Fruits” by T. K. Lim  6. “Landscaping principles and practices” by Jack E. Ingels  7. "Hydroponics: The Essential Hydroponics Guide: A Step-By-Step Hydroponic Gardening Guide to Grow Fruit, Vegetables, and Herbs at Home" by Andy Jacobson  8. "Vertical Gardening for Beginners: Ideas for Growing Beautiful Space-Saving Gardens Indoors and Outdoors" by Julie Ruth  9. "Spirulina in Human Nutrition and Health" by M. E. Gershwin and Amha Belay |

**Course Code and Title: S102BOP (CORE):**

**PRACTICAL I BOTANY (Plant Science and Human Welfare)**

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| **Level: 4.5** | **Credits: 02** | **Number of Lectures: 60** | **Semester-I** |

**Learning Outcome:** On successful completion of this course students will be able to:

* Explain Occurrence, structure, reproduction of *Nostoc, Spirogyra, Rhizopus, Aspergillus* and *Riccia*
* Identify and classify Algae, Fungi and bryophytes on basis of general characters and principles of taxonomy
* Differentiate modes of nutrition in fungi
* Evaluate economic importance of algae, fungi and bryophytes
* Understand the differences, ultrastructure and function of Cell wall, plasma membrane, endoplasmic reticulum and chloroplast, Mendelian Genetics.

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|  | |
| 1 | **Microscopy** |
| * Handling of compound microscope and Dissecting microscope |
| 2 | **Cryptogamic Botany** |
| * Study of vegetative and reproductive structures of *Zygnema*. |
| * Study of vegetative and reproductive structures of *Rhizopus.* |
| * Study of vegetative and reproductive structures of *Riccia*. |
| 3 | **Introduction to microbial techniques** |
| * Gram staining of Bacteria. |
| * Aseptic techniques, preparation of media (PDA, NA), preparation of plates and slants. (Demonstration) |
| 4 | **Medicinal Botany** |
| * Grandma’s Pouch: Botanical name, common name, family, constituents, biological source and uses of: Tulsi, Ginger, Adulsa and Clove. |
| 5 | **Entrepreneurship skills** |
| * Prepare Face mask, Gel, Lotion using botanicals. |
| * Mushroom cultivation (Demonstration). |
| 6 | **Nature Exploration and Digital skills (Internal assignments ANY ONE)** |
| * Field Visit: Exploration of Natural Biodiversity |
| * Blog writing on Field visits. |
| * Digital photography. |
| * Short film on Nature and Biodiversity. |

**Reference Books**

1. College Botany Volume I and II Gangulee, Das and Dutta (latest edition).

2. Cryptogamic Botany Volume I and II by G M Smith McGraw Hill.

## **EXAMINATION PATTERN FOR MAJOR SUBJECTS**

1. **Continuous Internal Assessment (20 Marks):**

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| **Sr. No.** | **Particulars** | **Marks** |
| 1 | Class test / assignment / Seminar / Quiz | 20 |

## Semester End Examination (30 Marks):

Question Paper Pattern

* 1. These examinations shall be of **One Hours** duration. Maximum marks **30**.
  2. There shall be three questions of which first questions are of **10 marks MCQ**. Question 2 & 3 will be of 10 marks each. Questions 1 will be based on **Unit- I&II,** Questions 2 will be based on **Unit-I** and **Questions 3** will be based on **Unit-II**.
  3. All questions shall be compulsory with internal choice within the questions.

## **Distribution of external 30 marls**

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| --- | --- | --- | --- | --- | --- |
| **Qn.** | **Sub-Qn** | **Particulars** | **Unit** | **Marks with options** | **Total Marks for qn** |
| **1** | **MCQ** | Answer the following  (Attempt **all**) | **I, II** | **10** | **10** |
| **2** | **a, b** | Answer the following  (Attempt **any one out of two**) | **I** | **20** | **10** |
| **4** | **a, b** | Answer the following (Attempt **any one out of two**)) | **II** | **20** | **10** |
|  |  | **Total** |  | **50** | **30** |

1. **Semester End Practical Examination (50 marks):**

## **Scheme of examination:**

* There will be internal assessment for practical (20 marks).
* A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of that semester of F.Y.B.Sc. Botany as per the minimum requirement.
* The practical examination will be conducted in **SINGLE SESSIONS** of two hours.
* The learners will be evaluated based on the experiments performed during the examination.
* The questions on slips for the same should be framed in such a way that candidate will be able to complete the task and should be evaluated for the skill and understanding of Botany.

# Distribution of marks in practical examination

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| --- | --- | --- |
| **Sr. No.** | **Particulars** | **Marks (50marks)** |
| 1 | Experiments external | 30 |
| 2 | Experiments internal | 20 |
|  | **Total Marks** | **50** |

**BOTSEC01(SEC): MUSHROOM CULTIVATION**

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| --- | --- | --- |
| **Level: 4.5** | **Credits: 02** | **Lectures: 60 L** |

**Learning Objectives:**

* Enable the students to identify edible and poisonous mushrooms
* Provide hands on training for the preparation of bed for mushroom cultivation and spawn production
* Give the students an industrial exposure to help them in understanding the establishment and functioning of mushroom farms
* Value addition of the mushroom products
* Learn marketing strategies - local to cross country
* Understand the available financial schemes and application processes for establishing a farm
* Give the learners an experience in research for qualitative and quantitative mushroom production
* Mushroom Cultivation

**Learning Outcome:**

On successful completion of the course, students will be able to:

* Identify edible types of mushroom
* Gain the knowledge of cultivation of different types of edible mushrooms and spawn production
* Manage the diseases and pests of mushrooms
* Develop competency in self-employment and income generation
* Packaging, Storing and grading of mushroom; post harvest procedures
* Apply for different Government, Non Government Schemes for establishing a production unit
* Markets available for commercial production
* Develop research aptitude

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| **PRACTCALS/ EXPERIMENTS** | |
| 1 | Study of external characters of mushroom |
| 2 | Study of internal characters |
| 3 | Study of different species of mushrooms |
| 4 | Life cycle of typical mushroom |
| 5 | Nutritional values of mushrooms |
| 6 | Medicinal usages of mushrooms |
| 7 | Media preparation for Spawn culture |
| 8 | Composition of compost and bed preparation |
| 9 | Preparation of different types of compost |
| 10 | Pasteurization of compost and sterilization processes |
| 11 | Seeding technique of spawn in compost |
| 12 | Harvesting stage and methodology |
| 13 | Packaging and labelling process |
| 14 | Recipes in mushroom cuisine |

**References:**

1. S.Kannaiyan & K.Ramasamy (1980). A hand book of edible mushroom, Today &Tomorrows printers & publishers, New Delhi.
2. Nailoke Pauline Kadhila, Favian Sinvula Mubiana, and Keumbo Lorna Haluendo, 2012: Mushroom Cultivation- A Beginners Guide; Published by University of Namibia
3. Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
5. Tripathi, D.P. (2005) Mushroom Cultivation, Oxford & IBH Publishing Co. PVT.LTD, New Delhi.

**Course Code and Title: BOTVSC01: Entrepreneurial Botany**

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| --- | --- | --- | --- |
| **Level: 4.5** | **Credits: 02** | **Number of Lectures: 60** | **Semester-I** |

**Learning Outcome:** On successful completion of this course students will be able to:

Practice the different algal and fungal cultivation practices.

Develop the skills of designing and carving of natural material.

Understand the making of aroma candles and incense sticks.

Comprehend the process of preparing herbal teas, natural dyes, organic pesticides, and composting.

Prepare business plan, marketing strategies and branding products.

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| **PRACTICALS** | |
|  | 1. To study the process of Mushroom Cultivation.  2. To study the techniques of Spirulina Farming.  3. Designing of jewellery using natural material. (Bio jewellery)  4. Vegetable and Fruit Carving techniques.  5. Preparation of Jam, Jelly, Squash.  6. Preparation of ketchup, Pickles, Candies.  7. To study the technique of Resin Art using plant material.  8. Making of Aroma candles.  9. Making of incense sticks.  10. Making of eco-friendly articles.  11. Preparation of Herbal teas.  13. Preparation of Natural Dyes.  14. Preparation of organic pesticides.  15. To study the process of Composting. |

**BOTVEC01(VEC): ENVIRONMENTAL BOTANY I**

|  |  |  |  |
| --- | --- | --- | --- |
| **Level: 5.0** | **Credits: 02** | **Number of Lectures: 30** | **Semester-III** |

**Learning Outcome:**

After completion of the program the students will be able to:

1. The students will acquire knowledge about the hazardous effects of different Environmental Pollutants and Relative Measures for their Control/Prevention.

2. Conservation and exploitation of biological diversity through crop management.

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| **Unit - I Environmental Factors and Pollutants 15 Lectures** | | |
|  | Natural Resources: Nature and Conservation of the following: Energy, Water, -Mineral and Land Resources.  Agriculture, Forestry, Range Land, Wild Life and Aquaculture. |  |
| **Unit II Biodiversity Conservation 15 Lectures** | | |
|  | Biodiversity and Conservation: importance,  reason of loss;  In-situ and ex-situ conservation of plants. |  |

**Books Recommended:**

1. Koziol, M.J. and Whatley, F.R. (2009). Gaseous Air Pollution and Plant Metabolism. Butterworths. U.K.

2. Goodstein, E.S. (2008). Economics and the Environment. Prentice Hall Publishers. New Jersey.

3. Agrawal, K.C. (2001). Environmental Biology, Agro Botanical Publishers, India.

4. Chhatwal, D.R., Mehra, M.C., Satake, M., Katyal, T., Katyal, M. and Nagahiro. T. (2001). Encyclopedia of Environmental Pollution and its Control. (6 Vols.), Anmol Publication, New Delhi, India.

5. Usher, M. (2001). Widllife Conservation Evaluation. Chapman and Hall.

6. Rao, D.N., Ahmad, K.J., Younas, and Singh, S.N. (2000). Perspectives in Environmental Botany (Vol. I,) Print House, Lucknow, India.

**BOTIK01(IK):** **BOTANY IN AYURVEDA**

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| --- | --- | --- |
| **Level: 4.5** | **Credits: 02** | **Lectures: 30 L** |

**Learning Objectives:**

* To understand importance of Ayurveda and its principles.
* To know Ayurveda methods for collection and storage of crude drugs.
* To train students for identification of medicinal plant parts and their description.
* The make conscious and aware of natural resources and environment.
* To create awareness in students about healthy environment for the human beings.
* To give knowledge of biodiversity; ethics, human health and diseases.
* To train students for use of raw materials in Ayurveda formulations and drugs.

**Learning Outcome:**

* By the end of the course, students will be able to:
* Aware the importance of Ayurveda and its principles.
* Understand the Ayurveda methods for collection and storage of crude drugs.
* Understand the medicinal plant parts and their description.
* Conscious and aware of natural resources and environment.
* Identify plants and environment for the benefit of human beings,
* Conscious about biodiversity; ethics, human health and diseases.
* Use raw materials in Ayurveda formulations and drugs.

**Course Content:**

|  |  |  |
| --- | --- | --- |
| **Unit - I INTRODUCTION TO AYURVEDA 10 Lectures** | | |
|  | 1.1 Definition, aim of Ayurveda, Brief description of Samhita and Ashtang. |  |
|  | 1.2 Introduction to department of AYUSH, CCIM, CCRAS, RAV |  |
| **Unit – II AYURVEDA AND INTEGRATED DISCIPLINE 10 Lectures** | | |
|  | 2.1 Ancient Bhartiya Contribution in Environment & Health Ethnic Studies, Life Science in Plants, Anatomy, Physiology, Agriculture, Ecology and Environment.  . |  |
|  | 2.2 Integrated Approach to Healthcare, Medicine, Microbiology, Surgery and Yoga. |  |
| **Unit – III PLANTS IN AYURVEDA 10 Lectures** | | |
|  | 3.1 Study on following dravyas with respect to Sanskrit name, Common name, Botanical name, Family, habit and parts used : Amalaki, Arjuna, Ashoka, Bhallataka, Bilva, Brahmi, Chandandravya, Chitraka, Daruharidra, Durva, Eranda, Gokshura, Guduchi, Nimba, Nirgudi, Punarnava, Shatavari, Tulsi, Lavangakeshara |  |

**References:**

|  |  |
| --- | --- |
| 1 | S.K. Jain (Ed.) (1989): Methods and approaches in Ethno-botany. Society of ethnobotanists, Lucknow, India. |
| 2 | S.K. Jain, (1990): Contributions of Indian Ethno-botany. Scientific publishers, Jodhpur. |
| 3 | S. K. Jain (1995): Manual of Ethno botany, Scientific Publishers, Jodhpur. |
| 4 | Colton C.M. (1997): Ethno botany. Principles and applications. John Wiley and Sons, Chichester. |
| 5 | Rama Ro, N. and A. N. Henry (1996): The Ethno-botany of Eastern Ghats in Andhra Pradesh, India. Botanical Survey of India. Howrah. |
| 6 | Trivedi P. C., (2006): Medicinal Plants: Ethno-botanical Approach, Agrobios, India. |
| 7 | Purohit and V., (2008): Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India. |
| 8 | D. C. Pal. & Jain, S.K., (1998): Tribal Medicine. Naya Prakash Publishers, Calcutta. |
| 9 | Raychudhuri, S.P., (1991): (Ed.) Recent advances in Medicinal aromatic and spice crops.Vol.1, Today & Tomorrow’s printers and publishers, New Delhi. |

==========================SEM-I END=================================

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| **SEM -II** | | | |
| S103BOT | Cytogenetics, Ecology and Environment Conservation | **Theory** | **2** |
| S104BOP | Practical II | **Practical** | **2** |
| BOTSEC02 | Fruit processing | **Skill Enh.** | **2** |
| BOTOE01 | Nursery Management (रोपवाटिका व्यवस्थापन) |  |  |
| BOTVSC02 | EXPERIMENTAL BOTANY II |  |  |

**Course Code and Title:**

**S103BOT (CORE): Cytogenetics, Ecology and Environment**

**Conservation**

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| --- | --- | --- | --- |
| **Level: 4.5** | **Credits: 02** | **Number of Lectures: 30** | **Semester-II** |

**Learning Objectives:**

* To enable the students, to identify the structure and functions of the Cell and cell organelles in plants.
* To enable the students to understand the Cell cycle and cell division in plants.
* To enable the students to apply the biostatistical concepts.
* To enable the students, to comprehend ecology and environment conservation.
* To enable the students, to carry out a thorough study of the active constituents of medicinal plants

**Learning Outcomes:**

After Completing the course, Student will be able to

* Identify the structure and functions of the Cell and cell organelles in plants.
* Understand the Cell cycle and cell division in plants.
* Comprehend the biostatistical application.
* Apply the biostatistical concepts.
* Carry out a thorough study of the active constituents of medicinal plants with an emphasis on the use of plant-based food as medicine.

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| **Unit - I Cytogenetics 15 Lectures** | | |
| 1 | Ultrastructure and functions of Cell wall, Plasma membrane. |  |
| 2 | Ultrastructure and functions of the cell organelles – Chloroplast, Endoplasmic reticulum, Mitochondrion |
| 3 | Cell cycle, Mitosis in Plant Cells and its significance |  |
| 4 | History, Concept and Definition, Genetic Terminologies- Gene, Genome, Allele, Locus, Traits, Genotype, Phenotype, Dominant, Recessive, Co-dominance, Heredity, Inheritance, Variation, Homozygous, Heterozygous, Back Cross and Test Cross. |
| 5 | Mendelian Genetics - Law of Dominance, Law of Segregation, Law of Independent Assortment, Monohybrid Cross, Dihybrid Cross, Incomplete Dominance and CoDominance. |
| 6 | Multiple alleles and Multiple genes  Gene Interaction – Introduction and definition, Concept of epistatic and non-epistatic interactions. |  |
| **Unit – II Ecology and Environment conservation 15 Lectures** | | |
| 1 | Introduction to Ecology: Concept, need and Scope. |  |
| 2 | Ecosystem - Types of ecosystems (Terrestrial & Aquatic), functions of ecosystem. |
| 3 | Environmental problems and its Impact - Natural & artificial ecological imbalance, climate change (ozone depletion, greenhouse effect). |
| 4 | Environment Health and its management: Waste disposal, water, sanitation & recycling of wastes, Nuclear hazards and human health risks. |
| 5 | Conservation - Introduction, Definition & importance of Conservation, in situ and ex situ conservation.  Ex-situ conservation: botanical gardens and zoological parks, seed bank, gene bank.  In-situ conservation: Wildlife sanctuaries, National parks, Biosphere reserves. Ecotourism. |

**References:**

|  |  |
| --- | --- |
|  | 1. Genetics by Russel. Wesley Longman Inc. publishers.  2. Plant Physiology by Taiz and Zeiger Sinauer Associates Inc. Publishers  3. Fundamentals of Ecology by E P Odum and G W Barrett. Thompson Asia Pvt Ltd. Singapore.  4. Cell Biology by De Robertis  5. Biostatistics and Biometry by Parihar and Parihar  6. Introduction to Biostatistics by Pranab Kumar Banerjee |

**Course Code and Title: S104BOP (CORE): PRACTICAL II BOTANY**

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| **Level: 4.5** | **Credits: 02** | **Number of Lectures: 60** | **Semester-II** |

A learner will be allowed to appear for the semester and practical examination only if he submits a certified journal of Botany having a certificate that the learner has completed the practical course of Botany Semester II as per the minimum requirements.

|  |  |
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| **PRACTICALS** | |
| 1 | Vascular cryptogams  Study of vegetative and reproductive structures of *Adiantum*. |
| 2 | Phanerogams  Study of vegetative and reproductive structures of *Cycas*.  Morphology of Non-essential whorls-Calyx and Corolla.  Morphology of Essential whorls. Androecium and Gynoecium. |
| 3 | Cytology  Study of various stages of mitosis in root tip cells (Allium).  To perform karyotyping on root tip cells of Allium cepa to observe and analyse chromosome morphology. |
| 4 | Biostatistics  Calculation of mean, median and mode, standard deviation.  Graphical representation of data: Frequency polygon, Histogram, Ogive, Bar diagram, Pie-charts. (Using Excel Sheet) |
| 5 | Ecological Adaptations (Morphology)  Morphological Adaptations of plants. (Mesophytes, Xerophytes). (Identification)  Morphological Adaptations of plants. (Hydrophytes, Halophytes, Epiphytes). (Identification) Nature Conservation |
| 6 | Field Visit: Exploration of In-Situ / Ex-Situ Conservation Methods in Botany (Visit)  Collection of seed of wild plants from natural habitat and preparation of Seed bank (Ex-situ) and Seed ball. |

**Reference Books**

1. College Botany Volume I and II Gangulee, Das and Dutta latest edition. Central Education enterprises

2. Cryptogamic Botany Volume I and II by G M Smith McGraw Hill.

3. Taxonomy of Angiosperms by A.V.S.S. Sambamurty

4. Taxonomy of Angiosperms – Taxonomy, Systematic Botany, Economic Botany, Ethnobotany, Saras Publication

5. A Text Book of Botany: Angiosperms by B.P.Pandey

6. Manual of Ethnobotany by S. K. Jain (latest edition)

7. An introduction to Ethnobotany by S. K. Jain and Ashok K. Jain, deep Publications.

8. Herbal Remedies by Urjita Jain

**Note**: Certified Journal is a must, to be eligible to appear for the semester end practical examination.

## **EXAMINATION PATTERN FOR MAJOR SUBJECTS**

1. **Continuous Internal Assessment (20 Marks):**

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| --- | --- | --- |
| **Sr. No.** | **Particulars** | **Marks** |
| 1 | Class test / assignment / Seminar / Quiz | 20 |

## Semester End Examination (30 Marks):

Question Paper Pattern

* 1. These examinations shall be of **One Hours** duration. Maximum marks **30**.
  2. There shall be three questions of which first questions are of **10 marks MCQ**. Question 2 & 3 will be of 10 marks each. Questions 1 will be based on **Unit- I&II,** Questions 2 will be based on **Unit-I** and **Questions 3** will be based on **Unit-II**.
  3. All questions shall be compulsory with internal choice within the questions.

## **Distribution of external 30 marls**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Qn.** | **Sub-Qn** | **Particulars** | **Unit** | **Marks with options** | **Total Marks for qn** |
| **1** | **MCQ** | Answer the following  (Attempt **all**) | **I, II** | **10** | **10** |
| **2** | **a, b** | Answer the following  (Attempt **any one out of two**) | **I** | **20** | **10** |
| **4** | **a, b** | Answer the following (Attempt **any one out of two**) | **II** | **20** | **10** |
|  |  | **Total** |  | **50** | **30** |

1. **Semester End Practical Examination (50 marks):**

## **Scheme of examination:**

* There will be internal assessment for practical (20 marks).
* A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of that semester of F.Y.B.Sc. Botany as per the minimum requirement.
* The practical examination will be conducted in **SINGLE SESSIONS** of two hours.
* The learners will be evaluated based on the experiments performed during the examination.
* The questions on slips for the same should be framed in such a way that candidate will be able to complete the task and should be evaluated for the skill and understanding of Botany.

# Distribution of marks in practical examination

|  |  |  |
| --- | --- | --- |
| **Sr. No.** | **Particulars** | **Marks (50marks)** |
| 1 | Experiments external | 30 |
| 2 | Experiments internal | 20 |
|  | **Total Marks** | **50** |

**BOTSEC02(SEC): FRUIT PROCESSING**

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| **Level: 4.5** | **Credits: 02** | **Lectures: 60 L** |

**Learning Objectives:**

* To learn the techniques of storage of Fruits.
* To understand importance of value addition Fruit products.
* To give knowledge of preparation of natural scented oils.
* To equip the students with practical knowledge Fruit processing.
* To give knowledge of Jam and Jelly preparation.
* To impart the basic skills in the field of Fruit processing.
* To give knowledge of care and precautions taken fruit processing.

**Learning Outcome:**

By the end of the course, students will be able to:

* Understand techniques of storage of Fruits.
* Get importance of value addition Fruit products.
* Get knowledge of preparation of natural scented oils.
* Get idea about the practical knowledge of Fruit processing.
* Get knowledge of preparation of Jam and Jelly.
* Develop entrepreneurship in Fruit processing
* Take care and precautions to setup Fruit processing industry.

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| **PRACTCALS/ experiments** | |
| 1 | Demonstration of fruit processing units. (01P) |
| 2 | Preparation of Jam. (01P) |
| 3 | Preparation of Tamarind syrup. (01P) |
| 4 | Preparation of Jelly. (01P) |
| 5 | Preparation of Aawla Supari , Sarbat (01P) |
| 6 | Preparation of Squash. (01P) |
| 7 | Preparation of Juice. (01P) |
| 8 | Preparation of Pickles. (01P) |
| 9 | Preparation of Muramba. (01P) |
| 10 | Preparation of Ketchup. (01P) |
| 11 | Preparation of Mango Papad and Jackfruit Papad. (01P) |
| 12 | Preparation of Potato Wafers and Banana Wafers. (01P) |
| 13 | Preparation of Gulkand. (01P) |
| 14 | Preparation of Kokam Aagal (01P) |
| 15 | Preparation of wine (Chiku / Jamun) (01P) |

**References:**

|  |  |
| --- | --- |
| 1 | Andress, E., and J. Harrison. So Easy to Preserve. 6th ed. Athens: University of Georgia Cooperative Extension Service, 2014. |
| 2 | <https://nchfp.uga.edu/publications/publications_usda.html#gsc.tab=0> Agriculture Information Bulletin No. 539, 2015 revision, United States Department of Agriculture. |
| 3 | <https://nchfp.uga.edu/how/can7_jam_jelly.html#gsc.tab=0> University of Minnesota Extension. |
| 4 | Patten, Marguerite (February 2001). Basic Basics: Jams, Preserves and Chutneys Handbook (2004 reprint ed.). Grub Street Books. ISBN 1-902304-72-1. |
| 5 | Isabel D. Wolf; William Schafer (1990). "Making Jams, Marmalades, Preserves, and Conserves". University of Minnesota extension school. |

**Course Code and Title: BOTVSC02 Plant Propagation Practices**

|  |  |  |  |
| --- | --- | --- | --- |
| **Level: 4.5** | **Credits: 02** | **Number of Lectures: 60** | **Semester-II** |

**Learning Outcome:** On successful completion of this course students will be able to:

* Identify garden implements and suitable potting mixture.
* Perform potting, repotting and preparation of nursery beds.
* Apply methods of seed treatment and application of growth hormones for Plant Propagation.
* Perform plant propagation practices.

|  |  |
| --- | --- |
| **PRACTICALS** | |
|  | 1. Study of Garden implements.  2. Preparation of Potting Mixture.  3. Potting & Repotting techniques.  4. Preparation of nursery beds.  5. Methods of Seed Treatment.  6. Application & methods of plant growth regulators.  7. Perform various methods of cutting.  8. Perform various methods of layering.  9. Perform various methods of grafting.  10.Perform various methods of budding.  11.Perform propagation by specialized structure- rhizome, suckers, runners, offset, bulb, corm, tuber, etc.  12.Visit to Plant nursery |

Reference Books

* Adriance, G.W. and F.R. Brison, 1000. Propagation of Horticultural Plants. Biotech Books, New Delhi.
* Chadha, K.L., P.N.Ravindran and Leela Sahijran (Eds) 1000. Biotechnology in Horticulture and Plantation crops. Malhotra Publishing House, New Delhi.
* Hartmann, H.T. and D.E. Kester, 1975. Plant Propagation: Principles and Practices. Prentice. Hall, New Delhi.
* Singh, S.P. 1989. Mist Propagation. Metropolitan Book Co., New Delhi.
* Wright, R C M. 1974. Simple Plant Propagation. Ward Lock, London.
* Ropwatika sangpoanp Dr Aba Patil,
* Ropwatika: Ravindra Katole. Godwa Publication

**BOTOE01: NURSERY MANAGEMENT (रोपवाटिका व्यवस्थापन)**

|  |  |  |
| --- | --- | --- |
| **Level: 4.5** | **Credits: 02** | **Lectures: 30 L** |

**Learning Outcomes**

* The students will be able to identify different types of nursery plants and classify them based on soil and climate.
* The students will be able to use various tools and implements to raise nursery
* The students will be able to demonstrate the skills of vegetative propagation techniques and use modern methods of plant multiplication.
* The students will be able to design garden layout and make a plan for an orchard in a given area.

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| **Unit - I INTRODUCTION TO NURSERY 05 Lectures** | | |
|  | Introduction to nursery: Basic concept and principles of nursery and its managements. |  |
| **Unit – II LAYOUT AND MANAGEMENT 05 Lectures** | | |
|  | Layout and management of commercial nursery: Nursery- site selection, layout, records, potting, repotting, Progeny orchard. |  |
| **Unit – III NURSERY TOOLS & STRUCTURES 10 Lectures** | | |
|  | Nursery (tools and implements), Propagation Structures: Mist chamber, humidifiers, greenhouses, glasshouses, cold frames, hot beds, poly-houses, etc. |  |
| **Unit – IV NURSERY MANAGEMENT 10 Lectures** | | |
|  | Nursery management of major crops, Problems in nursery management and its control, Insect/pest/disease control in nursery. |  |

**References:**

|  |  |
| --- | --- |
| 1 | Handbook of Gardening by Gopal Swami Aingar, 1975. |
| 2 | Handbook of Horticulture by CPWD. |
| 3 | Plant Propagation and Nursery Management by ICAR e Krishi Shiksha and TNAU |
| 4 | Resource Book on Horticulture Nursery Management by FDCM. |
| 5 | Flora of Sahyadri by Shriknat Inganhallikar. |

## **EXAMINATION PATTERN FOR OPEN ELECTIVE SUBJECTS**

## Scheme of examination:

* There will be internal assessment for OPEN ELECTIVE.
* A candidate will submit one assignments and one unit test carrying 10 Marks each.
* The learners will be evaluated based on the semester end theory examination.

# Distribution of marks (50 marks)

1. **Continuous Internal Assessment (20 Marks):**

|  |  |  |
| --- | --- | --- |
| **Sr. No.** | **Particulars** | **Marks** |
| 1 | Class test / assignment / Seminar / Quiz | 20 |

## Semester End Examination (30 Marks):

Question Paper Pattern

* 1. These examinations shall be of **One Hours** duration. Maximum marks **30**.
  2. There shall be two questions of which first question is of **20 marks**. Question 2 will be of 10 marks. Question **2** will be based on entire syllabus with **four short notes**.
  3. All questions shall be compulsory with internal choice within the questions. But question **2** has internal choice of any **two out of four**.