



CIRCULAR NO.SU/B.Sc./CBC&GS /65/2023

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies, Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor has accepted the **following syllabi of Bachelor of Science with Practical Pattern of Question Paper under the scheme of Choice Based Credit & Grading System** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc. Home Science (Degree)	IIIrd & IVth semester
2.	B.Sc. Information Technology (Degree)	IIIrd & IVth semester
3.	Bachelor of Computer Application (Degree)	IIIrd & IVth semester
4.	B.Sc.Botany (Optional)	IIIrd & IVth semester
5.	B.Sc.Dairy Science & Technology(Optional)	IIIrd & IVth semester
6.	B.Sc.Fisheries Science (Optional)	IIIrd & IVth semester
7.	B.Sc.Computer Science (Optional)	IIIrd & IVth semester
8.	B.Sc.Zoology (Optional)	IIIrd & IVth semester

This is effective from the Academic Year 2023-24 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.

REF.NO.SU/2023/30210-26

Date:- 26.05.2023.

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Deputy Registrar,
Academic Section

Copy forwarded with compliments to :-

- 1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

- 1] **The Director, Board of Examinations & Evaluation, Dr.BAMU,A'bad.**
- 2] The Section Officer,[B.Sc.Unit] Examination Branch,Dr.BAMU,A'bad.
- 3] The Programmer [Computer Unit-1] Examinations, Dr.BAMU,A'bad.
- 4] The Programmer [Computer Unit-2] Examinations, Dr.BAMU,A'bad.
- 5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.BAMU,A'bad.
- 6] The Public Relation Officer, Dr.BAMU,A'bad.
- 7] The Record Keeper, Dr.BAMU,A'bad.

Dr. Babasaheb Ambedkar Marathwada University,

Aurangabad – 43100, (M.S.) India.



Curriculum

B. Sc. BOTANY II Year

Semester III and IV

(w. e. f. Academic Year 2023-24)

Choice based Credit and Grading System (CBC & GS)

2023 – 2024

Dr. Babasaheb Ambedkar Marathwada University,

Aurangabad – 431004

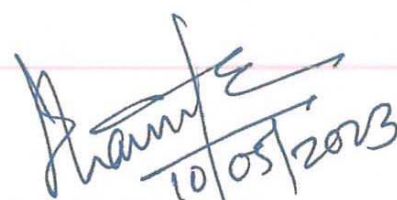
Curriculum

**B. Sc. BOTANY II Year
Semester III and IV**

**This syllabus was finalized in the meeting of Board of Studies in
Botany held on 09 – 05 – 2023.**

Following BOS members were present.

1.	Prof. Arvind S. Dhabe	Chairman
2.	Prof. Ashok M. Chavan	Member
3.	Prof. Abhay N. Salve	Member
4.	Prof. Jalindar S. Ambhore	Member
5.	Prof. Madhukar S. Wadikar	Member
6.	Dr. Shaikh R. I.	Member


10/05/2023

**Prof. Arvind S. Dhabe
Chairman
BOS in BOTany**

Prof. Dr. ARVIND S. DHABE
Chairman
Board of Studies in Botany,
Dr. Babasaheb Ambedkar Marathwada University,
Aurangabad - 431004


Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad								
Choice Based Credit System (CBCS) Structure & Curriculum								
B.Sc. Botany Three Year Undergraduate Degree Program								
Semester III								
Course	Course Code	Course Title	Periods (Periods /week)	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1C) Core Courses	BOT-311	Core Course (Theory Paper-V) Taxonomy of Angiosperms	45(3/week)	2	50	10	40	20
	BOT-312	Core Course (Theory Paper-VI) Plant Physiology	45(3/week)	2	50	10	40	20
	BOT-321	Lab course 3 (Based on BOT -311)	45(3/week)	1.5	50	10	40	20
	BOT-322	Lab course 4 (Based on BOT -312)	45(3/week)	1.5	50	10	40	20
Skill Enhancement course (SEC-1)	SEC-313	SEC-1 Any one skill to be chosen out of two SEC-1(A) , SEC-1 (B)	45(3/week)	2	50	10	40	20
Ability Enhancement compulsory courses (AECC-3)	ENG-331	Communication skills in English-III	45(5/week)	3	50	10	40	20
	SL-332	Marathi/Hindi/ Additional English/Urdu/Sanskrit A student can opt for any one of these languages (SL-III)	45(4/week)	3	50	10	40	20
			315	15	350	70	280	140
Total Credits for Semester III : 15 (Theory : 12 ; Laboratory : 3)								
Semester IV								
Course	Course Code	Course Title	Periods (Periods /week)	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1D) Core Courses	BOT-411	Core Course (Theory Paper-VII) Gymnosperms & Utilization of Plants	45(3/week)	2	50	10	40	20
	BOT-412	Core Course (Theory Paper-VIII) Plant Ecology	45(3/week)	2	50	10	40	20
	BOT-421	Lab Course 5 (Based on BOT-411)	45(3/week)	1.5	50	10	40	20
	BOT -422	Lab Course 6 (Based on BOT -412)	45(3/week)	1.5	50	10	40	20
Skill Enhancement course (SEC-2)	SEC-413	SEC-2 Any one skill to be chosen out of two SEC-2(C) , SEC-2 (D)	45(3/week)	2	50	10	40	20
Ability Enhancement compulsory courses (AECC-4)	ENG-431	Communication skills in English-IV	45(5/week)	3	50	10	40	20
	SL-432	Marathi/Hindi/ Additional English/ Urdu/Sanskrit A student can opt for any one of these languages (SL-IV)	45(4/week)	3	50	10	40	20
Additional Credits	EVS-413	Environmental Studies	45(3/week)	02	50	10	40	20
			360	17	350	70	280	140
Total Credits for Semester IV : 15 (Theory : 14 ; Laboratory : 03)								

Curriculum for Semester III (w.e.f. Academic Year 2023-24)

B. Sc. II Year (Theory), Semester III

Course Code: BOT -311 Paper V

Taxonomy of Angiosperms

(45L)

Credit: 02

Unit :1

Credit : 01

1. Definition, objectives and importance of taxonomy, Salient features, origin and evolution of Angiosperms. (03)
2. Bentham and Hooker's system of classification up to series level, its merits & demerits. (03)
3. Taxonomy in relation to anatomy, cytology, embryology, palynology, and ecology. (03)
4. Concept of Binomial Nomenclature and its advantages (03)
5. Concept of genus, species and epithet. (02)
6. Herbaria and Botanical Gardens. (03)

Unit: 2

Credits: 01

Studies of the following families: Systematic position as per Bentham and Hooker's System of Classification, Diagnostic characters of family, Description up to floral formula, floral diagram, common examples and their Economic importance. (28)

i. Annonaceae

ii. Malvaceae

iii. Leguminosae

Fabaceae (Papilionaceae)

Caesalpiniaceae

Mimosaceae

iv. Apocynaceae

v. Solanaceae

vi. Acanthaceae

vii. Lamiaceae (Labiatae)

viii. Nyctaginaceae

ix. Rubiaceae

x. Liliaceae

xi. Poaceae (Gramineae)

Continuous Internal Assessment (CIA): Tutorials and Assignments

(5)

Note: Internal assessment lectures should be used to assess student's credibility and knowledge of the above topics. Conduct one internal test and one tutorial of five mark each.

In assessment you are free to use different assessment methods.

B. Sc. II Year (Theory) Semester III)
Course Code: BOT-312 Paper VI **Plant Physiology**

45 L

Credits: 02

Unit: 1

1. Plant water relations:

- a) Diffusion, osmosis, plasmolysis and imbibition. (02)
- b) Water absorption and ascent of sap (Transpiration pull theory) (02)
- c) Transpiration – Definition, types, cuticular, lenticular and stomatal, structure of stomata, mechanism of opening and closing of stomata (starch–sugar hypothesis) (03)

2. Mineral nutrition: (05)

- a) Macro and microelements: Roles and deficiency symptoms of N, P,K, Mg, Ca, Fe, Zn, Bo, and Mo.
- b) Mineral uptake – Passive (ion exchange theory) and active (carrier concept).

3. Translocation of solutes: (03)

Mass flow hypothesis, protoplasmic streaming theory, Source and sink relationship.

Unit: 2

1. Enzymes: (05)

Chemical nature – Holoenzyme, apoenzyme, prosthetic group, co-factor & coenzyme. Properties, nomenclature, classification based on type of reactions, mechanism of enzyme action.

2. Growth regulators: (05)

Discovery, structure, types, roles and practical applications of Auxins, Gibberellins, Cytokinins, Abscisic acid and Ethylene.

Unit: 3

1. Photosynthesis:

Definition, ultra-structure of chloroplast, photosynthetic pigments, Light reactions-Hill reaction, red drop and Emerson enhancement effect, two pigment systems (PS I, PS II), Photophosphorylation – cyclic and non cyclic, Z-scheme; Dark reactions -C3, C4 and CAM Pathways. C3 & C4 Plants & Photoperiodism (10)

2. Respiration:

Definition, Ultra structure of mitochondria, types of respiration, Glycolysis, TCA Cycle, Photorespiration, Electron transport system, alcoholic and lactic acid fermentation. (10)

Continuous Internal Assessment (CIA): Tutorials and Assignments (5)

Note: Internal assessment lectures should be used to assess student's credibility and knowledge of the above topics. Conduct one internal test and one tutorial of five mark each. Teachers may use different assessment methods.

B. Sc. II Year (Practical), Semester - III
Lab Course III, BOT 321 (Based on BOT 311, Theory Papers – V)
Lectures – 45 **Credits – 1.5**

Study of locally available plants of the following families:

1. Annonaceae
2. Malvaceae
3. Leguminosae
 - a) Fabaceae (Papilionaceae)
 - b) Caesalpiniaceae
 - c) Mimosaceae
4. Apocynaceae
5. Solanaceae
6. Acanthaceae
7. Lamiaceae (Labiatae)
8. Rubiaceae
9. Nyctaginaceae
10. Liliaceae
11. Poaceae (Gramineae)
12. Herbarium Techniques
13. Study Tour and Field Visits

Continuous Internal Assessment (CIA): 07 marks for internal practical examination and 03 marks for Record Book / Submission of collection and field survey report / excursion report.

Note for students:

Candidate shall submit the following at the time of practical examination:

1. Certified laboratory record book: The record book is to be signed periodically by teacher in charge and certified by the Head of the Department at the end of the term. Candidate should not be allowed to appear for practical examination without a certified record book or a certificate from the Head of the Department.
2. Field Excursions Report: Submission of Excursion/Tour Report, Field report and digital specimens with GPS locality. **Collection of rare flowering and non-flowering plants should be avoided during excursion.** There shall be frequent study tours in local areas, industrial places and one should be to the area having different ecological conditions/ places of botanical interest under the guidance of teachers. T. A. and D. A. should be paid to the teachers, peons and field collectors as per university rules by Institutes/Colleges.

B. Sc. II Year (Practical), Semester - III
Lab Course IV, BOT 322 (Based on BOT 312, Theory Paper – VI)

45L

Credits: 1.5

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1. Osmosis by egg membrane and Potato Osmoscope
 2. Plasmolysis in *Tradescantia* leaves
 3. Effect of different concentrations of organic solvents on membrane permeability
 4. Determination of water potential of any tuber
 5. Detection of mineral elements in plant ash
 6. Digestion of starch by amylase
 7. Detection of enzyme activity: oxidase, peroxidase, catalase and dehydrogenase
 8. Separation of chloroplast pigments by paper chromatography
 9. Demonstration of Hill reaction
 10. Effect of different intensities of light on photosynthesis
 11. Effect of different colors of light on photosynthesis
 12. Fermentation by Kuhne's fermentation vessel
 13. Isolation of starch
 14. Isolation of pectin
 15. Estimation of total and reducing sugars in fruit juice by Fehling solution
 16. Separation of amino acids by paper chromatography
 17. Effect of IAA and Gibberellins on seed germination.

Continuous Internal Assessment (CIA): 07 marks for internal practical examination and 03 marks for Record Book / Submission of collection and field survey report / excursion report.

Note for students:

1. Candidate shall submit the following at the time of practical examination: Certified laboratory record book: The record book is to be signed periodically by teacher in charge and certified by the Head of the Department at the end of the term. Candidate should not be allowed to appear for practical examination without a certified record book or a certificate from the Head of the Department.
2. Field Excursions Report: Submission of Excursion/Tour Report, Field report and digital specimens with GPS locality. **Collection of rare flowering and non-flowering plants should be avoided during excursion.** There shall be frequent study tours in local areas, industrial places and one should be to the area having different ecological conditions/ places of botanical interest under the guidance of teachers. T. A. and D. A. should be paid to the teachers, peons and field collectors as per university rules by Institutes/Colleges.

B. Sc. II Year (Theory) Semester III)

BOT-313 Skill Enhancement Course-1 SEC 1 (A): Mushroom Cultivation

45L

Credits: 02

a. THEORY: (1 Credit) Total Hours: 15

Unit 1: Introduction, history. Edible and non-edible mushrooms (Poisonous). Types of edible mushrooms available in India. (3 Hours)

Unit 2: Cultivation techniques: Cultivation of Button, Oyster and Paddy straw mushrooms - Collection of raw materials, compost and composting, spawn & spawning, casing, cropping, picking and packing, management of diseases (5 Hours)

Unit 3: Post Harvest Technology and storage: Short-term preservation, conventional packaging, Storage of fresh mushrooms (Refrigeration, vacuum cooling) Long term storage (canning, pickles, *papads*), drying. Transport of fresh mushrooms. (4 Hours)

Unit 4: Economics in mushroom cultivation: Cost for site, spawn production, compost unit, machinery for small scale farm. Cost benefit ratio - Marketing in India and abroad, Export Value, Low cost technology (3 Hours)

b. PRACTICAL: (1 Credit) Total Hours: 15

Laboratory Exercises (Any 5) (3 Hours for each Practical)

1. Mushroom Cultivation, laboratory requirements and layout.
2. Mushroom morphology – L. S. of Basidiocarp (Button mushroom), section through gill and mounting of spores.
3. Preparation of culture medium.
4. Preparation of spawn for Oyster mushroom.
5. Cultivation of Oyster mushroom.
6. Mushroom preservation – Drying. Storage in brine and pickle making.
7. Visit to a relevant farm or Institute.

Suggested Readings-

1. Swaminathan, M. (1990). *Food and Nutrition*. Bengaluru: The Bangalore Printing and Publishing Co. Ltd.
2. Tewari, Pankaj Kapoor, S.C. (1988). *Mushroom cultivation*. New Delhi: Mittal Publication.
3. Dubey, R.C (1993). *A textbook of Biotechnology*. New Delhi: S. Chand & Company Pvt. Ltd.
4. Biswas, S., Datta, M., & Ngachan, S.V. (2012). *Mushrooms, a manual for cultivation*. New Delhi: PHI learning Private Limited.
5. Tripathi, D.P. (2005). *Mushroom Cultivation*. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.
6. Kannaiyan, S., & Ramasamy, K. (1980). *A handbook of edible mushroom*. New Delhi: Today & Tomorrows printers & publishers.

B. Sc. II Year (Theory) Semester III)

BOT-313 Skill Enhancement Course-1 SEC 1 (B): Soil Testing and Analysis

45L

Credits: 02

a. THEORY: (1 Credit) Total Hours: 15

Unit 1: Importance of Soil Testing and Analysis, Sample Collection and Processing, Purpose of Soil testing and analysis, precautions during soil collection & processing, Preservation labeling and Storage of soil samples. (4 Hours)

Unit 2: Study of Instruments: pH Meter, Conductivity meter, spectrometer, UV-Spectrophotometer, (Calibration, Instrumentation, applications only) use of soil testing kit and mobile soil testing van. (6 Hours).

Unit 3: Study of Laboratory requirements, working pattern for soil testing. (2 Hours).

Unit 4: Study of various elements, organic and inorganic compounds in soil. (3 Hours)

b. PRACTICAL: (1 Credit) Total Hours: 15

Laboratory Exercises (Any 5) (3 Hours for each Practical)

1. Estimation of pH and Electrical Conductivity of soil.
2. Testing of organic carbon in soil.
3. Estimation of available nitrogen in soil.
4. Estimation of available Phosphorus in soil.
5. Estimation of available potassium in soil.
6. Estimation of calcium in soil.
7. Estimation of Magnesium in soil.
8. Visit to Soil Testing Laboratory.

Suggested Readings-

1. Soil Sampling, Preparation and analysis, Marcell Dekker, Inc, New York.
2. Soil Sampling and methods of analysis, carter M.R. and E.G.Gregorich, 2007, 2nd Ed..
3. Methods of soil analysis, Part, American society of Agronomy Inc., Kuete, A.Et.at., 1986
4. Soils and soil fertility, Troch, F.R. And Thompson, L.M. Oxford Press.
5. Fundamentals of soil science, Foth, H.D. Wiley Books.
6. Soil Science and Management, Plaster, Edward J., Delmar Publishers.
7. Principles of Soil Chemistry (2Wed.) Marcel Dekker Inc., New York.
8. Handbook of Agricultural Sciences, S.S.Singh, P.Gupta, A.k.Gupta, Kalyani Publication.

Note: Soil Testing kits are to be made available by the institutions.

Curriculum for Semester IV (w.e.f. Academic Year 2023-24)

B. Sc. II Year (Theory) Semester IV)

Course Code: BOT-411 Paper VII (Gymnosperms and Utilization of Plants)

45 L

Credits: 02

Unit:1 **Credits: 01**

Gymnosperms:

1. Salient features, classification as per Sporne 1965 (02)
2. Geological time scale, fossilization, types of fossils, *Lyginopteris*, fossil fuels (03)
3. Contributions of Prof. Birbal Sahani (01)
4. Study of morphology, anatomy, reproduction (excluding developmental stages) (10)
and graphical representation of life cycle of the following types:
 - a) Cycadales – *Cycas*
 - b) Coniferales – *Pinus*
 - c) Gnetales- *Gnetum*
5. Economic importance of Gymnosperms (03)

Unit:2 **Credit: 01**

Utilization of Plants:

1. Domestication of plants and their centers of origin (N. I. Vavilov) (01)
2. History, origin, cultivation, harvesting, improved varieties and economic importance of the following plants: (10)
 - i. Food plants – Wheat, Jowar
 - ii. Sugar – Sugarcane
 - iii. Fibers - Cotton, Jute
 - iv. Vegetable oils – Groundnut, Sunflower
 - v. Beverages – Tea, Coffee
3. Botanical name, family name and economic importance of the following plants: (15)
 - i. Medicinal plants – *Aloe vera*, *Withania somnifera*, *Curcuma longa*, *Vitex negundo*
 - ii. Timber and Gum – Teak, Neem, Babul, Sisham
 - iii. Cosmetics and Perfumes – Rose, Mogra, Tuberose
 - iv. Spices – Clove, Black pepper, Cumin, Coriander, Cinnamon.

Continuous Internal Assessment (CIA): Tutorials and Assignments (05)

Note: Internal assessment lectures should be used to assess student's credibility and knowledge of the above topics. Conduct one internal test and one tutorial of five mark each. Teachers may use different assessment methods.

Unit: 1

Plant and Environment:

A) Climatic factors – (06)

a) Light as an ecological factor, global radiation and photosynthetically active radiation

b) Temperature as an ecological factor

c) Water as an ecological factor, physicochemical properties of water

B) Edaphic factors – (07)

Soil formation -soil profile, physicochemical properties of soil, major soil types of India, soil erosion and soil conservation.

C) Pollution factors- (07)

Definition, Types of Pollutions, Consequences of Pollution on Biosphere (Global warming), Bioaccumulation, and Phytoremediation, Functions of Pollution Control Board.

Unit: 2

1. Response of plants to water (10)

Morphological, physiological and anatomical response of plants to water– Hydrophytes, xerophytes, halophytes and epiphytes.

2. Phytogeography: (03)

Biogeographical zones in India in relation to forest types, and Biosphere Reserves in India.

Unit: 3

1. Community ecology: (05)

Community characteristics -Frequency, Density, life forms, and Biological spectrum.

1. Ecosystem: (07)

Structure -biotic and abiotic components, food chain, food web, ecological pyramids, energy flow, biogeochemical cycles-nitrogen and phosphorus.

Continuous Internal Assessment (CIA): Tutorials and Assignments (05)

Note: Internal assessment lectures should be used to assess student's credibility and knowledge of the above topics. Conduct one internal test and one tutorial of five marks each. In assessment you are free to use different assessment methods.

B. Sc. II Year (Practical), Semester - IV
Lab Course V, BOT 421 (Based on BOT 411, Theory Paper – VII)

45L

Credits: 1.5

Gymnosperms: (20)

a) Cycas

- i. Habit, young leaf, bulbils, male cone, microsporophyll, megasporophyll, pollen grains, mature seed.
- ii. Study through permanent slides-Normal root (T.S.). Stem (T.S.), Ovule (L.S.)
- iii. Study through hand section-Coralloid root (T.S.), Rachis (T.S.), Leaflet (T.S.)

b) Pinus

- i. Habit, long and dwarf shoot, scale leaves, foliage leaves, male cone, female cone, pollengrains (W.M.), winged seed.
- ii. Study through hand sections and permanent slides Root (T.S.), Stem (T.S.), Needle (T.S.)
- iii. Study through permanent slide - T.L.S. & R.L.S. of stem, L.S. of male cone, L.S. of female cone

c) Gnetum

- Habit, foliage leaves, male strobilus, female strobilus, pollengrains (W.M.), seed.
- ii. Study through hand sections and permanent slides Root (T.S.), Stem (T.S.),
 - iii. Study through permanent slide - T.L.S. & R.L.S. of stem, \ male strobili, and female strobili

Palaeobotany: (05)

- a) Types of fossils (Specimens)
- b) *Lygynopteris* (Specimen / Permanent slide)

Utilization of plants: (20)

- a) Food plants – Study of the morphology, structure and histochemical tests of food storing tissue in Jowar & Wheat
- b) Histochemical test of lignin and cellulose
- c) Vegetable oils – hand section of Groundnut & Sunflower Seed and staining of oil droplets by Sudan III
- d) Study of the sources of Timber, Gum, Medicinal plants, Cosmotics and Perfumes
- e) Study of Black pepper, Clove, Cinnamon, Cumin, Coriander
- f) Field notebook, specimen collection, and tour report.

Continuous Internal Assessment (CIA): 07 marks for internal practical examination and 03 marks for Record Book / Submission of collection and field survey report / excursion report.
Note for Lab course: Candidate shall submit the following at the time of exam.

1. Certified laboratory course record book.
2. Field note book / Tour report.

B. Sc. II Year (Practical), Semester - IV
Lab Course VI, BOT 422 (Based on BOT 412, Theory Paper – VIII)

45L

Credits: 1.5

1. Study of morphological and anatomical adaptations in hydrophytes – *Hydrilla*, *Eichhornia*, *Typha* and *Nymphaea* .
2. Study of morphological and anatomical adaptations in xerophytes -*Aloe*, *Nerium*, *Casuarina*.
3. Study of morphological adaptations in halophytes - Pneumatophore, Stilt roots
4. Study of morphological and anatomical adaptations in epiphytes
5. Study of vegetation by quadrat method
6. Estimation of Importance Value Index (IVI) of grassland ecosystem on the basis of relative frequency, relative density and relative abundance.
7. Determination of water holding capacity of different soils
8. Study of meteorological instruments -Rain gauge, Hygrometer, Barometer
9. Determination of percent leaf area injury of different infected leaf samples
10. Estimation of salinity of different water samples
11. Determination of pH of different soils by pH papers/universal indicator/pH meter.

Continuous Internal Assessment (CIA): 07 marks for internal practical examination and 03 marks for Record Book / Submission of collection and field survey report / excursion report.

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Suggested Readings

1. Odum, E. P. (2005). Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5th edition.
2. Singh, J. S., Singh, S. P., Gupta, S. (2006). Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi, India.
3. Sharma, P. D. (2010). Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
4. Wilkinson, D. M. (2007). Fundamental Processes in Ecology: An Earth Systems Approach. Oxford University Press. U.S.A.
5. Kormondy, E. J. (1996). Concepts of ecology. PHI Learning Pvt. Ltd., Delhi, India. 4th edition
6. Balfour Austin (2016). Plant Taxonomy. Syrawood Publishing House
7. Chapman, J. L. and Reiss, M. J. (1998). Ecology: Principles and applications. Cambridge, University Press.
8. Chopra G. L. (1984). Angiosperms: Systematics and Life-Cycle., Pradeep Publications
9. Cooke, Theodore (1903-8). The Flora of the Presidency of the Bombay Vol. I, II, III (Repr. ed), Botanical Survey of India.
10. Cronquist, A. (1968). The Evolution & Classification of Flowering Plants. Thomas Neel and Sons Ltd. London.
11. Datta S. C. (1988). Systematic Botany. New Age Publ.
12. Davis P. Hand V. H. Heywood (1963). Principles of Angiosperm Taxonomy. Oliver and Boyd, London.
13. Heywood V. H. (1967). Plant Taxonomy, Hodder & Stoughton Educational, London.
14. Judd Walter S., Campbell, C. S., Kellogg, E. A., Stevens, P.F. and M. J. Donoghue. (2008). Plant Systematics. A Phylogenetic Approach. Sinauer Associates, INC, Publishers. Sunderland, Massachusetts, USA.
15. Kormondy Edward (1995). Concepts of Ecology, Pearson Publ.
16. Lawrence G. H. M. (1955). An Introduction to Plant Taxonomy. McMillan, New York.
17. Lawrence, G. H. M. (1951). Taxonomy of Vascular Plants. McMillan, New York.
18. Michael P. (1984). Ecological Methods for field and Laboratory investigations TMHCo.ltd. Bombay.
19. Mondol A. K. (2016) Advanced Plant Taxonomy, New Central Book Agency (NCBA)
20. Naik V. N. (1988) Taxonomy of Angiosperms. Oxford and IBH
21. Odum E. P., (2004). Fundamentals of Ecology, Publ. Cengage Learning, Australia
22. Radford A. E. 1986. Fundamentals of Plant Systematics, Harper and Row, N. Y.
23. Santapau H. (1953). The Flora of Khandala on the Western Ghats of India. BSI
24. Sharma O. P. (2011), Plant Taxonomy, Tata Mc Graw Hill.
25. Shivrajan V. V. & N. K. P. Robson (1991). Introduction to Principles of Plant Taxonomy. Cambridge Univ. Press
26. Shukla Priti and Shital Mishra (1982). An introduction to Taxonomy of Angiosperms. Vikas Publ.
27. Simpson, M. G. (2010). Plant Systematics. Elsevier, Amsterdam.
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50. Verma, V. 2000. Text Book of Plant Physiology, Ane Books India, New Delhi.
51. Nobel, P. S. 2009. Physicochemical and Environmental Plant Physiology. 4th edition Academic Press,

IMPORTANT WEBSITES

1. THE FAMILIES OF FLOWERING PLANTS- L. Watson and M.J. Dallwitz:
<https://www.delta-intkey.com/angio/index.htm>
2. ANGIOSPERM PHYLOGENY WEBSITE, version 14.:
<http://www.mobot.org/MOBOT/research/APweb/>
3. THE PLANTS OF THE WORLD ONLINE PORTAL:
<http://www.plantsoftheworldonline.org/>
4. INTERNATIONAL PLANT NAME INDEX (IPNI): <https://www.ipni.org/>
5. TROPICOS: <https://www.tropicos.org/home>
6. BIODIVERSITY HERITAGE LIBRARY :<https://www.biodiversitylibrary.org/>
7. BOTANICUS DIGITAL LIBRARY: <https://www.botanicus.org/>
8. INTERNET ARCHIVE- DIGITAL LIBRARY: <https://archive.org/>
9. DATABASE OF PLANTS OF INDIAN SUBCONTINENT:

- <https://sites.google.com/site/efloraofindia/>
10. BOTANICAL SURVEY OF INDIA: https://bsi.gov.in/content/1416_1_FloraofIndia.aspx
 11. FLOWERS OF INDIA: <http://www.flowersofindia.net/>
 12. eFLORA OF WORLD: <http://www.efloras.org/>

B. Sc. II Year (Theory) Semester IV
BOT-413 Skill Enhancement Course-2 SEC 2 (C): Nursery and Gardening

45L

Credits:02

a. THEORY: Total Hours: 15 (1 Credit)

Unit 1: Nursery: Definition, objectives and scope, nursery layout (2 Hours)

Unit 2: Vegetative propagation: Methods of vegetative propagation-Layering, grafting, budding, division, offset, suckers, runners, bulbs, corms, bulbils, Cuttings. Hardening of plants. (3Hours)

Unit 3: Gardening: Definition, objectives and scope, different types of gardens – landscape, avenue plantation and home gardening, different features of a garden –fencing, steps, drives and paths, hedge, lawns (4 Hours)

Unit 4: Routine Garden Operations – Preparation of soil, manuring, watering, pruning, staking, defoliation, pinching, etc., management of pests and diseases and harvesting (4 Hours)

Unit 5: Kitchen garden: classification of vegetables, vegetables in different seasons; Study of cultivation of different vegetables (2 Hours)

b. PRACTICAL: (1 Credit) Total Hours: (15Hours)

Laboratory Exercises (Any 5) (3 Hours for each Practical)

1. Different methods of vegetative propagation – Grafting, layering, cutting, budding, division, runners, suckers, corms, bulbs, bulbils, tubers.
2. Study of some nursery operations - raising seedlings in trays, preparation of potting mixture, transplantation of seedlings in pots, care and maintenance of plants till flowering or fruiting.
3. To prepare a garden in bowls, urns, tubs, troughs, hanging baskets, jars, bottles, terrarium gardening
4. To prepare a sketch of Kitchen garden layout / Nursery layout plan
5. To prepare a Landscape design plan for a small home ground
6. Cultivation of any five local vegetables. (2P)
7. Identification and description of avencue plants, hedge plants, flower beds (any 3), lawn (any 2), ornamental shrubs (any 3) and trees (any 3)
8. Field visit to a plant nursery / landscaped public place / kitchen garden / local vegetable cultivation.

Suggested Readings-

1. Gardening in India, Bose T. K. & Mukherjee, D., Oxford & IBH Publishing Co., New Delhi.
2. Plant Propagation, Sandhu, M.K., Wile Eastern Ltd., Bangalore, Madras.
3. Introduction to Horticulture, Kumar, N., Rajalakshmi Publications, Nagercoil.
4. Textbook of Horticulture, (2nd Ed.), Rao, K. Manibhushan, Macmillan India Limited.
5. Home Gardening, Trivedi P.P., Indian Council of Agricultural Research, New Delhi.
6. Vegetable Crops Production, Rao, P.S., Sonali publications, New Delhi.

B. Sc. II Year (Theory) Semester IV
BOT-413 Skill Enhancement Course-2 SEC 2 (D): Medicinal Botany

45L

Credits: 02

a. THEORY: (1 Credit) Total Hours: 15

Unit 1: History, Scope and Importance of Medicinal Plants. Indigenous Medicinal systems- Introduction and Scope-Ayurveda, Siddha, Unani (4 Hours)

Unit 2: Conservation of endangered and endemic medicinal plants, In situ conservation: Biosphere reserves, sacred groves, National Parks; Ex-situ conservation: Botanic Gardens, Ethnomedicinal plant Gardens (5 Hours)

Unit 3: Propagation of Medicinal Plants: Propagation methods- sowing, cuttings, layering, grafting and budding (3 Hours)

Unit 4: Study of Folk medicines in India. Applications of natural products to cure certain diseases like Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases (3 Hours)

b. PRACTICAL: (1 Credit) Total Hours: (15 Hours)

Laboratory Exercises (Any 5) (3 Hours for each Practical)

1. Study of Locally available medicinal plants.
2. Study of plants used in Siddha medicine.
3. Study of plants used in Unani system of medicine.
4. Study of plants used to treat Jaundice.
5. Study of plants used to treat cardiac diseases.
6. Study of plants used to treat infertility.
7. Study of plants used to treat diabetes.
8. Study of plants used to treat Blood pressure.
9. Study of plants used to treat skin diseases.
10. Ex-situ conservation of important medicinal plants.

Suggested Readings:

1. Medicinal Plants: Ethnobotanical Approach, Trivedi P. C., Agrobios, India.
2. Medicinal Plant Cultivation: A Scientific Approach, Purohit and Vyas, Agrobios, India.
3. Ethno botany, Trivedi P.C. The Diamond printing press, Jaipur.
4. Marathwadyatil SamanyaVanaushadhi, Naik V.N., Amrut Prakashan, Aurangabad, (M.S.), India.
5. Practical Pharmacognosy techniques and experiment, Kokate C. K. and Ghokhale S. B., Nirali Prakashan, Pune, Maharashtra.
6. The practical Pharmacognocoy, Kokate C. K., Vallabh Prakashan, Delhi, India.
7. Indian Medicinal plants, Kirtikar K. R. and Basu B. D., Lalit Mohan Basu Publication , Allahabad.

DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

Faculty of Science

Pattern of Theory Question Paper

B.Sc. II YEAR (BOTANY) Semester III

Course Code: BOT -311 Paper V

Taxonomy of Angiosperms

Time: 2 Hours

Max. Marks: 40

- N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question (Unit 1) 10

or

Describe in brief:

- a. Short answer type (Unit 1)
b. Short answer type (Unit 1)
-

Q.2. Long answer type question (Unit 2) 10

or

Describe in brief:

- a. Short answer type (Unit 2)
b. Short answer type (Unit 2)
-

Q.3. Write short notes (Any two) 10

- a. Short note (Unit 1)
b. Short note (Unit 2)
c. Short note (Unit 2)

Q.4 Write short notes (Any Two) 10

- a. Short note (Unit 1)
b. Short note (Unit 1)
c. Short note (Unit 2)
-

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Pattern of Theory Question Paper

B.Sc. II YEAR (BOTANY) Semester III

Course Code: BOT -312 Paper VI Plant Physiology

Time: 2 Hours

Max. Marks: 40

N.B.: i) Attempt all questions

ii) All questions carry equal marks

iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question (Unit 2) 10

or

Describe in brief:

a. Short answer type (Unit 2)

b. Short answer type (Unit 2)

Q.2. Long answer type question (Unit 3) 10

or

Describe in brief:

a. Short answer type (Unit 3)

b. Short answer type (Unit 3)

Q.3. Write short notes (Any two) 10

a. Short note (Unit 1)

b. Short note (Unit 1)

c. Short note (Unit 1)

Q.4 Write short notes (Any two) 10

a. Short note (Unit 1)

b. Short note (Unit 2)

c. Short note (Unit 3)

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Pattern of Practical Question paper Examination

B.Sc. II YEAR (BOTANY) Semester III

Lab Course Code: BOT - 321 (Based on BOT -311) Taxonomy of Angiosperms

Time: 2 Hours

Max. Marks: 50

Date: _____ Batch No. _____

Center: _____

Q. 1. Describe, identify, classify giving reasons the specimen 'A'. Give floral formula and floral diagram. 12

Q.2. Identify, classify giving reasons and describe the specimen 'B'. Give floral formula and floral diagram. 12

Q.3. Identify and describe the specimen C, D, E and F as per the instructions 10

(C- and D - Morphology, E- and F - Economic importance)

Q4. Describe Key Characters or Diagnostic Characters of given specimen. 06

Q.5. Submission: 10

a) Record book

b) Tour report, field collection and viva - voce

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Pattern of Practical Question paper Examination

B.Sc. II YEAR (BOTANY) Semester III

Lab Course Code: BOT -322 (Based on BOT -312) Plant Physiology

Time: 2 Hours

Max. Marks: 50

Date: _____ Batch No. _____

Center: _____

Q. 1. Make a list of materials required for the physiological experiment allotted to you.

Show it to the examiner, write the procedure and record the readings. 12

(Expt. No. 2, 3, 4,5, 6,7 as per practical syllabus)

Q. 2. Make a list of materials required for the experiment allotted to you.

Show results to the examiner. 12

(Expt. No. 8,10,11,13,14,15,16 as per practical syllabus)

Q.3. Identify and describe the principle and working in the given experiment

(Experiment No. 1, 9, 12, 17) 16

Q.4. Submission: 10

a) Record book

b) Tour report and collection

c) Viva - voce

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Pattern of Theory Question Paper
B.Sc. II YEAR (BOTANY) Semester IV
Course Code: BOT -411 Paper VII Gymnosperms and Utilization of plants

Time: 2 Hours

Max. Marks: 40

- N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question (Unit 1) 10

or

Describe in brief:

- a. Short answer type (Unit 1)
- b. Short answer type (Unit 1)

Q.2. Long answer type question (Unit 2) 10

or

Describe in brief:

- a. Short answer type (Unit 2)
- b. Short answer type (Unit 2)

Q.3. Write short notes (Any two) 10

- a. Short note (Unit 1)
- b. Short note (Unit 2)
- c. Short note (Unit 1 or 2)

Q.4 Write short notes (Any two) 10

- a. Short note (Unit 1)
 - b. Short note (Unit 2)
 - c. Short note (Unit 1 or 2)
-

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Pattern of Theory Question Paper
B.Sc. II YEAR (BOTANY) Semester IV

Course Code: BOT -412 Paper

VIII Plant Ecology

Time: 2 Hours

Max. Marks: 40

-
- N.B.: i) Attempt all questions
ii) All questions carry equal marks
iii) Draw neat and well-labelled diagrams wherever necessary

Q.1. Long answer type question (Unit 2) 10

or

Describe in brief:

- a. Short answer type (Unit 2)
b. Short answer type (Unit 2)

Q.2. Long answer type question (Unit 3) 10

or

Describe in brief:

- a. Short answer type (Unit 3)
b. Short answer type (Unit 3)

Q.3. Write short notes (Any two) 10

- a. Short note (Unit 1)
b. Short note (Unit 1)
c. Short note (Unit 1).

Q.4 Write short notes (Any two) 10

- a. Short note (Unit 1)
b. Short note (Unit 2)
c. Short note (Unit 3).

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Pattern of Practical Question paper Examination
B.Sc. II YEAR (BOTANY) Semester IV
Lab Course Code: BOT -421 (Based on BOT -411)
Gymnosperms and Utilization of plants)

Time: 2 Hours

Max. Marks:50

Date: _____ Batch No. _____

Center: _____

- Q.1. Make a double stained permanent preparation of the given specimen 'A'
(Gymnosperm). Identify and describe with a well labelled diagram. 12
- Q.2. Histochemical tests in given material 'B'
(Protein / Carbohydrate / Lipid / cellulose / Lignin) 10
- Q.3. Identify and describe the specimen C, D, E and F as per the instructions 12
(C- and D - Gymnosperms, E- and F- Utilization of plants)
- Q.4. Economic importance of any two plants 06
-
- Q.4. Submission: 10
- a) Record book
- b) Tour report, collection and viva - voce
-

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Pattern of Practical Question Paper Examination

B.Sc. II YEAR (BOTANY) Semester IV

Lab Course Code: BOT -422 (Based on BOT – 412)

Plant Ecology

Time: 2 Hours

Max. Marks: 50

Date: _____ Batch No. _____

Center: _____

Q.1. Identify and describe morphological and anatomical adaptations in the given specimen. Make a temporary preparation of the given specimen. 12

Q.2. Conduct the ecological experiment, record the principle, observation and result (Experiment No. 5,6,7,9,10,11) 12

Q.3. Identify and describe the specimens A, B, C, and D, as per the instructions (Experiment No. 1, 2, 3, 4, 8) 16

Q.4. Submission: 10

a) Record book

b) Tour report, and collection

c) viva - voce



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