UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A' GRADE' UNIVERSITY)
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

Academic Section
Email: academicsectionju14@gmail.com

NOTIFICATION
(23/May/Adp./40)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the Syllabi and Courses of Study in the subject of **Botany** of Semesters **IIIrd** and **IVth** for **Four Year Under Graduate Programme** under the **Choice Based Credit System** as per **NEP-2020 (as given in the annexure)** for the examinations to be held in the years as per the details given below:

Subject	**Semester**	**for the examination to be held in the years**
Botany	Semester-III	December 2023, 2024 and 2025
	Semester-IV	May 2024, 2025 and 2026

The Syllabi of the courses is available on the University website: www.jammuuniversity.ac.in

Sd/-
DEAN ACADEMIC AFFAIRS

No. F. Acd/II/23/ 3541-3551
Dated: 26-5-2023.
Copy for information and necessary action to:

1. Dean, Faculty of Science
2. Convener, Board of Studies in **Botany**
3. Sr. P.A.to the Controller of Examinations
4. All members of the Board of Studies
5. Confidential Assistant to the Controller of Examinations
6. I/C Director, Computer Centre, University of Jammu
7. Deputy Registrar/Asst. Registrar (Conf. /Exams. UG/Eval Non-Prof)
8. Incharge, University Website for Uploading of the notification.

Sumitra Sharma 25/5
Deputy Registrar (Academic)

25/5/23 25/5 24/5/23

DEPARTMENT OF BOTANY

UNIVERSITY OF JAMMU

CURRICULUM FRAMEWORK FOR

FOUR-YEAR UNDER GRADUATE (FYUG) PROGRAM IN BOTANY

UNDER **CBCS**

AS PER

National Education Policy–2020

WITH EFFECT FROM THE ACADEMIC YEAR 2022–23

Approved By

Board of Studies in Botany

DEPARTMENT OF BOTANY, UNIVERSITY OF JAMMU, JAMMU

Following courses of study are prescribed for **3rd and 4th semesters** **FYUG** program in the subject of **BOTANY**

under **CBCS** as per **NEP-2020**

SEMESTER	TYPE OF THE COURSE	TITLE OF THE COURSE	COURSE NO.	CREDITS (T-Teaching P- Practical)
THIRD	MAJOR	DIVERSITY OF MICROBES, ALGAE, BRYOPHYTES AND PTERIDOPHYTES	UMJBOT301	4 (3T + 1P)
	MAJOR	CELL AND MOLECULAR BIOLOGY	UMJBOT302	4 (3T + 1P)
	MINOR	CELL BIOLOGY	UMIBOT303	4 (3T + 1P)
	MULTIDISCIPLINARY	PLANT IMPORTANCE AND PROPAGATION	UMDBOT304	4 (T)
	SKILL ENHANCEMENT	MUSHROOM CULTIVATION TECHNOLOGY	USEBOT305	2 (1T + 1P)
FOURTH	MAJOR	CHARACTERISTICS AND SYSTEMATICS OF SEED PLANTS	UMJBOT401	4 (3T + 1P)
	MAJOR	MYCOLOGY AND PLANT PATHOLOGY	UMJBOT402	4 (3T + 1P)
	MAJOR	PLANT ANATOMY	UMJBOT403	4 (3T + 1P)
	MAJOR	ECOLOGY AND CONSERVATION BIOLOGY	UMJBOT404	4 (3T + 1P)
	MINOR	ENVIRONMENTAL BIOLOGY	UMIBOT405	4(3T + 1P)

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Syllabus for FYUG Program in
BOTANY (under CBCS as per NEP–2020)
UG SEMESTER–III
(For the examinations to be held in the years December 2023, 2024, 2025)

DIVERSITY OF MICROBES, ALGAE, BRYOPHYTES AND PTERIDOPHYTES
(MAJOR COURSE)

Course No. UMJBOT301 **Max. Marks: 100 (Theory-75, Practical-25)**

	Credits	Contact Hours	Units	Examination			
				Duration (hours)		Weightage (Marks)	
				Mid-semester	End-semester	Mid-semester	End-semester
Theory	03	45	I to IV	1½	03	15	60
Practical	01	30	V	1½	3½	10	15

***Objectives*:**

The course is designed to familiarize the students with microbes and cryptogams. These plant groups are of great use in agriculture, horticulture, medical and biotechnology based industries. Therefore, students need to know about their structural diversity, biology and utilization.

***Course learning outcomes*:**

Students will be able to identify and document different microbes and cryptogams using laboratory and field skills. They will also learn about their economic importance and enable them to utilize the knowledge so gained for their livelihood generation.

Unit-I: Microbes and Microbiology

1.1 General account of plant viruses (TMV), transmission and control; general characteristics of viroids and prions; structure of Potato Spindle Tuber Viroid (PSTVd).

1.2 Bacteria– Ultrastructure, nutrition and reproduction, general account of Mycoplasma, Phytoplasma, Actinomycetes and Cyanobacteria.

1.3 Genetic recombination in bacteria (transformation, transduction and conjugation).

1.4 Economic importance of bacteria and plant viruses.

Unit-II: Algae

2.1 General characteristics and classification of algae (Parker, 1982) up to class level.

2.2 Important features of Chlorophyceae and Xanthophyceae; life histories of *Volvox*, *Oedogonium*, *Chara* and *Vaucheria*.

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DIVERSITY OF MICROBES, ALGAE, BRYOPHYTES AND PTERIDOPHYTES
(MAJOR COURSE)

Course No. UMJBOT301 **Max. Marks: 100 (Theory-75, Practical-25)**

2.3 Important features of Phaeophyceae and Rhodophyceae; Life histories of *Ectocarpus* and *Polysiphonia*.

2.4 Economic importance of algae (as food and feed; algal blooms and toxins).

Unit-III: Bryophytes

3.1 Bryophytes as the earliest land dwellers; general characteristics, classification (Smith,1955) and alternation of generations.

3.2 Structure and reproduction in Hepaticeae with reference to *Marchantia*.

3.3 Structure and reproduction in Anthocerotae and Musci with reference to *Anthoceros* and *Funaria*.

3.4 Evolution of sporophyte in bryophytes; importance of bryophytes in preventing soil erosion, monitoring and controlling pollution, geobotanical prospecting, horticulture and as source of antibiotics.

Unit-IV: Pteridophytes

4.1 General characteristics, classification (Sporne, 1975) and origin of pteridophytes (the first vascular plants); stelar system and alternation of generations.

4.2 Important characteristics of Psilopsida and Lycopsida; Structure and reproduction in *Psilotum, Lycopodium* and *Selaginella* (excluding development).

4.3 Important characteristics of Sphenopsida; structure and reproduction in *Equisetum* (excluding development).

4.4 Important characteristics of Pteropsida; structure and reproduction in *Pteris* and *Marsilea* (excluding development).

Unit-V: Practicals

5.1 Study of the genera included under algae and fungi.

5.2 Study of morphology, reproductive structures and anatomy of the examples cited in theory under Bryophyta and Pteridophyta.

5.3 Observation of disease symptoms in hosts infected by fungi, viruses and mycoplasma.

5.4 Section cutting of diseased materials and identification of the pathogens as per the theory syllabus.

5.5 Gram staining of bacteria.

5.6 Study of crustose, foliose and fruticose types of lichen thalli.

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DIVERSITY OF MICROBES, ALGAE, BRYOPHYTES AND PTERIDOPHYTES

(MAJOR COURSE)

Course No. UMJBOT301 **Max. Marks: 100 (Theory-75, Practical-25)**

Note for paper setters

End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%)

The question paper will have 2 sections. Section 'I' will be compulsory having four questions of 3 marks each and spread over the entire theory syllabus (one from each unit i.e., Units I to IV). The questions will be short answer type having answers not exceeding 50 to 70 words. Section 'II' will have eight long answer type questions, two from each unit. Each question will be of 12 marks. The candidates will be required to answer one question from each unit.

Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%)

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one long answer type question of 7 marks and four short answer type questions of2 marks each.

Suggested Readings

1. Bilgrami, K.S. and Saha L.C. 1992. A Textbook of Algae. CBS Publishers and Distributors, Delhi.
2. Dube, H.C. 1990. An Introduction to Fungi. Vikas Publishing House Pvt. Ltd., Delhi.
3. Parihar, N. S. 1996. The Biology and Morphology of Pteridophytes. Central Book Distributors, Allahabad.
4. Puri, P. 1980. Bryophyta: Broad prospectives. Atma Ram & Sons, Delhi.
5. Rashid A. 1976. An Introduction to Pteridophytes- Diversity and Differentiation. VikasPublishing House.
6. Smith, G.M. 1971. Cryptogamic Botany. Vol-I: Algae & Fungi. Tata McGraw Hill Publishing Co., New Delhi.
7. Smith, G.M. 1971. Cryptogamic Botany. Vol. II; Bryophytes & Pteridophytes. Tata McGraw Hill Publishing Co., New Delhi.
8. Sporne, K. R. 1970. The Morphology of Pteridophytes. Hutchinson Univ. Library, London.
9. Sumbali, G. and Mehrotra, R. S. 2009. Principles of Microbiology. The McGraw Hill Education Pvt. Ltd. New Delhi.
10. Sumbali G. 2010. The Fungi. 2nd Edn. Narosa Publishing House, New Delhi.

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UG SEMESTER–III
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CELL AND MOLECULAR BIOLOGY
(MAJOR COURSE)

Course No. UMJBOT302 **Max. Marks: 100 (Theory-75, Practical-25)**

	Credits	Contact Hours	Units	Examination			
				Duration (hours)		Weightage (Marks)	
				Mid-semester	End-semester	Mid-semester	End-semester
Theory	03	45	I to IV	1½	03	15	60
Practical	01	30	V	1½	3½	10	15

Objectives:

The course has been framed to acquaint the students with the structural and functional aspects of cellular, sub-cellular and molecular components of a cell. It will also help them to understand the interactions and interrelationships among these components.

Course learning outcomes:

The course will make the students understand the cellular regulatory mechanisms and enable them to suggest remedial approaches in case of abnormal cellular behavior.

Unit-I: Cell Structure.

1.1 Cell wall; Primary cell wall, its structure, formation and function.

1.2 Plasma membrane; the lipid bilayer structure, fluid mosaic model; functions of plasma membrane.

1.3 Cell organelles; structure and functions of endoplasmic reticulum, golgi bodies, chloroplasts, mitochondria and ribosomes.

1.4 Ultrastructure of nuclear membrane, organization and function of nucleolus.

Unit-II: Chromosome Structure and Multiplication.

2.1 Physical and chemical structure of chromosome; structure and importance of centromere and telomere; concept of sex chromosomes.

2.2 Reductional and equational divisions: Various stages; detailed structure of pairing and crossing over.

2.3 DNA: structure and replication; satellite and repetitive DNA.

2.4 Extranuclear genome: structure and function of mitochondrial and plastid DNA; Plasmids.

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CELL AND MOLECULAR BIOLOGY
(MAJOR COURSE)

Course No. UMJBOT302 **Max. Marks: 100 (Theory-75, Practical-25)**

Unit-III: Genome Organization and Function/Gene to Protein.

3.1 Organization of DNA in prokaryotic and eukaryotic genomes, role of proteins; nucleosome model.
3.2 Concept of gene; genetic code; structure and functions of mRNA, rRNA and tRNA.
3.3 Transcription: Mechanism and machinery.
3.4 Translation: Mechanism and machinery.

Unit-IV: Product and Regulation of Gene Expression.

4.1 Proteins: structure (primary, secondary and tertiary) and functions.
4.2 Gene expression and its regulation in prokaryotes.
4.3 Gene expression and its regulation in eukaryotes.
4.4 Concept and importance of regulatory RNAs.

Unit-V: Practicals

5.1 To study cell structure from onion leaf peels and demonstrate staining and mounting methods.
5.2 Comparative study of cell structure in onion cells, *Hydrilla* and *Spirogyra*.
5.3 Study of cyclosis in *Tradescantia* petal cells.
5.4 Study of plastids to examine pigment distribution in plants (e.g. *Cassia*, Tomato and *Capsicum*).
5.5 Examination of electron micrographs of eukaryotic cells with special reference to organelles.
5.6 Study of electron micrographs of viruses, bacteria, cyanobacteria and eukaryotic cells for comparative cellular organization.
5.7 Study of electron micrographs and X-ray crystallographs of DNA structure and replication (both prokaryotes and eukaryotes).
5.8 Preparation of 1% agarose gel and demonstration of gel loading.

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CELL AND MOLECULAR BIOLOGY
(MAJOR COURSE)

Course No. UMJBOT302 **Max. Marks: 100 (Theory-75, Practical-25)**

Note for paper setters

End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%)

The question paper will have 2 sections. Section 'I' will be compulsory having four questions of 3 marks each and spread over the entire theory syllabus (one from each unit i.e., Units I to IV). The questions will be short answer type having answers not exceeding 50 to 70 words. Section 'II' will have eight long answer type questions, two from each unit. Each question will be of 12 marks. The candidates will be required to answer one question from each unit.

Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%)

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one long answer type question of 7 marks and four short answer type questions of 2 marks each.

Suggested Readings:

1. Albert B., Bray, D., Raff, M., Roberts, K and Watson J.D. 2004. Molecular Biology of Cell. 3rd Edn. Garland Science. New York, USA.
2. Atherly, A.G., Girton, J.R. and Mc.Donald, J.F. 1999. The Science of Genetics. Diane Publishing. Co. Fort Worth, USA.
3. Gupta, PK. 1999. A Text Book of Cell and Molecular Biology. Rastogi Publications, Meerut, India.
4. Kleinsmith, L J. And Kish, V. M. 1995. Principles of Cell and Molecular Biology. 2nd Edn. Harper Collins College Publishers, New York, USA.
5. Lodish, H., Berk, A., Zipursky, S.L., Matsudaria P., Baltimore, D and Darnell, J. 2000. Molecular Cell Biology. 5th Edn. W.H. Freeman & Co. New York, USA.
6. Russell, P J. 1998. Genetics. The Benjamin Cummings Publishing Co. Inc., USA.
7. Snustad, D.P. and Simmons, M.J. 2000. Principles of Genetics. John Wiley & sons, Inc. USA.
8. Wolfe, S.L. 1993. Molecular and Cell biology. Wadsworth Publishing Co. California, USA.

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CELL BIOLOGY
(MINOR COURSE)

Course No. UMIBOT303 **Max. Marks: 100 (Theory-75, Practical-25)**

	Credits	Contact Hours	Units	Examination			
				Duration (hours)		Weightage (Marks)	
				Mid-semester	End-semester	Mid-semester	End-semester
Theory	03	45	I to IV	1½	03	15	60
Practical	01	30	V	1½	3½	10	15

Objectives:

The course has been framed to acquaint the students with the structural and functional aspects of cellular, sub-cellular and molecular components of a cell. It will also help them understand the interactions and interrelationships among these components.

Course learning outcomes:

The course will make the students understand the cellular regulatory mechanisms and enable them to suggest remedial approaches in case of abnormal cellular behavior.

Unit-I: Cell Structure.

1.5 Cell wall; Primary cell wall, its structure, formation and function.

1.6 Plasma membrane; the lipid bilayer structure, fluid mosaic model; functions of plasma membrane.

1.7 Cell organelles; structure and functions of endoplasmic reticulum, golgi bodies, chloroplasts, mitochondria and ribosomes.

1.8 Ultrastructure of nuclear membrane, organization and function of nucleolus.

Unit-II: Chromosome Structure and Multiplication.

2.5 Physical and chemical structure of chromosome; structure and importance of centromere and telomere; concept of sex chromosomes.

2.6 Reductional and equational divisions: Various stages; detailed structure of pairing and crossing over.

2.7 DNA: structure and replication; satellite and repetitive DNA.

2.8 Extranuclear genome: structure and function of mitochondrial and plastid DNA; Plasmids.

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CELL BIOLOGY
(MINOR COURSE)

Course No. UMIBOT303 **Max. Marks: 100 (Theory-75, Practical-25)**

Unit-III: Genome Organization and Function/Gene to Protein.

3.5 Organization of DNA in prokaryotic and eukaryotic genomes, role of proteins; nucleosome model.

3.6 Concept of gene; genetic code; structure and functions of mRNA, rRNA and tRNA.

3.7 Transcription: Mechanism and machinery.

3.8 Translation: Mechanism and machinery.

Unit-IV: Product and Regulation of Gene Expression.

4.1 Proteins: structure (primary, secondary and tertiary) and functions.

4.2 Gene expression and its regulation in prokaryotes.

4.3 Gene expression and its regulation in eukaryotes.

4.5 Concept and importance of regulatory RNAs.

Unit-V: Practicalss

5.9 To study cell structure from onion leaf peels and demonstrate staining and mounting methods.

5.10 Comparative study of cell structure in onion cells, *Hydrilla* and *Spirogyra*.

5.11 Study of cyclosis in *Tradescantia* petal cells.

5.12 Study of plastids to examine pigment distribution in plants (e.g. *Cassia*, Tomato and *Capsicum*).

5.13 Examination of electron micrographs of eukaryotic cells with special reference to organelles.

5.14 Study of electron micrographs of viruses, bacteria, cyanobacteria and eukaryotic cells for comparative cellular organization.

5.15 Study of electron micrographs and X-ray crystallographs of DNA structure and replication (both prokaryotes and eukaryotes).

5.16 Preparation of 1% agarose gel and demonstration of gel loading.

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CELL BIOLOGY
(MINOR COURSE)

Course No. UMIBOT303 **Max. Marks: 100 (Theory-75, Practical-25)**

Note for paper setters

End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%)

The question paper will have 2 sections. Section 'I' will be compulsory having four questions of 3 marks each and spread over the entire theory syllabus (one from each unit i.e., Units I to IV). The questions will be short answer type having answers not exceeding 50 to 70 words. Section 'II' will have eight long answer type questions, two from each unit. Each question will be of 12 marks. The candidates will be required to answer one question from each unit.

Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%)

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one long answer type question of 7 marks and four short answer type questions of2 marks each.

Suggested Readings:

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10. Atherly, A.G., Girton, J.R. and Mc.Donald, J.F. 1999. The Science of Genetics. Diane Publishing. Co. Fort Worth, USA.
11. Gupta, PK. 1999. A Text Book of Cell and Molecular Biology. Rastogi Publications, Meerut, India.
12. Kleinsmith, L J. And Kish, V. M. 1995. Principles of Cell and Molecular Biology. 2nd Edn. Harper Collins College Publishers, New York, USA.
13. Lodish, H., Berk, A., Zipursky, S.L., Matsudaria P., Baltimore, D and Darnell, J. 2000. Molecular Cell Biology. 5th Edn. W.H. Freeman & Co. New York, USA.
14. Russell, P J. 1998. Genetics. The Benjamin Cummings Publishing Co. Inc., USA.
15. Snustad, D.P. and Simmons, M.J. 2000. Principles of Genetics. John Wiley & sons, Inc. USA.
16. Wolfe, S.L. 1993. Molecular and Cell biology. Wadsworth Publishing Co. California, USA.

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UG SEMESTER–III
(For the examinations to be held in the years December 2023, 2024, 2025)

PLANT IMPORTANCE AND PROPAGATION
(MULTIDISCIPLINARY COURSE)

Course No. UMDBOT304 **Max. Marks: 75**

	Credits	Contact Hours	Units	Examination			
				Duration	(hours)	Weightage	(Marks)
				Mid semester	End semester	Mid semester	End semester
Theory	03	45	I to IV	1½	03	15	60

Objectives:

The course has been framed to familiarize students with the importance of plants for sustenance of our planet in general and mankind in particular. It also aims to educate them about different modes of plant reproduction.

Course learning outcomes:

The students will learn the importance of plants and various methods of their propagation. Insights gained therein will help them to bring the economically important taxa under effective commercial production and utilization.

Unit–I: Plants–An Overview

1.1 Diversity in habit (herb, shrub and tree) and habitat (terrestrial and aquatic) with respect to altitude (temperate, tropical, sub tropical and alpine).

1.2 Diversity in forms and body organisation.

1.3 Diversity of plant adaptation.

1.4 Concept of evolution and speciation.

Unit–II: Importance of Plants

2.1 Plants and their role in climate stability (soil fertility, prevention of soil erosion, availability of Oxygen, Carbon sequestration, pollution control).

2.2 Plants as source of food (wheat, maize, rice, mango, jamun, rajmah, apple, bottlegourd and fenugreek) – general description, botanical names and parts used.

2.3 Plants as source of fodder (clover, oak, *Grewia optiva*) and timber (*Pinus*, *Cedrus*, *Dalbergia* and Teak) – general description, botanical names and parts used.

2.4 Plants as source of medicine (quinine, belladona, *Rauwolfia* and *Digitalis*), essential oils (lemon-grass and lavender) and beverages (tea and coffee) – general description, botanical names and parts used.

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PLANT IMPORTANCE AND PROPAGATION
(MULTIDISCIPLINARY COURSE)

Course No. UMDBOT304 **Max. Marks: 75**

Unit–III: Modes of Vegetative Propagation

3.1 General account of asexual means of reproduction.

3.2 Natural and artificial means of vegetative propagation; advantages and limitations.

3.3 Propagation by bulbs, corms, tubers, rhizomes, runners, stolons and suckers – general account.

3.4 Propagation by cutting, layering, grafting and budding – basic concepts.

Unit –IV: Modes of Sexual Reproduction

4.1 General account of sexual means of reproduction.

4.2 Structure of flower and its various forms; types of pollination (self versus cross) mechanisms.

4.3 Fertilization, basic concept of seed and fruit development.

4.4 Seed germination and dormancy; types and methods to break dormancy.

Note for paper setters

End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%)

The question paper will have 2 sections. Section 'I' will be compulsory having four questions of 3 marks each and spread over the entire theory syllabus (one from each unit i.e., Units I to IV). The questions will be short answer type having answers not exceeding 50 to 70 words. Section 'II' will have eight long answer type questions, two from each unit. Each question will be of 12 marks. The candidates will be required to answer one question from each unit.

Mid Semester assessment Test (Total Marks: 15; syllabus to be covered: up to 50%)

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one long answer type question of 7 marks and four short answer type questions of2 marks each.

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PLANT IMPORTANCE AND PROPAGATION
(MULTIDISCIPLINARY COURSE)

Course No. UMDBOT304 **Max. Marks: 75**

Suggested readings

1. Bhojwani, S.S., Bhatnagar, S.P. and Dantu, P.K. (2018). The embryology of angiosperms. (6th edition). Vikas Publishing House, Noida.
2. Coulter, J.M. (1851). Morphology of Angiosperms (Morphology of Spermatophytes.Part-II). Nebu press, pp 376.
3. Johri, B.M. and Srivastava, P.S. (2013). Reproductive Biology of Plants. Springer Science and Business Media, pp 320.
4. Khan, A.S. (2017). Flowering Plants: Structure and Industrial Products. Wiley; 1st edition, United Kingdom, pp 344.
5. Kochhar, S.L. (2016). Economic Botany. Cambridge University Press, pp 680.
6. Nanda, K.K. and Kochar V.K. (1985). Vegetative Propagation of Plants. Kalyani Publishers, New Delhi.
7. Ramawat, K.G. et al. (2014). Reproductive Biology of Plants. CRC Press, Boca Raton.
8. Sadhu, M.K. (1999). Plant Propagation. New Age International (P) Limited Publishers,New Delhi.

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UG SEMESTER–III
(For the examinations to be held in the years December 2023, 2024, 2025)

MUSHROOM CULTIVATION TECHNOLOGY
(SKILL ENHANCEMENT COURSE)

Course No. USEBOT305 **Max. Marks: 50**

	Credits	Contact Hours	Units	Examination			
				Duration (hours)		Weightage (Marks)	
				Mid semester	End semester	Mid semester	End semester
Theory & Practical	02	30	I to III	01	2½	10	40

Objectives:

The course aims to make students understand the theoretical and practical details of mushrooms and their cultivation. The course is also focused upon the practical and safe utility of mushrooms for human consumption and economy generation.

Course Learning outcomes:

The students will be able to distinguish the various mushroom species for their nutritional, medicinal and other economic values. They can develop their own start ups for mushroom cultivation and can do value addition of both edible and medicinally important taxa.

Unit-I: Introduction, Types and Cultivation of Mushrooms

1.1 Characteristics of mushrooms. Types of edible mushrooms available in India- *Volvariella volvacea*, *Pleurotus citrinopileatus*, *Calocybe indica*, *Agaricus bisporus* and their cultivation.

1.2 Structure and life cycle of mushrooms with special reference to *Agaricus* and *Morchella*.

1.3 Nutritional, Pharmaceutical values and other economic importance of mushrooms.

1.4 Poisonous mushrooms: characteristics and effects.

Unit-II: Storage, Diseases and Value addition.

2.1 Shelf life of mushrooms, Short-term storage (Refrigeration – upto 24 hours), Long term storage (canning, pickles, papads), drying, storage in salt solutions. Low cost storage techniques. Types of foods prepared from mushrooms.

2.2 Diseases, infections and pests of mushrooms (Pre and Post harvest).

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MUSHROOM CULTIVATION TECHNOLOGY
(SKILL ENHANCEMENT COURSE)

Course No. USEBOT305 **Max. Marks: 50**

2.3 Scope of mushroom cultivation for rural upliftment as self help groups (SHGs) or co-operatives; different funding schemes available in J&K UT.

2.4 X matrix for business development in mushroom cultivation that includes Product value addition, Domestic and Export opportunities.

Unit-III: Practicals

3.1 Demonstration of the infrastructure required for cultivation of mushrooms [Substrates (locally available) Polythene bags, vessels, low cost stove, sieves, culture rack].

3.2 Spawn Production Technology: Mushroom unit (Thatched house), water sprayer, tray, small polythene bags.

3.3 Preparation and maintenance of Pure culture:
- i) Sterilization of glassware and media.
- ii) Inoculation and preparation of spawn, casing and harvesting

3.4 Mushroom bed preparation using locally available agro-wastes.

3.5 Composting technology in mushroom production (A low cost technology).

3.6 Cultivation of *Pleurotus citrinopileatus/ Agaricus bisporus*.

Note for paper setters

End Semester University Examination (Total Marks: 40; syllabus to be covered: 100%)

The question paper will have 2 components of 20 marks each.
Component 1 based on Units I & II will have 2 sections. Section 'I' will be compulsory having four questions of 2½ marks each and spread over the entire theory syllabus (two from each unit i.e., Units I and II). The questions will be short answer type having answers not exceeding 30 to 60 words. Section 'II' will have four long answer type questions, two from each unit. Each question will be of 5 marks. The candidates will be required to answer one question from each unit.
Component 2 based on Unit III will be external practical examination of 15 marks and viva voce of 5 marks.

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UG SEMESTER–III
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MUSHROOM CULTIVATION TECHNOLOGY
(SKILL ENHANCEMENT COURSE)

Course No. USEBOT305 **Max. Marks: 50**

Mid Semester Assessment Test (Total Marks: 10; syllabus to be covered: up to 50%)

The question paper will have 2 components of 5 marks each.

Component 1 will consist of theory paper with ten (10) questions distributed as 5 MCQs, 3 fill in the blanks and 2 one word answer tpe questions. All the questions are compulsory and each question carries ½ mark.

Component 2 will consist of practicals and will comprise of attendance, practical test and daily performance based on practical work done.

Suggested Readings:

1. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. Jayarajan. R (1991) Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
2. Swaminathan, M. (1990) Food and nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No.88, Mysore Road, Bangalore- 560018.
3. Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.
4. Nita Bahi (1984-1988) Hand Book of Mushrooms, II Edition, Vol. I & Vol. II
5. Chang, S., & Miles, G. P. (2004). Mushrooms: Cultivation, Nutritional Value, Medicinal Effects and Environmental Impact (p. 436). Boca Raton, FL: CRC Press.
6. Aggarwal, A., Sharma, Y.P. & Jangra, E. (2022). A Textbook on Mushroom Cultivation Theory and Practice, Newrays Publishing House, India, pp 292.
7. Kanwal, H.K., Acharya, K., Ramesh, G. and Reddy M.S. (2011). Molecular characterization of *Morchella* species from the Western Himalayan region of India. Current microbiology, 62(4): 1245-52.

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Syllabus for FYUG Program in
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UG SEMESTER–IV
(For the examinations to be held in the years May 2024, 2025, 2026)

CHARACTERISTICS AND SYSTEMATICS OF SEED PLANTS
(MAJOR COURSE)

Course No. UMJBOT401 **Max. Marks: 100 (Theory-75, Practical-25)**

	Credits	Contact Hours	Units	Examination			
				Duration	(hours)	Weightage	(Marks)
Theory	03	45	I to IV	1½	03	15	60
Practical	01	30	V	1½	3½	10	15

Objectives:

Gymnosperms and angiosperms occupying the two uppermost rungs in the evolutionary ladder of plants exhibit great diversity. The course is designed to study these groups for their morphological aspects and analyze the diversity in a scientific manner for establishing their interrelationships.

Course learning outcomes:

The students will be able to understand the process of fossilization and identify the fossil taxa. The course contents will enable them to identify, characterize and describe gymnosperms and angiosperms using classifications and taxonomic keys. It will also help them analyze the role of anatomy, embryology, cytology and phytochemistry in systematics. The students can pursue and disseminate the traditional and medicinal knowledge of seed plants among the stakeholders.

Unit-I: Seed Plants-Origin, Evolution and Characteristics

1.1 Fossilization – Processes and types, age of fossils and their importance.

1.2 Fossil gymnosperms – a general account; Benettitales (Cycadeoidales) – history and distribution.

1.3 Characteristic features, morphology, anatomy and reproduction in *Williamsonia* and *Cycadeoidea*.

1.4 Fossil angiosperms – a general account.

Unit-II: Classification, Morphology and Reproduction in Gymnosperms

2.1 General characters of gymnosperms; classification of gymnosperms as proposed by Sporne (1965).

2.2 Morphology, anatomy, reproduction and life cycle of *Cycas*.

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CHARACTERISTICS AND SYSTEMATICS OF SEED PLANTS

(MAJOR COURSE)

Course No. UMJBOT401 **Max. Marks: 100 (Theory-75, Practical-25)**

2.3 Morphology, anatomy, reproduction and life cycle of *Pinus*.

2.4 Morphology, anatomy, reproduction and life cycle of *Ephedra*.

Unit-III: Angiosperms-Origin and Nomenclature

3.1 Origin of angiosperms, characteristics of some primitive angiosperms with special reference to *Magnolia*.

3.2 History of angiosperm taxonomy – classical and modern; species concept and speciation.

3.3 Taxonomic identification: taxonomic keys and literature (floras, monographs and reviews).

3.4 Botanical nomenclature- principles and rules, taxonomic ranks, type concept and principle of priority.

Unit-IV: Classification and Tools in Angiosperm Taxonomy

4.1 Salient features of the classifications of Bentham & Hooker and Engler & Prantl; merits and demerits.

4.2 Concept and salient features of APG system of classification.

4.3 Contribution of anatomy and embryology to taxonomy.

4.4 Contribution of cytology and phytochemistry to taxonomy.

Unit-V: Practicals

5.1 Morphological diversity of families: Ranunculaceae (*Ranunculus*, *Delphinium*), Brassicaceae (*Brassica*, *Alyssum*, *Iberis*, *Coronopus*), Malvaceae (*Hibiscus, Abutilon*) and Asteraceae (*Tagetes*, *Ageratum*).

5.2 Morphological diversity of families: Fabaceae (Faboideae- *Lathyrus*, *Cajanus*, *Melilotus*, *Trigonella*; Caesalpinioideae- *Cassia*, *Caesalpinia*; Mimosoideae- *Prosopis*, *Mimosa*, *Acacia*), Apiaceae (*Coriandrum*, *Foeniculum*, *Anethum*), Acanthaceae (*Adhatoda*, *Peristrophe*), Apocynaceae (*Vinca*, *Thevetia*, *Nerium*).

5.3 Morphological diversity of families: Asclepidiaceae (*Calotropis*), Solanaceae (*Solanum*, *Withania*, *Datura*, *Petunia*), Euphorbiaceae (*Euphorbia*, *Phyllanthus*), Lamiaceae (*Ocimum*, *Salvia*).

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CHARACTERISTICS AND SYSTEMATICS OF SEED PLANTS
(MAJOR COURSE)

Course No. UMJBOT401 **Max. Marks: 100 (Theory-75, Practical-25)**

5.4 Morphological diversity of families: Chenopodiaceae (*Chenopodium*, *Beta*), Lilliaceae (*Asphodelus*, *Asparagus*, *Allium*), Poaceae (*Zea mays*, *Triticum aestivum*, *Oryza sativa*).

(Locally available genera/species of following should be included. This list is only indicative. Teachers may select plants available in their locality.)

5.5 Habit, external morphology, anatomy and life cycle of *Cycas*.

5.6 Habit, external morphology, anatomy and life cycle of *Pinus*.

5.7 Habit, external morphology, anatomy and life cycle of *Ephedra*.

(Studies should be made through live specimens, permanent slides, hand sections and dissections.)

In addition to laboratory exercises, study of plant diversity in nature is required, for which a field trip should be organized.

Note for paper setters

End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%)

The question paper will have 2 sections. Section 'I' will be compulsory having four questions of 3 marks each and spread over the entire theory syllabus (one from each unit i.e., Units I to IV). The questions will be short answer type having answers not exceeding 50 to 70 words. Section 'II' will have eight long answer type questions, two from each unit. Each question will be of 12 marks. The candidates will be required to answer one question from each unit.

Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%)

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one long answer type question of 7 marks and four short answer type questions of 2 marks each.

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CHARACTERISTICS AND SYSTEMATICS OF SEED PLANTS
(MAJOR COURSE)

Course No. UMJBOT401 **Max. Marks: 100 (Theory-75, Practical-25)**

Suggested readings:

1. Bhatnagar, S.P. and Moitra, A. 1996. Gymnosperms. New Age International Limited, New Delhi.
2. Davis, P.H. and Heywood, V.H. 1963. Principles of Angiosperm Taxonomy. Oliver andBoyd, London.
3. Gifford, E.M. and Foster, A.S. 1988. Morphology and Evolution of Vascular Plants. W.H. Freeman and company, New York.
4. Jeffery, C. 1982. An Introduction to Plant Taxonomy. Cambridge University Press, London.
5. Jones, S.B. and Luchsinger, A.E. 1986. Plant Systematics. 2nd Edn. Mc Graw Hill BookCo., New York.
6. Radford, A.E.1986. Fundamentals of Plant Systematics. Harper and Row, New York.
7. Singh, G. 1999. Plant Systematics: Theory and Practice. Oxford and IBH Pvt. Ltd., NewDelhi.
8. Sporne, K.R. 1965. The Morphology of Gymnosperms. Hutchinson and Co. Ltd.,London.
9. Stace, C.A. 1989. Plant Taxonomy and Biosystematics. 2nd Edn., Edward Arnold,London.
10. Stewart, W.M. 1983. Paleobotany and the Evolution of Plants. Cambridge University Press, Cambridge.

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UG SEMESTER–IV
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MYCOLOGY AND PLANT PATHOLOGY
(MAJOR COURSE)

Course No. UMJBOT402 **Max. Marks: 100 (Theory-75, Practical-25)**

	Credits	Contact Hours	Units	Examination			
				Duration	(hours)	Weightage	(Marks)
Theory	03	45	I to IV	1½	03	15	60
Practical	01	30	V	1½	3½	10	15

Objectives:

The course will impart knowledge and understanding on the structure, diversity, reproduction and life-cycle of fungi and fungi-like organisms. It will also provide insight into their pathogenic relationships with the plants.

Course learning outcomes:

The students will understand the extent of diversity of fungi and fungi-like organisms, and their mechanisms of affecting plant and animal life in one or the other way. It will enable them to identify plant pathogens and their role in causing substantial losses in yield of major crop plants. The students can attempt to devise strategies for their control and management.

Unit-I: Mycology: Origin, growth and scope

1.1 Introduction and history of mycology.
1.2 Concepts of nomenclature and classification, fungal biodiversity.
1.3 Reproduction and life cycles in fungi.
1.4 Importance of mycology in agriculture, dairy and food spoilage.

Unit-II: Organization, classification and reproduction in fungal organisms

2.1 Ultrastructure of a fungal cell; Hyphal types and aggregation; Nutritional types.
2.2 Characteristics of different groups of fungi and fungi like organisms up to generic level (a) Myxomycota and (b) Eumycota- i) Mastigomycotina ii) Zygomycotina, iii) Ascomycotina, iv) Basidiomycotina and v) Deuteromycotina.
2.3 Lichens: types and importance.
2.4 Homothallism and Heterothallism; Parasexuality in fungi.

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MYCOLOGY AND PLANT PATHOLOGY
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Unit-III: Plant pathology: History and development

3.1 Concepts of plant diseases.
3.2 History and developments in plant pathology, biotic and abiotic causes of plant diseases.
3.3 Survival and dispersal of important plant pathogens.
3.4 Role of environment and host nutrition on disease development.

Unit- IV: Disease development and defense strategies

4.1 Host parasite interaction, recognition concept and infection, symptomatology.
4.2 Disease development – role of enzymes, toxins and growth regulators.
4.3 Defense strategies – morphological and biochemical (Phytoalexins, PR proteins).
4.4 Disease management strategies – cultural, chemical and biological concepts.

Unit- V: Practicals

5.1 Preparation of various culture media.
5.2 Various sterilization methods used in culturing.
5.3 Preparation of PDA petri-plates and slants; aeromycoflora studies of lab./open air.
5.4 Fungal diseases; symptomatology and causal organisms; host-parasite relationship and diseases caused by fungi and fungal like organisms (Red Rot of sugarcane, Tikka disease of groundnut, Rust of wheat, Smut of maize, White Rust).
5.5 Macrofungi: Indentification and morphological studies of *Agaricus*, *Morchella*, *Geopora*, *Peziza*, *Polyporus*.
5.6 Study and identification of Crustose, Foliose and Fruticose lichens.

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MYCOLOGY AND PLANT PATHOLOGY
(MAJOR COURSE)

Course No. UMJBOT402 **Max. Marks: 100 (Theory-75, Practical-25)**

Note for paper setters

End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%)

The question paper will have 2 sections. Section 'I' will be compulsory having four questions of 3 marks each and spread over the entire theory syllabus (one from each unit i.e., Units I to IV). The questions will be short answer type having answers not exceeding 50 to 70 words. Section 'II' will have eight long answer type questions, two from each unit. Each question will be of 12 marks. The candidates will be required to answer one question from each unit.

Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%)

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one long answer type question of 7 marks and four short answer type questions of 2 marks each.

Suggested readings

1. Agrios GN. 2005. Plant Pathology. 5th Ed. Academic Press, New York.
2. Mehrotra RS & Aggarwal A. 2003. Plant Pathology. 2nd Ed. Oxford & IBH, New Delhi.
3. Singh RS. 2002. Introduction to Principles of Plant Pathology. Oxford & IBH, New Delhi.
4. Singh DP & Singh A. 2007. Disease and Insect Resistance in Plants. Oxford & IBH, New Delhi.
5. Upadhyay RK & Mukherjee KG. 1997. Toxins in Plant Disease Development and Evolving Biotechnology. Oxford & IBH, New Delhi. 69
6. Sharma PD, 2006. Plant Pathology. Narosa publishing house pvt. Ltd. 22 Daryaganj, Delhi.
7. Chaube HS, Pundhir VS, 2014. Crop diseases and their management. PHI learning Pvt. Ltd. Delhi – 110092.
8. Ainsworth GC, Sparrow FK & Susman HS. 1973. The Fungi – An Advanced Treatise. Vol. IV (A & B). Academic Press, New York.
9. Alexopoulos CJ, Mims CW¬ & Blackwell M.2000. Introductory Mycology. 5th Ed. John Wiley & Sons, New York.

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MYCOLOGY AND PLANT PATHOLOGY

(MAJOR COURSE)

Course No. UMJBOT402 **Max. Marks: 100 (Theory-75, Practical-25)**

10. Singh RS. 1982. Plant Pathogens – The Fungi. Oxford & IBH, New Delhi.
11. Webster J. 1980. Introduction to Fungi. 2nd Ed. Cambridge Univ. Press, Cambridge, New York.
12. Dubey H.C. 2005. Introduction of fungi. 3rd edition, Vikash Publishing House, New Delhi.

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PLANT ANATOMY
(MAJOR COURSE)

Course No. UMJBOT403 **Max. Marks: 100 (Theory-75, Practical-25)**

	Credits	Contact Hours	Units	Examination			
				Duration	(hours)	Weightage	(Marks)
Theory	03	45	I to IV	1½	03	15	60
Practical	01	30	V	1½	3½	10	15

Objectives:

Seed bearing plants represent the most advanced groups of plant kingdom. Proper knowledge about the internal and external structures will help the students in understanding the architectural designs of cells, tissues and organs of all the parts of these plants.

Course learning outcomes:

The students will be able to analyze the importance and significance of cellular and sub-cellular organizations of the tissues and organs. This will help them to appreciate and tap these natural resources for sustainable use.

UNIT-I: Basics of plant anatomy

1.1 Shoot primary structure, leaf, stem and their modifications.
1.2 Root system, structure, components, diversity and evolutionary significance.
1.3 Epidermal modifications in monocots and dicots (trichomes and stomata), their structural organization and systematic value.
1.4 Leaf: origin, development and vascularisation.

UNIT-II: Plant, Structure and Organization.

2.1 Meristems: concept and types; structure and organization of RAM and SAM.
2.2 Anatomy of primary root and primary stem (both monocots and dicots).
2.3 Vascularisation of primary shoot in monocotyledons and dicotyledons, leaf traces and leaf gaps; branch traces and branch gaps.
2.4 Internal structure of monocot and dicot leaf, concept of leaf senescence and abscission.

UNIT-III: Primary and Secondary Structures

3.1 Vascular cambium: structure and derivatives.
3.2 Cork cambium: structure and derivatives; lenticels.
3.3 Structure of secondary xylem and secondary phloem.
3.4 Secondary growth – a general account; growth rings; heartwood, sapwood.

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UNIT-IV: Fundamental tissues

4.1 Concepts of cell polarity and cell differentiation.
4.2 Xylem: classification, components, structure, diversity and function.
4.3 Phloem: classification, components, structure, diversity and function.
4.4 Wood anatomy: growth rings, functional aspects of dendrochronology, methods of wood quality parameters in India.

UNIT-V: Practicals

5.1 To study shoot and root tips with emphasis on cyto-histological zonation.
5.2 Anatomy of primary and secondary growth in monocots and dicots using hand sections and prepared slides.
5.3 Study of structure of secondary phloem and xylem.
5.4 Examination of Growth rings in wood and microscopic study of wood in T.S., T.L.S., and R.L.S.
5.5 Study of diversity in leaf shape, size, thickness, surface properties.
5.6 Study of internal structure of leaf, structure and type of stomata and trichomes (using epidermal peels of leaf).
5.7 Anatomy of the root; primary and secondary structure.

Note for paper setters

End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%)

The question paper will have 2 sections. Section 'I' will be compulsory having four questions of 3 marks each and spread over the entire theory syllabus (one from each unit i.e., Units I to IV). The questions will be short answer type having answers not exceeding 50 to 70 words. Section 'II' will have eight long answer type questions, two from each unit. Each question will be of 12 marks. The candidates will be required to answer one question from each unit.

Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%)

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one long answer type question of 7 marks and four short answer type questions of 2 marks each.

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PLANT ANATOMY
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Suggested Readings

1. Cutter, E.G. 1969. Plant Anatomy: Experiment and Interpretation. Part-I: Cells and Tissues. Edward Arnold, London
2. Cutter, E.G. 1970. Plant Anatomy: Experiment and Interpretation. Part-II: Organs. Edward Arnold London.
3. Esau, K. 1977. Anatomy of Seed Plants. 2nd Edn. John Wiley and Sons, NewYork.
4. Fahn, A. 1974. Plant Anatomy. 2nd Edn. Pergamon Press.
5. Kind, J. 1997. Reaching for the sun: How Plants work. Cambridge University Press, Cambridge, U.K.
6. Mauseth, J.D. 1988. Plant Anatomy. The Benjamin Cummings Publishing Company, Menio Park, California, USA.
7. Crang, Richard. (2018). Plant Anatomy. Springer, Switzerland.
8. Dickison, W. C. (2014). Integrative Plant Anatomy. Academic Press, Amsterdam.
9. Evert, et al. (2017). Esau's Plant Anatomy. 3rd ed. Wiley, USA.

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UG SEMESTER–IV
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ECOLOGY AND CONSERVATION BIOLOGY
(MAJOR COURSE)

Course No. UMJBOT404 **Max. Marks: 100 (Theory-75, Practical-25)**

	Credits	Contact Hours	Units	Examination			
				Duration	(hours)	Weightage	(Marks)
Theory	03	45	I to IV	1½	03	15	60
Practical	01	30	V	1½	3½	10	15

Objectives:

Plants are sessile on account of which they have to respond instantaneously to the changing environmental conditions in nature. The course content will make the students understand various mechanisms of their interactions with biotic and abiotic components of the ecosystems. This will make them realize the importance of plants to the ecosystem and hence mankind.

Course Learning Outcomes:

Knowledge gained by the students will enable them to utilize the plants for multifarious purposes in a sustainable manner. The students will also be able to understand the niche requirements of plants and analyze the possible threats to the plant diversity. Outcomes will help the students to think and devise strategies for their effective conservation.

Unit-I: Plants and Environment

1.1 Atmosphere- Stratification and gaseous composition; Carbon and hydrological cycle and their significance, greenhouse gases and climate change.
1.2 Soil structure, soil profiles and development; soil types in India.
1.3 Concept of ecology, ecosystem: structure, abiotic and biotic components, food chain, food web, ecological pyramids and energy flow.
1.4 Community ecology: Community characteristics, frequency, density cover, life forms, biological spectrum.

Unit-II: Population, community and niches

2.1 Population ecology, survivorship curves and life tables; ecotypes and ecads.
2.2 Ecological succession: Concept, process and its types; climax communities.
2.3 Ecotone and edge effect-concept and types.
2.4 Species distribution and ecological niche: concepts and significance.

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ECOLOGY AND CONSERVATION BIOLOGY
(MAJOR COURSE)

Course No. UMJBOT404 **Max. Marks: 100 (Theory-75, Practical-25)**

Unit-III: Introductory concepts of Conservation Biology

3.1 A brief history, concept and scope of conservation biology; ecological footprint
3.2 Guiding Principles and characteristics of Conservation Biology.
3.3 The species and Conservation; levels of Biodiversity (Genetic, intraspecific, ecosystem and Biome).
3.4 Value of Biodiversity; challenges associated with its conservation; Conservation values and ethics.

Unit-IV: Concerns of Conservation Biology

4.1 Overview of mass extinctions; Hot spots of extinction; patterns of species vulnerability
4.2 Genetics and conservation; intrapopulation, interpopulation variation, the fitness consequences of variation
4.3 Loss of genetic variation, management of genetic variation in natural populations, uses of genetic information in conservation
4.4 Community level conservation, the role of keytone species , mutualisms, species invasions and ecological restoration

Unit-V: Practicals

5.1 To determine the minimum requisite size of the quadrate for phytosociological studies.
5.2 To determine the frequency, density, abundance, basal area and importance value index of herbaceous and tree flora.
5.3 To determine the different life forms of the plant species of the grassland ecosystem and prepare a biological spectrum by comparing with Raunkaier's normal spectrum.
5.4 To study the various soil horizons for drawing the soil profile diagram.
5.5 To determine the bulk density, water holding capacity and porosity of forest and grassland ecosystems.
5.6 To measure pH and dissolved oxygen in different water ecosystems.
5.7 Determination of seed viability of highly threatened medicinal plants by tetrazolium chloride test.
5.8 Comparison of the seed morphology and viability of variously temperature treated seeds for seed storage practice.

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ECOLOGY AND CONSERVATION BIOLOGY
(MAJOR COURSE)

Course No. UMJBOT404 **Max. Marks: 100 (Theory-75, Practical-25)**

Note for paper setters

End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%)

The question paper will have 2 sections. Section 'I' will be compulsory having four questions of 3 marks each and spread over the entire theory syllabus (one from each unit i.e., Units I to IV). The questions will be short answer type having answers not exceeding 50 to 70 words. Section 'II' will have eight long answer type questions, two from each unit. Each question will be of 12 marks. The candidates will be required to answer one question from each unit.

Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%)

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one long answer type question of 7 marks and four short answer type questions of 2 marks each.

SUGGESTED READING

1. Chapman, J.L. and Reiss, M.J. 2000. Ecology: Principles and Applications. 2nd Edn., Cambridge University Press , U.K.
2. Kebs, C.J. 1989. Ecological Methodology. Harper and Row, New York, USA.
3. Kormondy, E.J. 1996. Concepts of Ecology. Prentice- Hall of India Pvt. Ltd. New Delhi.
4. Ludwist. J.A. and Reynolds, J.F. 1988. Statistical Ecology. Wiley, New York.
5. Misra, R. 1988. Ecology Work Book. Oxford and IBH, New Delhi.
6. Moore. P.W. and Chapman, S.B. 1986. Methods in Plant Ecology. Blackwell Scientific Publications.
7. Odum, E.P. 1983. Basic Ecology. Saunders, Philadephia.
8. Sharma, P. D. 2010. Ecology and Environment. 10th Edn. Rastogi Publications, Merut. India.
9. Townsend, C.R., Begon, M. and Harper, J.L. 2008. Essentials of Ecology. 3rd Edn. Blackwell publishing. U.K
10. Underwood, A.J. 1977. Experiments in Ecology: Their logical design and interpretation using analysis of variance. Cambridge University Press.

ECOLOGY AND CONSERVATION BIOLOGY

(MAJOR COURSE)

Course No. UMJBOT404 **Max. Marks: 100 (Theory-75, Practical-25)**

11. APHA-Standard methods for the examination of water and waste water, American Public Health Association, Washington.
12. Gary K. Meffe and C. Ronald Caroll. 1994. The Principles of Conservation Biology. Sinauer Associates, Inc, Sunderland, Massachusetts.
13. Richard B. Primack. 2014. Essentials of Conservation Biology Hardcover . Oxford University Press.
14. Richard B. Primack. 2016. An Introduction to Conservation Biology. Oxford University Press.

UNIVERSITY OF JAMMU
Syllabus for FYUG Program in
BOTANY (under CBCS as per NEP–2020)
UG SEMESTER–IV
(For the examinations to be held in the years May 2024, 2025, 2026)

ENVIRONMENTAL BIOLOGY
(MINOR COURSE)

Course No. UMIBOT405 **Max. Marks: 100 (Theory-75, Practical-25)**

	Credits	Contact Hours	Units	Examination			
				Duration	(hours)	Weightage	(Marks)
Theory	03	45	I to IV	1½	03	15	60
Practical	01	30	V	1½	3½	10	15

Objectives:

Plants are sessile on account of which they have to respond instantaneously to the changing environmental conditions in nature. The course content will make the students understand various mechanisms of their interactions with biotic and abiotic components of the ecosystems. This will make them realize the importance of plants to the ecosystem and hence mankind.

Course Learning Outcomes:

Knowledge gained by the students will enable them to utilize the plants for multifarious purposes in a sustainable manner. The students will also be able to understand the niche requirements of plants and analyze the possible threats to the plant diversity. Outcomes will help the students to think and devise strategies for their effective conservation.

Unit-I: Plants and Environment

1.1 Atmosphere- Stratification and gaseous composition; Carbon and hydrological cycle and their significance, greenhouse gases and climate change.
1.2 Soil structure, soil profiles and development; soil types in India.
1.3 Concept of ecology, ecosystem: structure, abiotic and biotic components, food chain, food web, ecological pyramids and energy flow.
1.4 Community ecology: Community characteristics, frequency, density cover, life forms, biological spectrum.

Unit-II: Population, community and niches

2.1 Population ecology, survivorship curves and life tables; ecotypes and ecads.
2.2 Ecological succession: Concept, process and its types; climax communities.
2.3 Ecotone and edge effect-concept and types.
2.4 Species distribution and ecological niche: concepts and significance.

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Unit-III: Introductory concepts of Conservation Biology

3.1 A brief history, concept and scope of conservation biology; ecological footprint
3.2 Guiding Principles and characteristics of Conservation Biology.
3.3 The species and Conservation; levels of Biodiversity (Genetic, intraspecific, ecosystem and Biome).
3.4 Value of Biodiversity; challenges associated with its conservation; Conservation values and ethics.

Unit-IV: Concerns of Conservation Biology

4.1 Overview of mass extinctions; Hot spots of extinction; patterns of species vulnerability
4.2 Genetics and conservation; intrapopulation, interpopulation variation, the fitness consequences of variation
4.3 Loss of genetic variation, management of genetic variation in natural populations, uses of genetic information in conservation
4.4 Community level conservation, the role of keytone species , mutualisms, species invasions and ecological restoration

Unit-V: Practicals

5.1 To determine the minimum requisite size of the quadrate for phytosociological studies.
5.2 To determine the frequency, density, abundance, basal area and importance value index of herbaceous and tree flora.
5.3 To determine the different life forms of the plant species of the grassland ecosystem and prepare a biological spectrum by comparing with Raunkaier's normal spectrum.
5.4 To study the various soil horizons for drawing the soil profile diagram.
5.5 To determine the bulk density, water holding capacity and porosity of forest and grassland ecosystems.
5.6 To measure pH and dissolved oxygen in different water ecosystems.
5.7 Determination of seed viability of highly threatened medicinal plants by tetrazolium chloride test.
5.8 Comparison of the seed morphology and viability of variously temperature treated seeds for seed storage practice.

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Note for paper setters

End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%)

The question paper will have 2 sections. Section 'I' will be compulsory having four questions of 3 marks each and spread over the entire theory syllabus (one from each unit i.e., Units I to IV). The questions will be short answer type having answers not exceeding 50 to 70 words. Section 'II' will have eight long answer type questions, two from each unit. Each question will be of 12 marks. The candidates will be required to answer one question from each unit.

Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%)

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one long answer type question of 7 marks and four short answer type questions of 2 marks each.

SUGGESTED READING

1. Chapman, J.L. and Reiss, M.J. 2000. Ecology: Principles and Applications. 2nd Edn., Cambridge University Press , U.K.
2. Kebs, C.J. 1989. Ecological Methodology. Harper and Row, New York, USA.
3. Kormondy, E.J. 1996. Concepts of Ecology. Prentice- Hall of India Pvt. Ltd. New Delhi.
4. Ludwist. J.A. and Reynolds, J.F. 1988. Statistical Ecology. Wiley, New York.
5. Misra, R. 1988. Ecology Work Book. Oxford and IBH, New Delhi.
6. Moore. P.W. and Chapman, S.B. 1986. Methods in Plant Ecology. Blackwell Scientific Publications.
7. Odum, E.P. 1983. Basic Ecology. Saunders, Philadephia.
8. Sharma, P. D. 2010. Ecology and Environment. 10th Edn. Rastogi Publications, Merut. India.
9. Townsend, C.R., Begon, M. and Harper, J.L. 2008. Essentials of Ecology. 3rd Edn. Blackwell publishing. U.K
10. Underwood, A.J. 1977. Experiments in Ecology: Their logical design and interpretation using analysis of variance. Cambridge University Press.

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