



# UNIVERSITY OF JAMMU

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

Academic Section

Email: [academicsectionju14@gmail.com](mailto: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](http://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.

*Sumitashamo*  
Deputy Registrar (Academic) 25/5

*SS* 25/5/23  
*AAA* 25/5  
*M* 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  
**3<sup>rd</sup> and 4<sup>th</sup> 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)

*Handwritten signature*

**UNIVERSITY OF JAMMU**  
**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*.

*Handwritten signature*

**UNIVERSITY OF JAMMU**  
**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)

- 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 Hepaticae 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.

*Handwritten signature*

**UNIVERSITY OF JAMMU**  
**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)

**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. 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 perspectives. Atma Ram & Sons, Delhi.
5. Rashid A. 1976. An Introduction to Pteridophytes- Diversity and Differentiation. Vikas Publishing 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. 2<sup>nd</sup> Edn. Narosa Publishing House, New Delhi.

*Handwritten signature*

**UNIVERSITY OF JAMMU**  
**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)**

**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.

*Handwritten signature*

**UNIVERSITY OF JAMMU**  
**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)**

---

**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.

*Kaul*



**UNIVERSITY OF JAMMU**  
**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)**

---

**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. 3<sup>rd</sup> 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. 2<sup>nd</sup> 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. 5<sup>th</sup> 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.

*Handwritten signature*

**UNIVERSITY OF JAMMU**  
**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)**

**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.

*Handwritten signature*

**UNIVERSITY OF JAMMU**  
**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)**

---

**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: Practicals**

- 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.

*Maus*

**UNIVERSITY OF JAMMU**  
**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)**

---

**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 of 2 marks each.

**Suggested Readings:**

9. Albert B., Bray, D., Raff, M., Roberts, K and Watson J.D. 2004. Molecular Biology of Cell. 3<sup>rd</sup> Edn. Garland Science. New York, USA.
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. 2<sup>nd</sup> 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. 5<sup>th</sup> 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.

*Handwritten signature*

**UNIVERSITY OF JAMMU**  
**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)**

**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, belladonna, *Rauwolfia* and *Digitalis*), essential oils (lemon-grass and lavender) and beverages (tea and coffee) – general description, botanical names and parts used.

*Maus*

**UNIVERSITY OF JAMMU**  
**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)**

---

**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 of 2 marks each.

*Handwritten signature*

**UNIVERSITY OF JAMMU**  
**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)**

---

**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. (6<sup>th</sup> 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 Kochhar 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.

*Mans*

**UNIVERSITY OF JAMMU**  
**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)**

**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).

*Handwritten signature*