B.Sc. (BOTANY) SEMESTER- II

CORE COURSE- I

MAJOR COURSE (THEORY)

COURSE TITLE: Higher Cryptogams and Phanerogams

COURSE CODE: BO-MJ-201 [CREDITS - 03]

<table>
<tr><th colspan="3">Course learning outcome</th></tr>
<tr><td colspan="3">After the successful completion of the Course, the learner will be able to:
1. Understand about the habit, habitates and diversity of higher cryptogamic plants, their classification, structure, growth and life cycle.
2. Acquaint with differentiation and structure of different plant organs.
3. Apro diversity among the bryophytes, pteridophytes and gymnosperms.</td></tr>
<tr><td>Module 1</td><td>Bryophytes</td><td>[15L]</td></tr>
<tr><td colspan="3">Learning objectives:
This module is intended to introduce:
• Awareness of structure, development and life cycle of bryophytes.
• Skill to identify different bryophytes.</td></tr>
<tr><td colspan="3">Learning outcome:
After the successful completion of the module, the learner will be able to
1. Illustrate diversity among the bryophyte and general characters of bryophytes.
2. Classify bryophytes based on their structure, reproduction and life cycles.
3. Aware of ecological, ethnic and economic importance of bryophytes.</td></tr>
<tr><td>1.1</td><td>• General Characters of Bryophytes.
• Classification (Rothmaler-1951 and Proskaver-1957) of Bryophytes.
• Economic and Ecological importance of Bryophytes</td><td>[7L]</td></tr>
<tr><td>1.2</td><td>• Occurrence, Morphology, anatomy and life cycles of Riccia and Marchantia.</td><td>[8L]</td></tr>
<tr><td>Module 2</td><td>Pteridophytes</td><td>[15L]</td></tr>
<tr><td colspan="3">Learning objectives:
This module is intended to:
• Create awareness in morphology, anatomy, development and life cycle of Pteridophytes.
• Identify different Pteridophytes and classify them.</td></tr>
</table>

Learning outcome:

After the successful completion of the module, the learner will be able to:

1. Grasp the overall diversity among the Pteridophytes. Illustrate general characters of Pteridophytes.
2. Classify pterophytes based on their structure, reproduction, and life cycles.
3. Understand the ecological, ethnic, and economic importance of pteridophytes.

2.1	• General Characters of Pteridophytes • Classification (Reimers, 1954) of Pteridophytes. • Economic and ecological importance of Pteridophytes.	[7L]
2.2	• Occurrence, morphology, anatomy and life cycle of ***Nephrolepis.***	[8L]
Module 3	**Gymnosperms**	**[15]**

Learning objectives:

This module is intended to make students

- Aware of gymnosperms, their morphology, anatomy, development and life cycle.
- Identify different gymnosperms and classify them.

Learning outcome:

After the successful completion of the module, the learner will be able to

1. Illustrate diversity among the gymnosperms. General characters of gymnosperms.
2. Classify gymnosperms based on their structure, reproduction, and life cycles.
3. Understand the ecological, ethnic, and economic importance of gymnosperms.

3.1	• General Characters of Gymnosperms. • Classification (Sporne- 1965) of Gymnosperms. • Economic and Ecological importance of Gymnosperms.	[8L]
3.2	• Occurrence, morphology, anatomy and life cycle of the genera: ***Cycas***	[7L]

References:

- Pandey B P (2011). College Botany (Vol. 3). S. Chand & Co. Ltd, New Delhi, India
- Pandey S.N. and Trivedi P.S(2015). A text book of Botany vol. I(Algae, Fungi, Bacteria, Viruses, Lichen & Plant pathology)12th Edition, Vikash publishing House Pvt. Ltd., New Delhi
- Biswas, C. and Johrc, B.M. (1977). The Gymnosperms. Narosa publishing House, New Delhi.
- Sharma, O.P. (2012). Pteridophyta. Tata McGraw-Hill Education, Delhi
- Vashishta, P.C. (1991). Gymnosperms. S. Chand & Company Ltd., Ram Nagar, New Delhi.

- Vashishta, P.C. (1991). Vascular Cryptogams. S. Chand & Company Ltd., RamNagar, New Delhi.
- Chopra, R. N. (2005). Biology of bryophytes. New Age International (P) Ltd. New Delhi, India.

Question Paper Template

B. Sc. (BOTANY) SEMESTER II

Core Course- II

COURSE TITLE: Higher Cryptogams and Phanerogams.

COURSE CODE: BO-MJ-201 **[CREDITS - 03]**

Module	Remembering / Knowledge	Understanding	Applying	Analysing	Evaluating	Creating	Total marks
I	3	4	-	-	4	-	11
II	3	5		-	4	-	12
III	3	5	-	-	4	-	12
Total marks per objective	9	14	-	-	12	-	35
% Weightage	26%	40%	-	-	34%	-	100%

Mapping of CLOs and PSOs

Course Learning Outcomes	Programme Outcomes					
	1	2	3	4	5	6
1. Understand the diversity among the higher cryptogams and Gymnosperm.	X	X			X	
2. Explain the systematic structure of Bryophytes, Pteridophytes and Gymnosperm.		X				
3. Students will be able to classify the Bryophytes, Pteridophytes and Gymnosperms.	X	X			X	
4. Students will be able to identify the different types of Bryophytes, Pteridophytes and Gymnosperms.	X	X			X	

B.Sc. (BOTANY) SEMESTER- II

CORE COURSE- I1

MAJOR COURSE (THEORY)

COURSE TITLE: Flowering Plants and Systematics

COURSE CODE: BO-MJ-202 [CREDITS - 03]

Course learning outcome		
After the successful completion of the Course, the learner will be able to: 1. Enlightened on the process of gradual evolution in plants. 2. Equipped to understand the increasing complexity in plant body with introduction to flowers and their parts, arrangement of flowers, arrangement of calyx, corolla, stamens and carpels. 3. Understand principles of taxonomy and importance of characters in taxonomy. 4. Critically appraise the characters obtained from different sources over and above morphological characters. 5. Study the morphology of the some common Angiospermic plants found around with their identification and classification.		
Module 1	**Structure of flower**	**[15L]**
Learning objectives: The module is intended to • Provide an overview of morphological features of the flowers. • Be acquainted with the fundamental mechanisms associated with the development, differentiation and structure of different plant organs.		
Learning outcomes: After the successful completion of the module, the learner will be able to 1. Describe the morphological characteristics of a flower. 2. Use morphology for the identification of flowering plants.		
1.1	➢ Types of Inflorescence ➢ Introduction, types, and parts of a flower. • Aestivation • Placentation • Androecium • Gynoecium	[15L]
Module 2	**Introductory Plant Systematics**	**[15L]**

Learning objectives:

This module is intended to

- Discuss naming of plants and the binomial nomenclature.

Learning outcome:

After the successful completion of the module, the learner will be able to

- Compare different methods of classification.
- Knowledge on the botanical survey of India, importance and functions of gardens and herbaria.
- Prepare Herbarium specimens.

2.1	➢ Binomial Nomenclature, Types of Classification (Artificial, Natural and Phylogenetic), APG ➢ Bentham and Hooker's System of classification (up to series) ➢ Herbarium technique, Botanical Garden and Botanical Survey of India (BSI)	[15L]
Module 3	**Angiosperm Families**	**[15L]**

Learning objectives:

This module is intended to

- Describe the morphological characteristics of flowers and their variations.
- Understand characters good and bad characters

Learning outcome:

After the successful completion of the module, the learner will be able to

1. Classify plants as per Bentham and Hooker's system of classification and know their economic importance.

3.1	➢ Classification (as per Bentham and Hooker's), general and distinguishing characters and economic importance of following angiosperm families: • Malvaceae • Fabaceae • Nyctaginaceae • Amaryllidaceae	[15L]

References:

- College Botany Vol. I - III Gangulee, et al. 5th Edi. 1990 New central book agency Calcutta.
- Taxonomy of Angiosperms V. Singh 1st Edi. 1981 Rastogi pub.
- V. Singh (1981).1st Edi Taxonomy of Angiosperms: Rastogi pub.
- B.P. Panday(2001),Taxonomy of Angiosperm: S.Chand
- A.C.Datta(1964). Botany for Degree Student. Oxford University press
- Das Datta and Gangulee,(1990).College Botany Volume-I.5th Edition New central book agency Calcutta
- Gangulee and Kar(1990).College Botany Volume-II.New central book agency Calcutta
- Mukharjee,(1990).College Botany Volume-III.New central book agency Calcutta
- A. C. Datta(1989). College Botany 3rd Edi Oxford Bombay.

Question Paper Template

F.Y. B. Sc. (BOTANY) SEMESTER II

Core Course- II

COURSE TITLE: Flowering Plants and Systematics

COURSE CODE: BO-MJ-202 **[CREDITS - 03]**

Module	Remembering / Knowledge	Understanding	Applying	Analysing	Evaluating	Creating	Total marks
I	3	4	-	-	4	-	11
II	3	-	5	-	4	-	12
III	3	-	5	-	-	4	12
Total marks per objective	9	4	10	-	8	4	35
% Weight age	26%	11%	29%	-	23%	11%	100%

Mapping of CLOs and PSOs

Course Learning Outcomes	Programme Outcomes					
	1	2	3	4	5	6
1. Understand about flower parts arrangements.	X	X				
2. Explain the types of classification of plants.	X					
3. Students will be able to identify the plant species and disrobe the plant characters.		X	X			
4. Students will be able to prepare a herbarium.			X			X

B.Sc. (BOTANY) SEMESTER II

COURSE TITLE: PRACTICAL (MJ- 201 and 202)

COURSE CODE: BOP-MJ-201 and 202 [Credit- 02]

Course Learning Outcome

After the successful completion of the Course, the learner will be able to:

1. Assign the plants to their respective family based on morphological characteristics.
2. Describe plant morphology with live specimens.

PRACTICAL Module – I (course – I)

1	**A.** study the external features of Gametophyte and sporophyte, Anatomy of ***Riccia*** using fresh or preserved specimens. **B.** To study the permanent slide of ***Riccia.***
2	**A.** Study external features of Gametophyte and sporophyte, Anatomy of ***Marchantia*** using fresh or preserved specimens. **B.** Study permanent slides of ***Marchantia.***
3	**A.** Study of the morphology of **Sporophyte of Nephrolepis** using fresh or preserved material. **B.** Preparation of slides from the fresh/preserved material of **Stolon (T.S.) of Nephrolepis.** **C.** Preparation of slides from the fresh/preserved material of leaflet passing through the **sori of Nephrolepis.** **D.** Preparation of slides from the fresh/preserved material **Rachis (T.S.) of Nephrolepis.**
4	**A.** Study fresh/preserved specimens of **Cycas coralloid roots** **B**. Study fresh/preserved specimens of **Cycas Megasporophyll.** **C.** Study fresh/preserved specimens of **Cycas Microsporophyll.** **D.** Study fresh/preserved specimens of **Cycas Rachis.** **E.** Preparation of slides from fresh or preserved specimen material of **Cycas leaflet.**

PRACTICAL Module – I (course – II)

1	**Study Flower: (any of the type as per availability)** • Regular Flower- *Ipomoea* • Irregular Flower- *Clitoria and Caesalpinia*

	• Uniscxual Flower- Coccinia/Papaya • Bisexual *Flower-Hibiscus*
3	**Study of inflorescence of the following:** **A. Racemose:** *a.* *Raceme: Caesalpinia pulcherrima, Brassica juncea.* *b.* Spike: *Achyranthes aspera, Polianthes tuberosa.* *c.* Spadix: *Colocasia* *d.* Catkin: *Acalypha hispida* *e.* Corymb: *Cassia, lxora* *f* Umbel: *Coriander* *g.* Capitate: *Acacia, Albizia* *h.* Capitulum: *Helianthus and Tridax* **B. Cymose:** • Unbranched a. Solitary Terminal: *Datura* b. Solitary Axillary: *Hibiscus* • Branched A. Monochasial a. Helicoid: *Hamellia patens* b. Scorpoid: *Heliotropium* B. Dichasial or Biparous: *Clerodendrum, Nyctanthes and Jasminum* C. Polychasial or Multiparous: *Nerium and Calotropis*
4	**Study the following placentation types:** Marginal, Axile, Free central, Parietal, Basal and Superficial.
5	Study types of **Aestivations.**
6	Study types of **Bracts.**
7	Study types of **Stamen.**
8	Study of morphological characters, floral dissection, T.S of ovary and floral formula of **Malvaceae.**
9	Study of morphological characters, floral dissection, T.S of ovary and floral formula of **Fabaceae.**

10	Study of morphological characters, floral dissection, T.S of ovary and floral formula of **Nyctaginaceae.**
11	Study of morphological characters, floral dissection, T.S of ovary and floral formula of **Amaryllidaceae.**

- Every candidate shall complete a laboratory course by the regulations issued from time to time by the Academic Council on the recommendation of the Board of Studies.
- Every candidate shall record observations directly in the laboratory journal. Every journal shall be signed periodically.
- At the end of the semester candidate shall produce a certified journal during the practical examination.

B.Sc. (BOTANY) SEMESTER II

MINOR COURSE THEORY

COURSE TITLE: HIGHER CRYPTOGAMS AND PHENEROGAMS

COURSE CODE: BO –MI-201 [CREDITS - 02]

Course learning outcome
After the successful completion of the Botany Minor Course, the learner will be able to: • Familiarize and identify viruses, bacteria, algae, and fungi. • Describe morphology of angiosperms like root, stem, leaf, flower and inflorescence.

Module 1	**Bryophytes and Pteridophytes**	**[15L]**

Learning objectives:

The module is intended to

- Provide a thorough knowledge of general characters and classification of Bryophytes.
- Describe Vegetative structure and Life cycle of ***Riccia*** and ***Marchantia.***
- Acquire knowledge about general characters and classification of pteridophytes.
- Describe the Vegetative structure and Life cycle of ***Nephrolepis.***

Learning outcomes:

After the successful completion of the module, the learner will be able to

1. Gain knowledge about diversity among the bryophytes and pteridophytes with their general characters.
2. Understand the Classification of bryophytes and pteridophytes based on their structure, reproduction and life cycles.
3. Evaluate the ecological, ethnic, and economic value of bryophytes and pteridophytes

1.1	**BRYOPHYTES-1** • General Characters of Bryophytes. • Classification (Rothmaler-1951 and Proskaver-1957) of Bryophytes.	[3L]
1.2	**BRYOPHYTES-2** • Morphology, anatomy, occurrence and life cycle of Riccia and ***Marchantia.*** • Economic and Ecological importance of Bryophytes	[4L]
1.3	**PTERIDOPHYTES-1** • General Characters of Pteridophytes. • Classification (Reimers, 1954) of Pteridophytes.	[4L]

1.4	**PTERIDOPHYTES-2** • Morphology, anatomy, occurrence, and life cycle of the genera: ***Nephrolepis*** • Economic and ecological importance of Pteridophytes.	[4L]
Module 2	**Gymnosperm and Angiosperm**	**[15L]**

Learning objectives:

This module is intended to

- Acquire knowledge about the morphology, internal structure and importance of gymnosperms and Angiosperm.
- Discuss the importance of characters obtained from some modern disciplines as an aid to plant taxonomy.
- Realize the values of diversity and its importance in human welfare.
- To understand the basis of plant nomenclature and classification.

Learning outcome:

After the successful completion of the module, the learner will be able to

1. Identify flowers and their parts, arrangement of flowers, arrangement of calyx and corolla, and arrangement of the placenta.
2. Study basic principles of taxonomy and use of rules of nomenclature.
3. Identify the local angiosperms to the families prescribed and prepare herbarium specimen.

2.1	**GYMNOSPERM-1** • General Characters of Gymnosperms. • Classification (Sporne- 1965) of Gymnosperms.	[3L]
2.2	**GYMNOSPERM-2** • Occurrence, morphology, anatomy and life cycle of the genera: ***Cycas*** • Economic and Ecological importance of gymnosperm	[4L]
2.3	**ANGIOSPERM-1** • Introduction, types and parts of flower. • Inflorescence • Aestivation • Placentation • Androecium • Gynoecium	[4L]

2.4	**ANGIOSPERM-2** • Introduction to code and some rules of nomenclature. • Binomial nomenclature, Types of Classification (Artificial, Natural and Phylogenetic) • Bentham and Hooker's System of classification (up to series) .	[4L]

REFERENCES:

- A.C.Datta(1964). Botany for Degree Student. Oxford University press
- Das Datta and Gangulee,(1990).College Botany Volume-I.5th Edition New central book agency Calcutta
- Gangulee and Kar(1990).College Botany Volume-II.New central book agency Calcutta
- Mukharjee,(1990).College Botany Volume-III.New central book agency Calcutta
- A. C. Datta(1989). College Botany 3rd Edi Oxford Bombay
- . V. Singh (1981).1st Edi Taxonomy of Angiosperms: Rastogi pub.
- B.P. Panday(2001),Taxonomy of Angiosperm: S.Chand
- Pandey B P (2011). College Botany (Vol. 3). S. Chand & Co. Ltd, New Delhi, India
- Pandey S.N. and Trivedi P.S(2015). A text book of Botany vol. I(Algae, Fungi, Bacteria, Viruses, Lichen & Plant pathology)12th Edition, Vikash publishing House Pvt. Ltd., New Delhi
- Biswas, C. and Johrc, B.M. (1977). The Gymnosperms. Narosa publishing House, NewDelhi.
- Sharma, O.P. (2012). Pteridophyta. Tata McGraw-Hill Education, Delhi
- Vashishta, P.C. (1991). Gymnosperms. S. Chand & Company Ltd., Ram Nagar, NewDelhi.
- Vashishta, P.C. (1991). Vascular Cryptogams. S. Chand & Company Ltd., Ram Nagar, New Delhi.
- Chopra, R. N. (2005). Biology of bryophytes. New Age International (P) Ltd. New Delhi, India.

Mapping of CLOs and PSOs

Course Learning Outcomes	Programme Outcomes					
	1	2	3	4	5	6
1. Understand the diversity among the Higher Cryptogams and Phanerogams.	X	X			X	
2. Explain the systematic structure of Bryophytes, Pteridophytes and Phanerogams.		X				
3. Students will be able to classify the Bryophytes, Pteridophytes, and Phanerogams.	X	X			X	
4. Students will be able to identify the different types of Bryophytes, Pteridophytes and Phanerogams.	X	X			X	

Question Paper Template

B. Sc. (BOTANY) SEMESTER II

MINOR BOTANY (THEORY)

COURSE TITLE: HIGHER CRYPTOGAMS AND PHENEROGAMS

COURSE CODE: BO-MI-201 **[CREDITS - 02]**

Module	Remembering/ Knowledge	Understanding	Applying	Analysing	Evaluating	Creating	Total marks
I	3	6	--	3	--	--	12
II	3	6	--	4	--	--	13
Total marks per objective	06	12		07			25
% Weightage	24%	48%		28%			100%

BSc. (BOTANY) SEMESTER II

COURSE TITLE: PRACTICAL(MI)-II

COURSE CODE: BOP MI-201 [CREDIT- 02]

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: 1. Understand the anatomical structure of ***Marchantia*** and ***Riccia***. 2. Differentiate the sporophytic and gametophytic structure. 3. Study the morphological characters of Angiosperms.

PRACTICAL Module – I (Course – II)	
1	**A.** Study external features of gametophyte & sporophyte, anatomy of ***Marchantia*** using fresh or preserved specimens. **B.** Study permanent slides of ***Marchantia.***
2	**A.** To study the external features of Gametophyte & Sporophyte, the Anatomy of ***Riccia*** using fresh or preserved specimens. **B.** To study the permanent slide of ***Riccia***
3	**A.** Study of the morphology of Sporophyte of ***Nephrolepis*** using fresh or preserved specimens. **B.** Preparation of slides from the fresh/preserved material of Stolon (T.S.) of ***Nephrolepis***
	C. Preparation of slides from the fresh/preserved material of leaflet passing through the sori of ***Nephrolepis.*** **D.** Preparation of slides from the fresh/preserved material Rachis (T.S.) of ***Nephrolepis***
4	**A.** Study fresh/preserved specimens of ***Cycas*** coralloid roots, **B.** Study fresh/preserved specimens of ***Cycas*** Megasporophyll **C.** Study fresh/preserved specimens of ***Cycas*** Microsporophyll. **D.** Study fresh/preserved specimens of ***Cycas*** Rachis.

B.Sc. (BOTANY) SEMESTER II

Multidisciplinary

COURSE TITLE: Ethnobotany, Pharmacognosy and Economic botany

COURSE CODE: BO-MDC-201 [CREDITS - 02]

Course learning outcome		
After the successful completion of the Course, the learner will be able to: 1. Understand delimits and scopes of ethnobotany, pharmacognosy & economic botany. 2. Learn to identify the useful medicinal plants and crop plants found around you. 3. Effectively communicate scientific ideas both orally and in writing. 4. Collect crude drugs from field/market and test their genuineness and quality.		
Module 1	**Introduction to Ethnobotany and Pharmacognosy**	**[15L]**
Learning objectives: The module is intended to ● Provide comprehensive knowledge on different aspects related to medicinal plants. ● Acquire knowledge on the status and the developments in ethnobotany and pharmacognosy with a practical approach. ● To produce a student who thinks independently, and critically and discusses various aspects of medicinal plants and crop plant. ● **P**repar**e** drugs of natural origin and test their quality.		
Learning outcomes: After the successful completion of the module, the learner will be able to 1. Be able to discuss patterns of cultural evolution with plants. 2. Understand and interrelate the different systems of medicine. 3. Discuss the role, importance and contribution of ethnomedicine, and active compounds of pharmacological importance.		
1.1	➢ Introduction, aim, scope and importance of: • Ethnobotany. • Pharmacognosy.	[5L]
1.2	➢ Introduction to different systems of medicine (Ayurvedic, Siddha and Homeopathy) ➢ Ethnobotany and its importance in medicine. Common and rare medicinal plants of South Gujarat. ➢ Principal active compounds and pharmacological uses.	[10L]

Module 2	Economic Botany	[15L]
Learning objectives: The module is intended to • Capacitate students to stand and face national and international examinations related to ethnobotany, pharmacognosy & economic botany. • Empower the student to become an employee or an entrepreneur in Botany, Pharma companies, NGOs, BSI, ZSI and forest department.		
Learning outcomes: After the successful completion of the module, the learner will be able to: 1. Understand the importance of botanical resources around them. 2. Appreciate economic and ecological importance of plants and strive to cultivate and conserve them.		
2.1	➢ Be aware the following plants: botanical name, family, parts used, external morphology, cultivation and economic uses. A. **Cereals** – Rice (*Oryza sativa*), wheat (*Triticum aestivum*), Maize (*Zea mays*). B. **Pulses** – Pigeon pea (Toor- *Cajanus cajan*), Chick Pea (Chana- *Cicer arietinum*), Green gram (Moong- *Vigna radiata*). C. **Spices** – Cardamom (*Elettaria cardamomum*), Black pepper (*Piper nigrum*), Turmeric (*Curcuma longa*). D. **Oils** – Groundnut (*Arachis hypogaea*), Castor (*Ricinus communis*), Sesame (*Sesamum indicum*).	[8L]
2.2	➢ Be aware the following plants: botanical name, family, parts used, external morphology, cultivation and economic uses. A. **Fibres** – Cotton (*Gossypium herbaceum*), Jute (*Corchorus*) and coir (cocos nucifera). B. **Timbers–** Teak (*Tectona grandis*), Shisham (*Dalbergia latifolia* and *D. Sissoo*) and Sevan (*Gmelina arborea*)	[7L]

	C. **Dyes-**Sinduri (*Bixa orellana*), Mehendi (*Lawsonia inermis*) D. **Beverages –** Tea (*Camelia sinensis*), Coffee (*Coffea arabica)*, Cocoa (*Theobroma cacao*).	

References:

- Vinod D Rangari(2017). Pharmacognosy & Phytochemistry Vol.1and 2. Career publication
- Biren Shah & A. K. Seth(2019). Textbook of Pharmacognosy & Phytochemistry. Elseviers.
- S. B Gokhale, C.K. Koktae, and A.R Purohit(2009) A text book of Pharmacognosy. Nirali Prakashan.
- Michael Heinrich and Joanne Barnes(2017). Fundamentals of Pharmacognosy and Phytotherapy4th Edition. Elseviers..
- Bendre and Kumar(1999) Economic Botany. Rastogi Publications
- Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
- Samba Murty and Subrahmanyam (2011). Text Book of Modern Economic Botany, CBS Publishers and Distributors, New Delhi.
- Hill, Albert F(2016) Economic Botany : A Text book of useful plants and Plant products , Surjeet Publication.
- Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
- Singh, Pandey and Jain (2017). Economic Botany, Rastogi Publication, Meerut.
- B. Baruah (2017). Economic Botany, Kalyani Publishers, New Delhi.

Question Paper Template

B. Sc. (BOTANY) SEMESTER II

Multidisciplinary

COURSE TITLE: Ethnobotany, Pharmacognosy and Economic Botany

COURSE CODE: BO-MDC-201 [CREDITS - 02]

Module	Remembering/ Knowledge	Understanding	Applying	Analysing	Evaluating	Creating	Total marks
I	5	10	10	-	-	-	25
II	5	10	10	-	-	-	25
Total marks per question	10	20	20	-	-	-	50
% Weightage	20%	40%	40%	-	-	-	100%

Mapping of CLOs and PSOs

Course Learning Outcomes	Programme Outcomes					
	1	2	3	4	5	6
1. Understand the different systems of Medicine.	X	X	X			
2. Explain the different types of plants' traditional uses and pharmacognosy.		X	X			X
3. Students will be able to cultivate crop plants and medicinal plants and make an ethno medicine.		X				X
4. Students will be able to use minor and major products of plants.	X		X			

B.Sc. (BOTANY) SEMESTER II

Multidisciplinary (Practical)

COURSE TITLE: Ethnobotany, Pharmacognosy and Economic botany

COURSE CODE: BOP-MDC-201 [CREDIT- 02]

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: 1. Demonstrate practical skills. 2. Correlate their Botany theory concepts through practicals. 3. Increase the understanding of the students about the ethnobotany, pharmacognosy and economic botany.

PRACTICAL Module – I

1	To detect the presence of reducing sugar.
2	To detect the presence of non-reducing sugar.
3	To study and observe starch grains.
4	To detect the presence of proteins.
5	To detect the presence of lipids.
6	To study medicinal plants available around to you.

PRACTICAL Module - II

1	To study economic importance of Cereals – Rice (*Oryza sativa*), wheat (*Triticum*), Maize (*Zea mays*). (botanical name, family, part used, external morphology and their uses)
2	To study economic importance of Pulses – Pigeon pea (Toor- *Cajanus cajan*), Chick Pea (Chana- *Cicer arietinum*), Green gram (Moong- *Vigna radiata*) (botanical name, family, part used, external morphology and their uses).
3	To study the economic importance of Spices – Cardamom (*Elettaria cardamomum*), Black pepper (*Piper nigrum*), Turmeric (*Curcuma longa*) (botanical name, family, part used, external morphology and their uses)
4	To study economic importance of Fibres – Cotton (*Gossypium herbaceum*), Jute (*Corchorus*) and coir (Cocos nucifera). (botanical name, family, part used, external morphology and their uses)
5	To study economic importance of Timber – Teak (*Tectona grandis*), Shisham (*Dalbergia sp.*), Sevan (*Gmelina arborea*) (botanical name, family, part used, external morphology and their uses)

6	To study economic importance of Dyes – Sinduri (*Bixa orellana*), Mehendi (*Lawsonia inermis*) (botanical name, family, part used, external morphology and their uses)
7	To study economic importance of Beverages – Tea (*Tectona grandis*), Coffee (*Coffea arabica* and *Coffea canephora.)*, Cocoa (*Theobroma cacao*). (botanical name, family, part used, external morphology and their uses)
8	To study economic importance of Oil – Groundnut (*Arachis hypogaea*), Castor (*Ricinus communis*), Sesame (*Sesamum indicum*). (botanical name, family, part used, external morphology and their uses)

- Every candidate shall complete laboratory course in accordance with the regulations issued from time to time by Academic Council on the recommendation of the Board of Studies.
- Every candidate shall record observation directly in the laboratory journal. Every Journal shall be signs periodically.
- At the end of the semester candidate shall produce certified journal during the practical examination.

B.Sc. (BOTANY) SEMESTER II

Skill Enhanced Course

COURSE TITLE: Basics of crude herbal drugs

COURSE CODE: BO- SEC-201 [CREDITS - 01]

Course Learning Outcome		
After the successful completion of the Course, the learner will be able to: 1. Develop skill to identify medicinal plants in different stages of growth and dried material. 2. Effectively communicate scientific ideas both orally and in writing. 3. Prepare crude drugs of natural origin and test their quality. 4. Master pharmacognostic techniques to identify crude drugs.		
Module 1	**Production & extraction of crude drugs**	**[15L]**
Learning objectives:		

The module is intended to

- Provide a comprehensive knowledge on different aspects related to medicinal plants and crop plants.
- Deliver knowledge on the methods of studying ethnobotany, pharmacognosy and economic botanywith a practical approach.
- Produce a student who thinks independently, and critically and discusses various aspects of medicinal plants and crop plant life.

Learning outcomes:

After the successful completion of the module, the learner will be able to

1. Establish relationship between human societies and plants.
2. Differentiate between ethnobotany, pharmacognosy and economic botany.

1.1	➢ Introduction, Definition, History, Scope and development of Pharmacognosy. ➢ **Source of drugs:** Terrestrial and aquatic Plants. ➢ **Classification of drugs:** Alphabetical, Morphological, Taxonomical, Chemical, Pharmacological. ➢ **Quality control of drugs of natural origin:** Adulteration, evaluation by organoleptic, microscopic, physical, chemical, and biological methods and properties.	[7L]
1.2	➢ Cultivation and collection of drugs of natural origin. ➢ Factors influencing cultivation of medicinal plants: Atmospheric and soil factors. ➢ Drying, Grading, Packaging, Storage, Preservation, Sterilization. ➢ Different extraction methods: Maceration, Percolation, Extraction- continuous (Soxhlet), aqueous (decoction, Infusion, Digestion, Tincture).	[8L]

References:

- inod D Rangari(2017). Pharmacognosy & Phytochemistry Vol.1and 2. Career publication
- Biren Shah & A. K. Seth(2019). Textbook of Pharmacognosy & Phytochemistry. Elseviers.
- S. B Gokhale, C.K. Koktae, and A.R Purohit(2009) A text book of Pharmacognosy. Nirali Prakashan.
- Michael Heinrich and Joanne Barnes(2017). Fundamentals of Pharmacognosy and Phytotherapy 4th Edition. Elseviers

Question Paper Template

B. Sc. SEMESTER II

Skill Enhanced Course

COURSE TITLE: Basics of crude herbal drugs

COURSE CODE: BO-SEC-201 [CREDITS - 01]

Module	Remembering / Knowledge	Understanding	Applying	Analysing	Evaluating	Creating	Total marks
I	5	10	10	-	-	-	25
Total marks per Questions	5	10	10	-	-	-	25
% Weightage	10%	45%	45%	-	-	-	100%

Mapping of CLOs and PSOs

Course Learning Outcomes	Programme Outcomes					
	1	2	3	4	5	6
1. Understand about pharmacognosy and crud drugs.		X	X			
2. Explain the different types of plants' traditional uses and pharmacognosy.	X	X	X			
3. Students will be able to cultivate medicinal plants and make crud drugs.		X				
4. Students will be able to use different types of extraction methods for crud drug preparation.	X		X			

F.Y. BSc. (BOTANY) SEMESTER II

Skill Enhanced Course (Practical)

COURSE TITLE: Basics of crude herbal drugs

COURSE CODE: BOP- SEC-201 [CREDIT- 01]

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: 1. Demonstrate practical skills. 2. Correlate their theory concepts through practical.

PRACTICAL Module – I

1	Collection of different plant parts for their medicinal use.
2	Drying, Grading and Storage of collected plant parts.
3	Learn methods of maceration.
4	Conduct the extraction through Percolation.
5	Conduct the extraction through Soxhlet.
6	Conduct the extraction through decoction.
7	Conduct the extraction through Infusion.
8	Conduct the extraction through Digestion.
9	Conduct the extraction as Tincture.
10	Paper chromatography of the crude extract of medicinal plant.
11	Perform qualitative analysis of primary metabolite.
12	Perform qualitative analysis of secondary metabolite.
13	To identify crude drugs by using the organoleptic method – Cinnamon, Clove, Fennel, Harde.

- Every candidate shall complete laboratory courses by the regulations issued from time to time by the Academic Council on the recommendation of the Board of Studies.
- Every candidate shall record observations directly in the laboratory journal. Every journal shall be signed periodically.
- At the end of the semester candidate shall produce a certified journal during the practical examination.