Department of Botany

<u>Syllabus</u> <u>Furkating College (Autonomous)</u> <u>FYUGP</u>



B.Sc. in BOTANY

FOUR YEAR UNDER-GRADUATE PROGRAMME (FYUGP) IN BOTANY, FURKATING COLLEGE (AUTONOMOUS)

1. The Preamble:

Present day plant science is a fusion of the traditional components with the modern aspects of biochemistry, molecular biology, Genetics and biotechnology. Over the years, plant science (Botany) has shown enormous gain in information and applications owing to tremendous inputs from research in all its aspects. With the global need for conservation, field plant biologists have contributed significantly in assessing and exploring newer dimensions for plant diversity. New insights have been gained in functional and structural aspects of plant development by utilizing modern tools and techniques for botanical research. Challenging areas of teaching and research have emerged in ecology and reproductive biology. Concern for ever increasing pollution and climate change is at its highest than ever before. Keeping the above mentioned advancements and rich plant resources in North East India in view, a revised curriculum is offered by Dibrugarh University at the undergraduate level as per the National Education Policy-2020 so that the undergraduate Botany students of Furkating college shall have the benefit of a balanced, carefully-crafted course structure taking care of different aspects of plant science, namely plant diversity, physiology, biochemistry, molecular biology, Genetics and Crop improvement, reproduction, anatomy, taxonomy, ecology, economic botany and the impact of environment on the growth and development of plants. All these aspects have been given due weightage over the eight semesters. It is essential for the undergraduate students to acquaint themselves with various tools and techniques for exploring the world of plants up to the subcellular level. Keeping view of employment entrepreneurship, applied courses have also been introduced. These courses shall provide the botany students hands on experience and professional inputs. On the whole, the curriculum is a source of lot of information and is supported by rich resource materials. It is hoped that a student graduating in Botany with the new curriculum will be able to explore the rich plant diversity of North East India, more particularly of Assam

2. Introduction:

Furkating college UG syllabus of Botany is designed as per the guidelines of National Education Policy-2020. This Four Year Under Graduate Programme (FYUGP) in Botany consists of Major (Core) disciplines, Minor disciplines, Multi Disciplinary Generic Elective Courses (GE), Ability Enhancement Courses (AEC), Value Added Courses (VAC), Skill Enhancement Courses (SEC), Environmental Education (EE), YOGA, Community Engagement like NCC/NSS, Digital and Technological solutions, Internship, Field Studies, Research Ethics, Research Projects and Discipline Specific electives (DSE) to acquaint the students with balanced knowledge on the plant resources, environment, contemporary issues and entrepreneurship.

The Bachelor of Science in Botany of Furkating college (autonomous) under NEP-2020 is a programme with multiple exit options. UG certificate, UG Diploma, UG Degree and UG Degree (Honours with Research) in Botany will be awarded to students after successful completion of one, two, three and four years respectively. It is expected that, on successful completion of this four yearprogramme students will be skilled in multidisciplinary aspects for exploration and sustainable utilization of plant/natural resources of NE region of India.

3. Aims of Four Year Under-Graduate Programme (FYUGP) in Botany:

1. To introduce the students with the rich biodiversity of North east India, more particularly Assam

2. To enable the students to explore the potential of plant resources for human welfare and their use in a sustainable way.

3. To develop capabilities of students for critical evaluation of contemporary issues related to environment and nature.

4. To generate skilled human resource for biological entrepreneurship.

5. To study the medicinal aspect of different medicinal plant.

4. Graduate Attributes of the FYUGP in Botany:

Disciplinary Knowledge

The graduates should have the ability to demonstrate comprehensive knowledge and understanding of both the theoretical and applied components of plant science and allied areas of study in a multidisciplinary context.

Students should have the ability to connect relevant disciplines, and recent trends in biological and contemporary issues.

Communication Skills

The graduates in Botany should have the ability to present and express information, thoughts, experiments and results clearly and concisely for effective communication of any issues related to plant and nature.

Moral and Ethical Awareness/Reasoning

Ability to recognise ethical issues that are pertinent to one's work and pledge not to engage in unethicalbehaviour such as plagiarism, copyright and infringement of intellectual property rights; ability toappreciate recent developments in various fields and one's research with honesty and integrity in all aspects.

Multicultural Competence

Ability to correlate and compare recent developments in various branches of plant science worldwide; ability to collaborate research in various fields of biology with other researchers from allied organisations; acquisition of knowledge on traditional practices of different ethnic communities.

Information/Digital Literacy

The graduates of Botany should have the ability to utilize Information and

Communications Technology (ICT) tools, biological databases and computer and softwares in solving biological problems.

Reflective Thinking and Problem Solving:

After completion of graduation in Botany the students will be able to understand the value of plant resources, need for conservation of plant resources, bio-prospecting and sustainable utilization of plant resources for human welfare.

Critical Thinking

The graduates of Botany should be competent for critical analysis of problems related to plant and nature, sustainable uses of biological resources and their conservation strategies.

5. Programme Learning Outcome

P.O. 1: Knowledge on diversity of plant resources, their importance and strategies for conservation.

P.O. 2. Scientific approach to address problems in plant science and use of plant based products for human welfare.

P.O. 3. Application of knowledge and skills in entrepreneurship.

P.O. 4. Develop new techniques/methods for solving the problems of the allied disciplines.

6. Teaching Learning Process

The programme allows to use varied pedagogical methods and techniques both within classroom and beyond.

- a. Lecture
- b. Practical
- c. Tutorial
- d. Documentary on related topic
- e. Project Work/Dissertation
- f. Group Discussion
- g. Seminars/workshops/conferences
- h. Field visits and Report/Excursions
- i. Mentor/Mentee
- 7. Assessment
 - a. Home assignment
 - b. Project Report
 - c. Class Presentation: Oral/Poster/Power point
 - d. Group Discussions

 - e. In semester examinationsf. End Semester examinations

FUKATING COLLEGE (AUTONOMOUS), FURKATING GOLAGHAT-785610

FYUGP Structure as per UGC Credit Framework of December, 2022

Year	Semester	Course	Title of the Course	Total Credit
		C - 1	Understanding Cryptograms : Non Archegoniate & Archegoniate.	4
		Minor 1	Understanding Cryptograms : Non Archegoniate & Archegoniate	4
		GEC - 1	Natural resource management	3
	1 st Semester	AEC 1	Modern Indian Language	4
		VAC 1	Understanding India	2
		VAC 2	Health and Wellness	2
		SEC 1	Tea plantation and management/Mushroom Culture technology	3
¥	22			
Year 01		C - 2	Morphology and Reproduction of Gymnosperm & Angiosperm	4
		Minor 2	Morphology and Reproduction of Gymnosperm & Angiosperm	4
		GEC 2	Plant Diversity and Human Welfare	3
	2 nd Semester	AEC 2	English Language and Communication Skills	4
		VAC 3	Environmental Science	2
		VAC 4	Yoga Education	2
		SEC 2	Biofertilizers/Conservation and Cultivation of Orchids	3
			22	
The stu requisite summer	udents on exit sh 44 Credits in Ser term or internsh	all be award nester 1 and hip / Apprent	led Undergraduate Certificate (in the Field of Study/Discipline) after securir I 2 provided they secure 4 credits in work based vocational courses offere iceship in addition to 6 credits from skill based courses earned during 1 st Semester	ng the d during and 2 nd
		C - 3	Cell Biology	4
		C - 4	Plant Biochemistry & Molecular Biology	4
	Ord Compositor	Minor 3	Plant Physiology & Metabolism	4
	3 rd Semester	GEC – 3	Ethnobotany	3
Year 02		VAC 3	Digital and Technological Solutions / Digital Fluency	2
		AEC – 3	Communicative English / Mathematical Ability	2
				-
		SEC – 3	Nursery and Gardening/Medicinal Botany	3

Abbreviations Used:

- C = Major
- GEC = Generic Elective Course / Multi Disciplinary Course
 AEC = Ability Enhancement Course
- SEC = Skill Enhancement Course
- VAC = Value Added Course

Structure of question paper shall be as follows : 60 marks paper :

1	1 mark questions	x7 nos.(no alternative)	=07
2	2 marks very short answer	X4nos. (no alternative)	=08
	type question		
3	5 mark short answer type question	X3nos. of out of 5 questions	=15
4	10 marks long answer type question	X3nos. of out of 5 questions	=30
		Total marks	60

FURKATING COLLEGE (AUTONOMOUS), FURKATING -785610, ASSAM FYUGP Structure as per UGC Credit Framework, NEP-2020

DETAILED SYLLABUS OF 1st SEMESTER

Title of the Course	: Understanding Cryptogams: on Archegoniate and archegoniate
Course Code	: BOTA-MA-1014
Nature of the Course	: MAJOR/CORE COURSE I
Total Credits	04
Distribution of Marks	: 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES: The objective of this course is to provide knowledge to the students on various forms of Non archegoniate & archegoniate diversity - their characteristics, life cycle pattern mode of reproduction and economic importance.

UNITS	CONTENTS	L	Τ	Р	Total
					Hours
	Introduction to Cryptogams: Characteristics features and	12	3	-	15
	their divisions.				
Ι	Introduction to Algae :(Non-archegoniate)				
	General characteristics; Classification system of Fritsch, and				
1	Basic concept of evolution; range of thallus organization;				
	cell structure; pigment system, reserve food, flagellation,				
6	methods of reproduction. Role of algae in the environment,				
Marks	agriculture, biotechnology and industry.				
	Study of major divisions of Algae:				
	Comparative study of Characteristics; Occurrence; Mode of				
	reproduction; Morphology and life cycles of				
	Chylamydomonas, Volvox, Oedogonium, vaucheria, Chara,				
	Ectocarpus, Batrachospermum and Polysiphonia. Diatoms				
	general - characteristics and importances. Cynobacteria;				
	concept of fresh water & marine algae. Anabanae, Nostoc				
	Introduction to fungi(Non archaegoniate)	11	3	-	14
II	Salient features; Classification; Thallus organization; Cell				
	wall composition; Mode of Nutrition; Classification.				
16	Mycorrhiza (Ectomycorrhiza, Endomycorrhiza and their				
Marks	significance); Lichen: Classification & Economic				
	Importances. Concept on toadstool and mushroom				
	Study of major divisions of fungi:				
	General characteristics of Chytridiomycota, Zygomycota,				
	Ascomycota, Basidiomycota, Oomycota: asexual and sexual				
	fruiting bodies; Life cycle of Phytophthora, Saccharomyces,				
	Penicillium, Paccinia, Peziza, Agaricus,cyathus				
	Economic importance of fungi.				

	Where, L: Lectures T: Tutorials	P:	Pract	ticals	
	Total	40	10	25	75
	5. Study of fossil slide - Rhynia, calamites, sphenophyllum				
	Marselia				
	Lycopodium ,Selaginella, Equisetum and Ophioglossium,				
	4. Study of vegetative and reproductive structures of				
	Marchantia Anthoceros Sphagnum				
	3 Study of vegetative and reproductive structures of <i>Riccia</i>				
	Peziza.				
	Phytophthora Saccaromyces Penicillium Puccinia and				
	2 Study of vegetative and reproductive structures of				
17101K5	slides				
Marks	electron micrographs/temporary preparations and permanent				
20	Vaucheria Ectocarnus Diatom and Polysinhonia through				
i ractical	Clamydomonus Nostoc Volvor Ordononium Chara			23	23
Practical	1 Study of vegetative and reproductive structures of			25	25
	calamitas sphenophyllum				
	India Process of fossilization fossil ptoridor byte Physics				
	evolution; Ecological and economic importance.				
Marks	<i>Ophioglossum, Marselia</i> . Heterospory, and seed habit, stelar				
14 M	Psilotum,lycopodium,Selaginella,Equisetum and				
1.4	Classification, morphology, anatomy and reproduction of				
IV	Pteridophytes:(Archegoniate)	08	2		10
	India.				
	Distribution of Liverworts & mosses with reference to N.E				
	Ecological and economic Importance of bryophytes.				
	Reproduction and evolutionary trends in bryophytes.				
	of Riccia, Marchantia, Anthoceros, Sphagnum;				
Marks	alternation of generation- Gametophytic &Sporophytic phase				
14	morphology, anatomy and reproduction, concept on				
	General features; classification; thallus organization;				
III	Bryophytes :(Archegoniate)	09	2		11

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination -
- Others (Any one)
 - Sessional Examination

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o Assignments

LEARNING OUTCOMES:

- (1) Know the classification, morphology, reproduction and economic and ecologicalimportance of cryptogams.
- (2) Handling and observation of algae, fungi, bryophytes and pteridophytes.

SUGGESTED READINGS:

- 1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
- 2. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
- 3. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. AravaliInternational, New Delhi.
- 4. Vashistha B.R et.al.,(1999). Botany for Degree Students 'Algae', S. Chand publisher.
- Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, JohnWiley & Sons (Asia) Singapore. 4th edition.
- 6. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge.
 - 3 edition
- 7. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan PublishersIndia Ltd.
- 8. Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot.Allahabad.
- 9. Vanderpoorten, A. & Goffinet, B. (2009) Introduction to Bryophytes. CambridgeUniversityPress
- 10. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
- 11. Pandey S.N. et. al, (1995). A text book of Pteridophyta, Vikas Publishing House Pvt Ltd., NewDelhi.

FURKATING COLLEGE (AUTONOMOUS), FURKATING -785610, ASSAM FYUGP Structure as per UGC Credit Framework, NEP-2020

DETAILED SYLLABUS OF 1st SEMESTER

Title of the Course	: Understanding Cryptogams: on Archegoniate and archegoniate
Course Code	: BOTA-MI-1014
Nature of the Course	: MINOR COURSE I
Total Credits	04
Distribution of Marks	: 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES: The objective of this course is to provide knowledge to the students on various forms of Non archegoniate and archegoniate diversity - their characteristics, life cycle pattern mode of reproduction and economic importance.

UNITS	CONTENTS	L	Τ	Р	Total
					Hours
	Introduction to Cryptogams: Characteristics features and	12	3	-	15
	their divisions.				
Ι	Introduction to Algae : :(Non-archegoniate)				
	General characteristics; Classification system of Fritsch, and				
16	Basic concept of evolution; range of thallus organization;				
Marks	cell structure; pigment system, reserve food, flagellation,				
	methods of reproduction. Role of algae in the environment,				
	agriculture, biotechnology and industry.				
	Study of major divisions of Algae:				
	Comparative study of Characteristics; Occurrence; Mode of				
	reproduction; Morphology and life cycles of				
	Clamydomonous, Volvox, Oedogonium, Chara, Ectocarpus,				
	Batracospermum and Polysiphonia. Diatoms general -				
	characteristics and importance. Cynobacteria; concept of				
	fresh water & marine algae. Anabanae, Nostoc				
	Introduction to fungi:(Non-archegoniate)	11	3	-	14
II	Salient features; Classification; Thallus organization; Cell				
	wall composition; Mode of Nutrition; Classification.				
16	Mycorrhiza (Ectomycorrhiza, Endomycorrhiza and their				
Marks	significance); Lichen: Classification & Economic				
	Importance. Concept on toadstool and mushroom				
	Study of major divisions of fungi:				
	General characteristics of Chytridiomycota, Zygomycota,				
	Ascomycota, Basidiomycota, Oomycota: asexual and sexual				
	fruiting bodies; Life cycle of Phytophthora, Saccharomyces,				
	Penicillium, Paccinia, Peziza, Agaricus, Cyathus Economic				
	importance of fungi.				

III	Bryophytes :(Archegoniate)	09	2		11
	General features; classification; thallus organization;				
14	morphology, anatomy and reproduction of Riccia,				
Marks	Marchantia, Anthoceros, Sphagnum; Reproduction and				
	evolutionary trends in bryophytes. Ecological and economic				
	importance of bryophytes. Distribution of Liverworts &				
	mosses with reference to N.E India.				
IV	Pteridophytes:	08	2		11
	Classification, morphology, anatomy and reproduction of				
14	Psilotum,Lycopodium,Selaginella,Equisetum and				
Marks	Ophioglossum, Marselia. Heterospory, Seed habit, stelar				
	evolution; Ecological and economic importance.				
	Distribution of fern and fern allies with reference to N.E				
	India. Process of fossilization, fossil pteridophyte- Rhynia,				
	calamites, sphenophyllum				
				25	25
Practical	1 Study of vegetative and reproductive structures of				
	Clamydomonus, Nostoc, Volvox, Oedogonium, Chara,				
20	Vaucheria, Ectocarpus, Diatom and Polysiphonia, through				
Marks	electron micrographs/temporary preparations and permanent				
	slides.				
	2 Study of vegetative and reproductive structures of				
	Phytophthora Saccaromyces Penicillium Puccinia and				
	Peziza				
	3 Study of vegetative and reproductive structures of <i>Riccia</i>				
	Marchantia Anthoceros Sphagnum				
	4 Study of vegetative and reproductive structures of				
	Lycopodium .Selaginella, Eauisetum and Ophioglossium.				
	Marselia				
	5 Study of fossil slide - Rhynia, calamites, sphenophyllum				
	Total	40	10	25	75
	Where, L: Lectures T: Tutorials	P:]	Pract	ticals	

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination -
- Others (Any one)
 - Sessional Examination

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o Assignment

LEARNING OUTCOMES:

- 1. Know the classification, morphology, reproduction and economic and ecological importance of cryptogams.
- 2. Handling and observation of algae, fungi, bryophytes and pteridophytes.

(20 Marks)

10 Marks

10 Marks

SUGGESTED READINGS:

- 1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
- 2. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
- 3. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International,New Delhi.
- 4. Vashistha B.R et.al.,(1999). Botany for Degree Students 'Algae', S. Chand publisher.
- Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley & Sons(Asia) Singapore. 4th edition.
- 6. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. rd
 - 3 edition
- 7. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan PublishersIndia Ltd.
- 8. Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot.Allahabad.
- 9. Vanderpoorten, A. & Goffinet, B. (2009) Introduction to Bryophytes. CambridgeUniversityPress
- 10. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
- 11. Pandey S.N. et. al, (1995). A text book of Pteridophyta, Vikas Publishing House Pvt Ltd., NewDelhi.

Title of the Course: Natural resource managementCourse Code:BOTA-GEC-1013Nature of the Course: Generic Elective Course-ITotal Credits:03Distribution of Marks: 80 (End Sem) + 20 (In-Sem)

COURSE OBJECTIVES:*The objective of this course is to provide knowledge to the students on importance, sustainable utilization, conservation and management of natural resources.*

UNITS	CONTENTS	L	Т	Р	Total Hours
I 15 MARKS	Natural resources: Definition and types. Natural resources of NE India.	8	01	-	09
II 25 MARKS	Sustainable utilization of land and water resources; Soil degradation and management; water resources and their management. Renewable and non-renewable sources of energy.	12	01	-	13
III 15 MARKS	Forests: Definition, Significance; Types of vegetation in India; NTFC Depletion and Management, JFM.	08	02	-	10
IV 25 MARKS	Contemporary practices in resource management: EIA, GIS, Participatory Resource Appraisal, Ecological Footprint with emphasis on carbon footprint, Resource Accounting; Waste management. National and international efforts in resource management and conservation	10	03	-	13
	Total	38	07	-	45
Where, L: Lectures T: Tutorials P: Practicals					

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination
- Others (Any one)
 - Sessional Examinations
 - o Assignment

LEARNING OUTCOMES:

1. Know about the natural resources, its types, sustainable utilization and management practices.

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SUGGESTED READINGS:

- Vasudevan, N. (2006). Essentials of Environmental Science. Narosa Publishing House, New Delhi.
- Singh, J. S., Singh, S.P. and Gupta, S. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications, New Delhi.
- Rogers, P.P., Jalal, K.F. and Boyd, J.A. (2008). An Introduction to Sustainable Development. Prentice Hall of India Private Limited, New Delhi

(20 Marks) 10 Marks

10 Marks

Title of the Course: TEA PLANTATION AND MANAGEMENT Course Code: BOTA-SEC-1013 Nature of the Course: Skill Enhancement Course-ITotal Credits: 03 Distribution of Marks: 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES: The objective of this course is to provide knowledge to the students on tea plant, its history, tea cultivation practices, tea production and processing.

UNITS	CONTENTS	L	Т	Р	Total Hours
I (20 marks)	History of tea cultivation, classification; Botany of tea plant, morphology and anatomy of tea plants; Climate and tea production, temperature, rainfall, humidity, sunshine, shade trees, soil characteristics, organic matter, soil nutrients, nutrients application.	10	1	-	11
II (20 marks)	Cultivation Practices: Tea culture and Propagation techniques, seed propagation, vegetative propagation, grafting, nursery management; Selection of planting sites, land preparation, plant spacing and staking, irrigation, organic Tea cultivation. Manuring, pruning, tipping and plucking, shade tree.	10	2	-	12
III (20 marks)	Production and processing: Black tea, Green tea and Oolong tea. Tea grades; storing of tea; Organic tea preparation, instant tea, herbal tea health benefits of tea, employment generation, revenue earner.	10	1	-	11
Practical (20 marks)	Demonstration of tea nursery, cutting and vegetative propagation, pruning and skiffing, tea processing industries and packaging of tea.		01	25	26
	Total	30	05	25	60
W	here, L: Lectures T: Tutorials	P :	Prac	ticals	

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination -
- Others (Any one)
 - o Sessional Examination
 - o Assignment

(20 Marks)

10 Marks

10 Marks

LEARNING OUTCOMES:

- 1. Know the tea cultivation, production and processing techniques.
- 2. Learn the tecniques of vegetative propagation of tea and development of teanursery.

SUGGESTED READINGS:

- 1. Tea Cultivation in the Plains of North East India by A. P. Das, S. E. KabirRegency Publications
- 2. Global Advance in Tea Science Paperback June 1, 2002 by N. K. Jain
- 3. James Norwood Pratt's Tea Dictionary by James Norwood Pratt and Devan Shah
- 4. Global tea scienceCurrent Status and Future Needs Editors

Title of the Course: Mushroom Culture Technology Course Code: BOTA-SEC-1023 Nature of the Course: Skill Enhancement Course-ITotal Credits: 03 Distribution of Marks: 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES:*The objective of this course is to provide knowledge to the students on Mushroomcultivation, production and processing techniques.*

UNITS	CONTENTS	L	Т	Р	Total Hours
I (20 marks)	Introduction, Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms.Types of edible mushrooms available in India – Volvariellavolvacea, Pleurotuscitrinopileatus, Agaricusbisporus.	10	1	-	11
II (25 marks)	Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, composting technology in mushroom production.	10	2	-	12
III (15 marks)	Storage: Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions.	10	1	-	11
Practical (20 marks)	Identification of edible mushroom, Demonstration of spawn preparation, Demonstration of culture & packaging technique of mushroom.		01	25	26
	Total	30	05	25	60
W	here. L: Lectures T: Tutorials	P	· Prac	ticals	

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination -
- Others (Any one)
 - Sessional Examination

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• Assignment

LEARNING OUTCOMES:

- 1. Know the Mushroom cultivation, production and processing techniques.
- 2. Learn the techniques of identification of edible and non-edible mushrooms.

SUGGESTED READINGS:

- 1. Marimuthu, T. Krishnamoorthy, A.S. Sivaprakasam, K. and Jayarajan. R (199 Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
- Swaminathan, M. (1990) Food and Nutrition. Bappeo, 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 Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II

FURKATING COLLEGE (AUTONOMOUS), FURKATING -785610, ASSAM FYUGP Structure as per UGC Credit Framework, NEP-2020

DETAILED SYLLABUS OF 2ndSEMESTER

Title of the Course	: Morphology and Reproduction of Gymnosperm
	and Angiosperms.
Course Code	: BOTA-MA-2014
Nature of the Course	: MAJOR/CORE COURSE II
Total Credits	04
Distribution of Marks	: 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES: The objective of this course is to provide knowledge to the students on Gymnosperms and Angiosperms with their morphology, mode of reproduction, patterns of embryo development and economic and ecological importance.

UNITS	CONTENTS	L	Т	Р	Total
					Hours
	Gymnosperms. :(Morphology and Reproduction)	11	02		13
Ι					
	General characteristics, classification, morphology,				
16	anatomy and reproduction of Cycas, Pinus, Ginkgo and				
MARKS	Gnetum; Patterns of embryo development in				
	gymnosperms. Ecological and economic importance.				
	Fossil Gymnosperm				
	Process of fossilization; early land plants;				
	Bennitials, Cycadeoidea, Lyginopteris; Geological time				
	scale; importance of fossil study. (Geological time scale				
	of plants).				
	Morphology of Angiosperms:	09	02		11
II	Morphology and types of root, stem, and leaves;				
	phyllotaxy and venation, hairs and trichomes,				
12	inflorescence and its types; aestivation. Arrangement				
MARKS	and types of reproductive parts of flower, placentation				
	and its types.				

	Reproduction of Angiosperms and Palynology:	10	03	-	13
	Anther wall: structure and functions,				
III	microsporogenesis, pollen wall structure, MGU (male				
	germ unit) structure, Number Position and Character				
16	(NPC) system; palynology and scope (a brief account);				
MARKS	pollen viability, storage and germination.				
	Ovule:				
	Structure and types of ovule; female gametophyte-				
	megasporogenesis (monosporic, bisporic and				
	tetrasporic) and megagametogenesis.				

IV	Pollination, fertilization and	10	03		13
	postfertilization developments				
16	of angiosperm:				
MARKS	Pollination types and significance; adaptations for				
	pollination; Double fertilization; Structure and types;				
	general pattern of development of dicot and monocot				
	embryo and endosperm and its type embryo-endosperm				
	relationship; nutrition of embryo; polyembryony,				
	apomixes and parthenocarpy self, incompatibility.				
Practicals	1. Study of morphology and reproductive parts of			25	
	Cycas, Pinus, Ginkgo & Gnetum.				
20	2. Study of Fossil plants (Photographs/specimen).				
Marks	3. Study of different types of roots (Morphology only).				
	4. Types of leaves, venation, hairs and				
	trichomes, phyllotaxy, inflorescence and aestivation.				
	5. Typesof placentation and ovule (Preparation of				
	temporaryslides)				
	6. Study of pollen morphology and pollen tube				
	formation.Invitro germination of				
	germination				
	7. Study of types of embryos and endosperms				
	(Permanentslides/ photographs)				
	Total	40	10	25	75
W	here, L: Lectures T: Tutorials	P :	Pract	icals	

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination
- Others (Any one)
 - Sessional Examinations
 - o Assignment

LEARNING OUTCOMES:

- 1. Know the classification, morphology, reproduction and economic andecological importance of gymnosperm and angiosperm
- 2. Handling and observation of gymnosperm and angiosperm

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SUGGESTED READINGS:

- 1. Bhatnagar, S.P. & Moitra, A. (1996). Gymnosperms. New Age International (P) LtdPublishers, New Delhi, India.
- 2. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms, VikasPublishing House. th Delhi. 5editions.
- 3. Shivanna, K.R. (2003). Pollen Biology and Biotechnology. Oxford and IBH Publishing Co.Pvt. Ltd. Delhi.
- 4. Dutta A.C. (1963). Botany for Degree Students (Revised Edition), Oxford University Press.

FURKATING COLLEGE (AUTONOMOUS), FURKATING -785610, ASSAM FYUGP Structure as per UGC Credit Framework, NEP-2020

DETAILED SYLLABUS OF 2ndSEMESTER

Title of the Course	: Morphology and Reproduction of Gymnosperm
	and Angiosperms.
Course Code	: BOTA-MI-2014
Nature of the Course	: Minor course-II
Total Credits	04
Distribution of Marks	: 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES:*The objective of this course is to provide knowledge to the students on Gymnosperms and Angiosperms with their morphology, mode of reproduction, patterns of embryodevelopment and economic and ecological importance.*

UNITS	CONTENTS	L	Т	P	Total
					Hours
	Gymnosperms:(Morphology and Reproduction)	11	02		13
Ι	General characteristics, classification, morphology,				
	anatomy and reproduction of Cycas, Pinus, Ginkgo and				
16	Gnetum; Patterns of embryo development in				
MARKS	gymnosperms. Ecological and economic importance.				
	Fossil Gymnosperm:				
	Process of fossilization; early land plants;				
	Bennitials, Cycadeoidea, Lyginopteris; Geological time				
	scale; importance of fossil study (Geological time scale of				
	plants).				
	Morphology of Angiosperms:	09	02		11
II	Morphology and types of root, stem, and leaves;				
	phyllotaxy and venation, hairs and trichomes,				
12	inflorescence and its types; aestivation. Arrangement				
MARKS	and types of reproductive parts of flower, placentation				
	and its type				

	Reproduction of Angiosperms and Palynology:	10	03	-	13
	Anther wall: structure and functions,				
III	microsporogenesis, pollen wall structure, MGU (male				
	germ unit) structure, Number Position and Character				
16	(NPC) system; palynology and scope (a brief account);				
MARKS	pollen viability, storage and germination.				
	Ovule:				
	Structure and types of ovule; female gametophyte-				
	megasporogenesis (monosporic, bisporic and				
	tetrasporic) and megagametogenesis.				
IV	Pollination, fertilization and post fertilization	10	03		13
	developments of Angiosperm				

16 MARKS	developments of Angiosperm Pollination; Double fertilization; Structure and types; g pattern of development of dicot and monocot en endosperm and its type; embryo-endosperm relation nutrition of embryo; polyembryony, apomixes parthenocarpy self, incompatibility.	for eneral bryo, nship; and	10	05		15
Practical	 Study of morphology and reproductive parts of <i>Cycas, Pinus, Ginkgo & Gnetum.</i> Study of Ecosil plants (Photographs/specificar) 				25	
20 Marks	 Study of Possil plants (Photographs/specimen). Study of different types of roots (Morphology only).4.Types of leaves, venation, hairs and trichomes, phyllotaxy, inflorescence and aestivation. 					
	 Types of placentation and ovule (Preparation of temporaryslides) Study of pollen morphology and pollen 					
	tubeformation, invitro germination of pollen grains. 7.Study of types of embryos and endosperms					
	(Permanentsides/ photographs) Total	40	1	0	25	75

Where,

L: Lectures

T: Tutorials P: Practicals

MODES OF IN-SEMESTER ASSESSMENT: (20 Marks)

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- One Internal Examination -
- Others (Any one)
 - Sessional Examinations
 - o Assignment

10 Marks

LEARNING OUTCOMES:

- 3. Know the classification, morphology, reproduction and economic andecological importance of gymnosperm and angiosperm
- 4. Handling and observation of gymnosperm and angiosperm

SUGGESTED READINGS:

- 8. Bhatnagar, S.P. & Moitra, A. (1996). Gymnosperms. New Age International (P) LtdPublishers, New Delhi, India.
- 9. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms, VikasPublishing House. Delhi. 5th edition.
- 10. Shivanna, K.R. (2003). Pollen Biology and Biotechnology. Oxford and IBH Publishing Co.Pvt. Ltd.Delhi.
- 11. Dutta A.C. (1963). Botany for Degree Students (Revised Edition), Oxford University Press.

Title of the Course : Plant Diversity and Human Welfare **Course Code** : **BOTA-GEC-2013** Nature of the Course : Generic Elective Course-II **Total Credits** 03 **Distribution of Marks** : 80 (End Sem) + 20 (In-Sem)

COURSE OBJECTIVES: The objective of this course is to provide knowledge to the students on biodiversity and its importance for human welfare.

UNITS	CONTENTS	L	Т	Р	Total Hours
I 20 MARKS	Plant diversity and its scope- Genetic diversity, Species diversity, Plant diversity at the ecosystem level, Agrobiodiversity and cultivated plant taxa, wild taxa. Values and uses of Biodiversity: Ethical and aesthetic values, Precautionary principle, Methodologies for valuation, Uses of plants, Uses of microbes.	10	1	-	11
II 20 MARKS	Loss of Biodiversity: Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agrobiodiversity, Projected scenario for biodiversity loss, Management of Plant Biodiversity: Organizations associated with biodiversity management- Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR; Biodiversity legislation and conservations, Biodiversity information management and communication.	10	2	-	12
III 20 MARKS	Conservation of Biodiversity: Conservation of genetic diversity, speciesdiversity and ecosystem diversity, In situ and ex situ conservation, Socialapproaches to conservation, Biodiversity awareness programmes, Sustainable development.	10	1	-	11
IV 20 MARKS	Role of plants in relation to Human Welfare; a) Importance of forestry their utilization and commercial aspects b) Avenue trees, c) Ornamental plants of India. d) Alcoholic beverages through ages. Fruits and nuts: Important fruit crops their commercial importance. Wood and its uses.	10	01	-	11
TI	Total	45	05	-	45

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination -
- Others (Any one)
 - Sessional Examinations
- Assignment **LEARNING OUTCOMES**:

- 10 1. Know the scope, dimension and importance and threats to plant diversity.
- 2. Conservation ways of biodiversity and its Sustainable utilization.
- 3. Acquire knowledge of biodiversity for human welfare.

SUGGESTED READINGS:

- 1. Krishnamurthy, K.V. (2004). An Advanced Text Book of Biodiversity Principles and
 - Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.

- (20 Marks) 10 Marks **10 Marks**

: Biofertilizers : BOTA-SEC-2013 :Skill Enhancement Coursel-II 03

: 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES:*The objective of this course is to provide knowledge to the students on biofertilizers, its importance and its production from different biological sources..*

UNITS	CONTENTS	L	Т	Р	Total Hours
I 15 marks	Factors affecting plant growth; essential nutrients; microbes used as biofertilizer (nitrogen fixers, phosphate solubilizers, PGPR) biocontrol agents.	08	-	-	08
II 15 marks	Cyanobacteria (blue green algae), <i>Azolla</i> and <i>Anabaena azo</i> llae association, process of nitrogen fixation, blue green algae and <i>Azolla</i> in rice cultivation.	08	-	-	08
III 15 marks	Mycorrhizal association, types of mycorrhizal association; colonization of AM – isolation and inoculum production of AM, and its influence on growth and yield of crop plants.	08	1	-	09
IV 15 marks	Organic farming – Green manuring and organic fertilizers, Recycling of bio-degradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.	12	1		13
Practical (20 MARKS)	Demonstration/field visit to biofertilizer producing units, identification of some common biofertilizers.			22	22
	Total	36	02	22	60
Wh	ere. L: Lectures T: Tutorials	P	P: Prac	cticals	

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination
- Others (Any one)
 - Sessional Examinations
 - Assignment

LEARNING OUTCOMES:

After the completion of this course, the learner will be able to:

1. Learn about the biofertilizers, its manufacturing processes.

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- 2. Know about the role different organisms and bioresources in production of biofertilizers.
- 3. Able to identify the common biofertilizers.

SUGGESTED READINGS:

- 1. Dubey, R.C., 2005 A Text book of Biotechnology S.Chand& Co, New Delhi.
- 2. Kumaresan, V. 2005, Biotechnology, Saras Publications, New Delhi.
- 3. John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay Publication, New Delhi.
- 4. Sathe, T.V. 2004 Vermiculture and Organic Farming. Daya publishers.
- 5. Subha Rao, N.S. 2000, Soil Microbiology, Oxford & IBH Publishers, New Delhi.

6. Vayas, S.C, Vayas, S. and Modi, H.A. 1998 Bio-fertilizers and organic Farming AktaPrakashan, Nadiad

12

Title of the Course	: Conservation and Cultivation of Orchids
Course Code	: BOTA-SEC-2023
Nature of the Course	:Skill Enhancement Coursel-II
Total Credits	03
Distribution of Marks	: 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES:*The objective of this course is to provide knowledge to the students on Orchid diversity with special reference to NE India, Cultivation, Propagation and conservation techniques..*

UNITS	CONTENTS	L	Т	Р	Total Hours
т	Introduction to Orchids:	06		-	06
1 13 MARKS	Salient features, habitat, origin and diversity, morphology and classification of orchids, Economic importance of Orchids.				
II 17 MARKS	Common and endemic Orchidsof North East India: status and distribution; RET species of Orchids of India with special reference to NE India	10		-	10
III 18 MARKS	Propagation of Orchids: Different methods of propagation of orchids (cutting and hybridization), Substratum/soil preparation of orchids, nutritional and environmental requirement maintenance of orchidarium, <i>In-</i> <i>vitro</i> propagation of orchids.	12	1	-	13
IV	Conservation of Orchids: <i>in-situ</i> and <i>ex-situ</i> conservation, Conservation of habitats and host plants.	8	1	-	09
12 MARKS					
Practical 20 MARKS	Identification of orchids, Demonstration of vegetative propagation of orchids, preparation of substrata for economically importance orchids, exposure visit to Orchidarium.	-	-	22	22
	Total	36	2	22	60
W	here, L: Lectures T: Tutorials	P	: Prac	ticals	•

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination
- Others (Any one)
 - Sessional Examinations
 - Assignment

LEARNING OUTCOMES:

- 4. Learn about the diversity of orchids with special reference to NE India.
- 5. Learn about the propagation techniques for orchid cultivation.

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6. Know about the in-situ and ex-situ conservation ways for orchid conservation.

SUGGESTED READINGS:

1. Gogoi, K. 2017. Wild Orchids of Assam: A Pictorial guide. Assam State Biodiversity Board.

FURKATING COLLEGE (AUTONOMOUS), FURKATING -785610, ASSAM FYUGP Structure as per UGC Credit Framework, NEP-2020

DETAILED SYLLABUS OF 3rd SEMESTER

Title of the Course	: Cell Biology
Course Code	: BOTA-MA-3014
Nature of the Course: M	AJOR/CORECOURSEIII
Total Credits	04
Distribution of Marks	: 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES:*The objective of this course is to provide students the concept of cell as functional unit of life, structure of plant cell and functions of cellular components and its chemical composition.*

UNITS	CONTENTS	L	Т	Р	Total
					Hours
	The cell	15	3		18
Ι	Cell as a unit of structure and function; Plant and				
16	animal cell, cell theory and its exception,				
MARKS	Characteristics of prokaryotic and eukaryotic cells;				
	Origin of eukaryotic cell (Endosymbiotic theory,				
	PPLO, Prion).				
	Cell wall and plasma membrane	15	04		19
	Structure and function of Plant cell wall; Molecular				
II	bass of plant cell wall, Plasma membrane, Overview of				
	fluid mosaic model; Chemical composition of				
24	membranes; membrane function.				
MARKS	Cell organelles				
	Nucleus; Structure-nuclear envelope, nuclear pore				
	complex, nuclear lamina, organization of chromatin;				
	nucleolus. Microtubules, microfilaments and				
	intermediary filament. Chloroplast, mitochondria and				
	peroxisomes. Structural organization and function of				
	mitochondria and chloroplast; Ribosomes- types,				
	components and function; Lysosomes, Endoplasmic				
	Reticulum – Structure, targeting and insertion of				
	proteins in the ER, Golgi Apparatus, vacuoles,				
	tonoplast.				

III	Cell division	10	03		13
	Types of cell division, stages of mitosis and				
20	meiosis; Phases of eukaryotic cell cycle, Regulation of				
MARKS	cell cycle-checkpoints, role of protein kinases,				
	Significance, Synaptonemal complex, Spindle				
	Apparatus.				
	1. Study of plant cell structure with the help of			25	30
	epidermal peel mount of Onion/Crinum/Vinca				
Practicals	rosa.				
	2. Demonstration of the phenomenon of				
20	protoplasmic streaming in Hydrilla leaf,				
Marks	vallisnaria.				
	3. Measurement of cell size by of micrometric				
	method. Concept of Microscopic Constant.				
	4. Cell counting using haemocytometer.				
	(Yeast/pollen grains).				
	5. Study the phenomenon of plasmolysis and				
	deplasmolysis.				
	6. Study different stages of mitosis and meiosis				
	 Study of cell and its organelles with the help of electron micrographs (Demonstration). 				
	8. Cytochemical staining of: DNA- Feulgen and				
	cell wall in the epidermal peel of onion using				
	Periodic Schiff's (PAS) staining technique.				
	Total	40	10	25	75
T	Where,L: LecturesT: Tutorials	ŀ	P: Pra	ctical	5

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination
- Others (Any one)
 - Sessional examination
 - o Assignment

LEARNING OUTCOMES:

- (1) Know the types of biomolecules present on plant body and their functions.
- (2) Isolation and estimation of biomolecules

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SUGGESTED READINGS:

- 1. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
- Hardin, J., Becker, G., Skliensmith, L.J. (2012). Becker's World of the Cell, Pearson EducationInc. U.S.A. 8th edition.
- Verma, P. S. and Agrawal, V. K. (2004). Cell Biology, Genetics and Molecular Biology, S. Chand Publisher

FURKATING COLLEGE (AUTONOMOUS), FURKATING -785610, ASSAM FYUGP Structure as per UGC Credit Framework, NEP-2020

DETAILED SYLLABUS OF 3rd SEMESTER

Title of the Course	: Plant Biochemistry & Molecular Biology
Course Code	: BOTA-MA-3024
Nature of the Course	: MAJOR/CORE COURSE III
Total Credits	04
Distribution of Marks	: 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES: The objective of this course is to provide knowledge to the students onBiomolecules and their functions.

UNITS	CONTENTS	L	Т	Р	Total
					Hours
	Biomolecules:	10	03		13
	Types and significance of chemical bonds; Structure				
Ι	and properties of water; pH and buffers.				
	Carbohydrates: Nomenclature and classification;				
16	Monosaccharides; Disaccharides; Oligosaccharides and				
MARKS	polysaccharides and its function.				
	Lipids: Definition and major classes of storage and				
	structural lipids; Fatty acids structure and functions;				
	Essential fatty acids; Triacylglycerols structure,				
	functions and properties; Phosphoglycerides.				
	Proteins: Structure of amino acids; Levels of protein				
	structure-primary, secondary, tertiary and quarternary;				
	Protein denaturation and biological roles of proteins.				
	Nucleic acids: Structure of nitrogenous bases;				
	Structureand function of nucleotides;				
	Types of nucleic acids; Structure of A, B, Z types				
	of DNA; Types of RNA, Genetic and non genetic RNA				
	;Structure of tRNA.	10			1.1
	Bioenergetics:	10	02		11
	Laws of thermodynamics, concept of free energy,				
11	endergonic and exergonic reactions, coupled reactions,				
1.6	redox reactions. ATP: structure, its role as energy				
16	currency molecule.				
MARKS	Enzymes				
	Structure: holoenzyme, apoenzyme, cofactors,				
	coenzymes and prosthetic group; Classification of				
	enzymes; Features of active site,				
	substrate specificity, mechanism of action (activation				

	energy, lock and key hypothesis, induced - fit theroy),			
	Michaelis – Menten equation, enzyme inhibition and			
	factors affecting enzyme activity.			
	Genetic material and its organization :	12	03	15
	DNA as the carrier of genetic information (Griffith's		00	10
	Hershey & Chase Avery McLeod & Mc Carty			
TIT	avantiment): denoturation and renaturation of DNA:			
111	Organization of DNA Prohamistas Viruses			
16	Enlaguates DNA Structures Organella DNA			
	Eukaryotes. KINA Structure; Organetie DINA-			
MAKKS	mitochondria and chioroplast DNA.			
	Replication and Transcription of DNA			
	Types of DNA Replication, General principles –			
	bidirectional, semi-conservative and semi discontinuous			
	replication, RNA priming; Various models of DNA			
	replication, replication of linear ds-DNA. Transcription			
	in prokaryotes and eukaryotes; Post Transscriptional			
	modification of RNA			
	Operon concept: Lac operon and its regulation.			
	Genetic codes & Translation	08	02	10
IV	Role of Genetic codes in Translation, Ribosome			
	structure and assembly, mRNA; Charging of tRNA,			
12	aminoacyl tRNA synthetases; Various steps in protein			
MARKS	synthesis, factors involve in initiation, elongation and			
	termination of polypeptides; Post-translational			
	modifications of			
	proteins.			
	1. Qualitative tests for carbohydrates, reducing			
Practical	sugars, non-reducing sugars, lipids and proteins.			
20 1	2. Cytochemical staining of: DNA- Feulgen and cell			
20 marks	wall in the epidermal peel of onion using Periodic			
	Schiff's (PAS) staining technique.			
	3. Estimation of plant proteins by Biuret/Lowry			
	method.			
	4. Estimation of reducing and non-reducing sugars in			
	plant samples.			
	5. DNA estimation by diphenylamine reagent/UV			
	Spectrophotometry.			
	6. Study of DNA replication mechanisms through			
	photographs (Rolling circle, Theta replication and			
	semi-discontinuous replication).			
	7. Study of structures of prokaryotic RNA			
	polymerase and eukaryotic RNA polymeraseII			
	through photographs.			
	Photographs establishing nucleic acid as genetic			

Where,	L: Lectures	T: Tutorials	P:P	ractical	's	
		Total	40	10	25	75
	experiments)	Chase's and Practiker & Conrat's				
	material (Mess	elson and Stahl's, Avery et al, Griffith's, Chase's and Fraenkel & Conrat's				

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination
- Others (Any one)
 - Sessional examination
 - Assignment

LEARNING OUTCOMES:

After the completion of this course, the learner will be able to:

- 1. Know the types of biomolecules present on plant body and their structure and functions.
- 2. Isolation and estimation of biomolecules

SUGGESTED READINGS:

- 1. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.
- Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
- Pandey SN and Singha, B.K. (New edition) Plant Physiology, Vikas Publishing House PVT Ltd. New Delhi
- 4. Singh B.D. Genetics (4th edition, Paper back), MedTech Science Press.
- Arun Chandra Sahu (2018). Essential of Biomolecules and Cell Biology (As per CBCS Syllabus). Kalyani Publisher.

(20 Marks)	
10 Marks	
10 Marks	

FURKATING COLLEGE (AUTONOMOUS), FURKATING -785610, ASSAM FYUGP Structure as per UGC Credit Framework, NEP-2020

DETAILED SYLLABUS OF 3rd SEMESTER

Title of the Course	: Plant Physiology &
Metabolism	
Course Code	: BOTA-MI-3014
Nature of the Course	: Minor course-III
Total Credits	04
Distribution of Marks	: 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES: *The objective of this course is to provide knowledge to the students onplant physiological processes.*

UNITS	CONTENTS	L	Т	Р	Total Hours
	Plant-water relations:	10	01	-	11
	Importance of water, water potential and its				
	components; Ascent of sap, Dixon and Joys				
	Hypothesis, Transpiration and its				
Ι	significance; Factors affecting transpiration; Root				
	pressure and guttation, Stomatal index.				
14	Translocation in phloem:				
MARKS	Composition of phloem sap, girdling experiment;				
	Pressure flow model; Phloem loading and unloading.				
	Mineral nutrition:	07	01	-	08
	Essential elements, macro and micronutrients; Criteria				
II	of essentiality of elements: Role of essential elements:				
	Transport of ions across cell membrane active and				
12	nassive transport or ions deross con memorane, derive and				
MADKS	passive transport, carriers, channels and pumps.				
MAKKS	Biological nitrogen fixation; Nitrate and ammonia				
	assimilation.				
	assimilation.				

	Photosynthesis:	15	02	-	17
III	Photosynthetic Pigments (Chl a, b, xanthophylls,				
22	carotene); Photosystem I and II, reaction center,				
22 MARKS	antenna molecules; Electron transport and mechanism				
MARKS	of ATP synthesis; C ₃ , C ₄ and CAM pathways of				
	carbon fixation; Photorespiration, Kranz Anatomy.				
	Respiration:				
	Glycolysis, anaerobic respiration, TCA cycle;				
	Oxidative phosphorylation, Glyoxylate, Oxidative				
	Pentose Phosphate Pathway.				
IV	Plant growth regulators & plant responses:	08	1	-	09
12	Physiological roles of auxins, gibberellins, cytokinins,				
MARKS	ABA, ethylene, Florigens, Plant response to light and				
	temperature; photoperiodism and its importance.				
	1. Determination of osmotic potential of plant cell		30		30
	sap byplasmolytic and weight method.				
Practicals	2. To study the effect of environmental factors (light				
	andwind) on transpiration by excised twig.				
20 marks	3. Demonstrate the activity of catalase and study the				
	effectof pH and enzyme concentration.				
	4. Calculation of stomatal index and stomatal				
	frequency of a mesophyte and a xerophytes.				
	5. Demonstration of Hill reaction.				
	6. To study the effect of light intensity and				
	bicarbonate concentration on O ₂ evolution in				
	photosynthesis.				
	7. Determination of rate of respiratory quotient (RQ)	10	05	30	75
	10181	40	05	30	15

Where,

L: Lectures

T: Tutorials

P:Practical's

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination
- Others (Any one)
 - Sessional examination
 - Assignment

LEARNING OUTCOMES:

After the completion of this course, the learner will be able to:

- 3. Know the types of biomolecules present on plant body and their structure and functions.
- 4. Isolation and estimation of biomolecules

SUGGESTED READINGS:

- Pandey SN and Singha, B.K. (New edition) Plant Physiology, Vikas Publishing House PVT Ltd. New Delhi.
 22
- 2. Jain, V. K. Fundamental of Plant Physiology (New edition paperback), S. Chand Publisher.
- 3. Srivastava, H.S. (2019). Plant Physiology and Biochemistry, Rastogi Publication.

Title of the Course

: Ethnobotany

: **BOTA-GEC-3013**

Course Code Nature of the Course **Total Credits Distribution of Marks**

- : Generic Elective Course-II 03
- : 80 (End Sem) + 20 (In-Sem)

COURSE OBJECTIVES: The objective of this course is to provide knowledge to the students on use of plant resources in traditional practices of the ethnic communities of NE India.

UNITS	CONTENTS	L	Т	Р	Total Hours
I 25 MARKS	Ethnobotany Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science.The relevance of ethnobotany in the present context; Major and minor ethnic groups or Tribals of India, and their life styles. Plants used by the tribals: a) Food plants b) intoxicants and beverages c) Resins and oils and miscellaneous uses.	10	1	-	11
II 15 MARKS	Methodology of Ethnobotanical studies a) Field work b) Herbarium c) Ancient Literature d) Archaeological findings e) temples and sacred places.	10	2	-	12
III 25 MARKS	Medico-ethnobotanical sources in India;Significance of the following plants in ethno botanical practices (along with their habitat and morphology) a) <i>Azadiractha indica</i> b) <i>Ocimum</i> <i>sanctum</i> c) <i>Vitex negundo</i> . d) <i>Gloriosa superba</i> e) <i>Tribulus terrestris</i> f) <i>Pongamia pinnata</i> g) <i>Cassia</i> <i>auriculata</i> h) <i>Indigofera tinctoria</i> . Role of ethnobotany in modern medicine with special example Rauvolfia <i>sepentina</i> , <i>Trichopus zeylanicus</i> , <i>Artemisia</i> , <i>Withania</i> . Role of ethnic groups in conservation of plant genetic resources. Endangered taxa and forest management (participatory forest management).	10	1	-	11
IV 15 MARKS	Ethnobotany and legal aspects Ethnobotany as a tool to protect interests of ethnic groups. Sharing of wealth concept with few examples from India. Biopiracy, Intellectual Property Rights and Traditional Knowledge.	10	01	-	11
	Total	45	05	-	45

Where,

L: Lectures

T: Tutorials

P:Practical's

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination
- Others (Any one)
 - Sessional Examinations
 - Assignment

LEARNING OUTCOMES:

- 23
- 1. Know the scope, dimension and importance of ethnobotany.

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- 2. Conservation ways of biodiversity and its Sustainable utilization in traditional practices.
- 3. Acquire knowledge of bioactive compounds available in plant resources of NE India.
- **10 Marks**
- (20 Marks) 10 Marks

Title of the Course Gardening	: Nursery and
Course Code	: BOTA-SEC-3013
Nature of the Course	: Skill Enhancement course-III
Total Credits	03
Distribution of Marks	: 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES:*The objective of this course is to provide knowledge to the students on* setting up of nursery and gardens and its management.

UNITS	CONTENTS	L	Т	Р	Total Hours
I 20 MARKS	Nursery: definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants. Seed storage: Seed banks, factors affecting seed viability, genetic erosion- Seed production technology. Seed testing and certification; Greenhouse - mist chamber, shed root, shade house and glass house.	10		-	10
II 20MARKS	Vegetative propagation: air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings - Hardening of plants - green house - mist chamber, shed root, shade house and glass house.	10		-	10
III 20 MARKS	Gardening: Different types of gardening - landscape and home gardening - parks and its components - plant materials and design. Gardening operations: soil preparation, manuring,watering, management of pests and diseases and harvesting.Sowing/raising of seeds and seedlings - Transplanting of seedlings.	10		-	10
Practicals 20 marks	Preparation of cuttings/seedlings of some important horticultural crops. Exposure visit to established nurseries, farms, gardens etc.,			30	30
	Total	30		30	60
Where, L: Lectures T: Tutorials		P	?: Prac	cticals	

Where,

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination -
- Others (Any one)
 - Sessional examination
 - Assignment

LEARNING OUTCOMES:

- Learn about the nursery development processes, requirements and, management 1. techniques.
- 2. Learn about the garden development processes, requirements and, management techniques.

(20 Marks) 10 Marks 10 Marks

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SUGGESTED READINGS:

- Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
- 2. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
- 3. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
- 4. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
- Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.
- Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA.

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Title of the Course	: Medicinal Botany
Course Code	: BOTA-SEC-3023
Nature of the Course	: Skill Enhancement course-
IIITotal Credits	03
Distribution of Marks	: 80 (End Sem) (60T+20P) + 20 (In-Sem)

COURSE OBJECTIVES:*The objective of this course is to provide knowledge to the students on traditional herbal medicinal practices, its importance and plants used as herbal medicine and its propagation.*

UNITS	CONTENTS	L	Т	Р	Total Hours
I 12 marks	History, Scope and Importance of Medicinal Plants. Conservation of endangered and endemic medicinal plants.	05		-	05
II 16 marks	Ayurveda: History, origin, Panchamahabhutas, SaptadhatuandTridoshaconcepts, Rasayana, plants used in ayurvedic treatments, Siddha: Origin of Siddha medicinalsystems, Basis of Siddha system, plants used in Siddha medicine.	06		-	06
III 20 marks	Definition: endemic and endangered medicinal plants, red list criteria; In situ conservation: Biosphere reserves, sacred groves, National Parks; <i>Ex-situ</i> conservation: Botanic Gardens, Ethnomedicinal plant Gardens. Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding.	12			12
IV 12 marks	Unani: History, concept:Umoor-e- tabiya, tumorstreatments/ therapy, polyherbal formulations.	07			07
Practicals 20 marks	Identification, collection and conservation (Propagation and Plantation) of local medicinal plants.			30	30
	Total	30		30	60
Where, L: Lectures T: Tutorials		P :	Prac	ticals	

MODES OF IN-SEMESTER ASSESSMENT:

- One Internal Examination
- Others (Any one)
 - Sessional examination

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o Assignment

LEARNING OUTCOMES:

- 1. Learn about the various traditional medicinal systems with special reference toNE India.
- 2. Know about importance of medicinal plants, their status and conservationalstrategies.
- 3. Identification, propagation and conservation the medicinal plants.

SUGGESTED READINGS:

- 1. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
- 2. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach,

2ndedn.Agrobios, India.

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