

SYLLABUS

For

3 YEARS BSC BOTANY PROGRAMME

(Revised Syllabus Approved by Academic Council)



*Dept. of
Botany*

JUNE, 2018

UNIVERSITY OF SCIENCE & TECHNOLOGY, MEGHALAYA

Techno City, 9th Mile, Baridua, Ri-Bhoi, Meghalaya, 793101

B.Sc Botany (Major)
Course content
Credit=136, Total marks=3400

SEMESTER-I

Course Code	Title	Credit	Nature of course (T/P)	Marks Allotted		
				Internal	End Semester	Total
BSB-101 (CC-1)	Phycology and Lichen	4	T	30	70	100
BSB-102 (CC-2)	Archegoniates and Palaeobotany	4	T	30	70	100
BSB-103	Phycology and Lichen	2	P	15	35	50
BSB-104	Archegoniates and Palaeobotany	2	P	15	35	50
BSZ-711 (GE-1)	Invertebrate biology and Ecology	4	Y	30	70	100
BSZ-712	Invertebrate biology and Ecology	2	P	15	35	50
BEN-711 (AECC)	Communicative English	4	T	30	70	100
Total		22				550

SEMESTER-II

Course Code	Title	Credit	Nature of course (T/P)	Marks Allotted		
				Internal	End Semester	Total
BSB-201 (CC-3)	Anatomy, Palynology and Embryology	4	T	30	70	100
BSB-202 (CC-4)	Instrumentation and Laboratory Techniques	4	T	30	70	100
BSB-203	Anatomy, Palynology and Embryology	2	P	15	35	50
BSB-204	Instrumentation and Laboratory Techniques	2	P	15	35	50

BSZ-721 (GE-2)	Chordate diversity, comparative anatomy and Evolution	4	T	30	70	100
BSZ-722	Vertebrate biology and histology	2	P	15	35	50
BEV-720 (AECC)	Environmental Science	*	T	30	70	100*
	Total	18				450

*Marks will not be counted for SGPA only grades will be given

SEMESTER-III

Course Code	Title	Credit	Nature of course (T/P)	Marks Allotted		
				Internal	End Semester	Total
BSB-301 (CC-5)	Angiosperm Taxonomy	4	T	30	70	100
BSB-302 (CC-6)	Mycology and Plant Pathology	4	T	30	70	100
BSB-303 (CC-7)	Cytology and Genetics	4	T	30	70	100
BSB-304	Angiosperm Taxonomy and Mycology	2	P	15	35	50
BSB-305	Plant Pathology, Cytology and Genetics	2	P	15	35	50
BSC-731 (GE-3)	Organic , Inorganic and Physical Chemistry	4	T	30	70	100
BSC-732	Taxonomy and Biostatistics / Organic , Inorganic and Physical Chemistry	2	P	15	35	50
BSB-306 (SEC-I)	Biofertilizer	2	T	15	35	50
	Total	24				600

SEMESTER-IV

Course Code	Title	Credit	Nature of course (T/P)	Marks Allotted		
				Internal	End Semester	Total
BSB-401 (CC-8)	Microbiology	4	T	30	70	100
BSB-402 (CC-9)	Plant Physiology	4	T	30	70	100
BSB-403 (CC-10)	Ecology and phytogeography	4	T	30	70	100
BSB-404	Microbiology and water relations	2	P	15	35	50
BSB-405	Plant Physiology and Ecology	2	P	15	35	50
BSC-731 (GE-4)	Organic , Inorganic and Physical Chemistry	4	T	30	70	100
BSC-732	Organic , Inorganic Physical Chemistry	2	P	15	35	50
BSB-307 (SEC-II)	Nursery and Gardening	2	T	15	35	50
	Total	24				600

SEMESTER-V

Course Code	Title	Credit	Nature of course (T/P)	Marks Allotted		
				Internal	End Semester	Total
BSB-501 (CC-11)	Pharmacognosy	4	T	30	70	100
BSB-502 (CC-12)	Economic Botany	4	T	30	70	100
BSB-503	Pharmacognosy	2	P	15	25	50
BSB- 504	Economic Botany	2	P	15	25	50
DSE-I	Stress Biology	4	T	30	70	100

DSE-I	Stress Biology	2	P	15	35	50
DSE-II	Plant Breeding	4	T	30	70	100
DSE-II	Plant Breeding	2	P	15	35	50
	Total	24				600

SEMESTER-VI

Course Code	Title	Credit	Nature of course (T/P)	Marks Allotted		
				Internal	End Semester	Total
BSB-601 (CC-13)	Molecular Biology	4	T	30	70	100
BSB-602 (CC-14)	Applied Botany	4	T	30	70	100
BSB-603	Molecular Biology	2	P	15	35	50
BSB-604	Applied Botany	2	P	15	35	50
DSE-III	Plant Resource Utilization	4	T	30	70	100
DSE-III	Plant Resource Utilization	2	P	15	35	50
DSE-IV	Horticultural Practices and Post Harvest Technology	4	T	30	70	100
DSE-IV	Horticultural Practices and Post Harvest Technology	2	P	15	35	50
	Skill Enhancement Course (SEC-3)	Non Credit Mandatory	-	-	-	-
	Total	24				600

CC:Core Course **AECC:** Ability Enhancement Compulsory Course **SEC:** Skill Enhancement Course
DSE: Discipline Specific Elective **GE:** Generic Elective (Multidisciplinary Course)

B.Sc Botany (Major)
Course content
Credit=136, Total marks=3400

SEMESTER -I

Paper Code	Title	Credit	Total Marks
BSB-101	Phycology and Lichen (Theory) (CC-1)	4	100
BSB-102	Archegoniates and Palaeobotany (Theory) (CC-2)	4	100
BSB-103	Phycology and Lichen (Practical)	2	50
BSB-104	Archegoniates and Palaeobotany (Practical)	2	50
BSZ-711	Invertebrate biology and Ecology (Theory)/ (GE-1a)	4	100
BSZ-712	Invertebrate biology and Ecology (Practical)/(GE-1b)	2	50
BEN-711	Communicative English (AECC)	4	100
	Total	22	550

SEMESTER -II

Paper Code	Title	Credit	Total Marks
BSB-201	Anatomy, Palynology and Embryology(Theory) (CC-3)	4	100
BSB-202	Instrumentation and Laboratory Techniques (Theory) (CC-4)	4	100
BSB-203	Anatomy, Palynology and Embryology (Practical)	2	50
BSB-204	Instrumentation and Laboratory Techniques (Practical)	2	50
BSZ-721	Chordate diversity, comparative anatomy and Evolution (Theory)/(GE-2a)	4	100
BSZ-722	Vertebrate biology and histology (Practical)/(GE2b)	2	50
BEV-720	Environmental Science (AECC)	*	100*
	Total	18	450

*Marks will not be counted for SGPA only grades will be given

SEMESTER -III

Paper Code	Title	Credit	Total Marks
BSB-301	Angiosperm Taxonomy(Theory) (CC-5)	4	100
BSB-302	Mycology and Plant Pathology (Theory) (CC-6)	4	100
BSB-303	Cytology and Genetics (Theory) (CC-7)	4	100
BSB-304	Angiosperm Taxonomy and Mycology (Practical)	2	50
BSB-305	Plant Pathlogy, Cytology and Genetics (Practical)	2	50
BSC-731	Organic , Inorganic and Physical Chemistry (Theory) (GE-3a)	4	100
BSC-732	Taxonomy and Biostatistics (Practical)/ Organic , Inorganic and Physical Chemistry(Practical)	2	50

	(GE-3b)		
BSB-306 (SEC-I)	Biofertilizer	2	50
	Total	24	600

SEMESTER -IV

Paper Code	Title	Credit	Total Marks
BSB-401	Microbiology (Theory) (CC-8)	4	100
BSB-402	Plant Physiology (Theory) (CC-9)	4	100
BSB-403	Ecology and phytogeography (Theory) (CC-10)	4	100
BSB-404	Microbiology and water relations (Practical)	2	50
BSB-405	Plant Physiology and Ecology(Practical)	2	50
BSC-731	Organic , Inorganic and Physical Chemistry (Theory) (GE-4a)	4	100
BSC-732	Organic , Inorganic Physical Chemistry(Practical) (GE-4b)	2	50
BSB-307 (SEC-II)	Nursery and Gardening	2	50
	Total	24	600

SEMESTER -V

Paper Code	Title	Credit	Total Marks
BSB-501	Pharmacognosy (Theory)	4	100
BSB-502	Economic Botany (Theory)	4	100
BSB-503	Pharmacognosy (Practical)	2	50
BSB- 504	Economic Botany (Practical)	2	50
DSE-I	Stress Biology(Theory)	4	100
DSE-I Practical	Stress Biology(Practical)	2	50
DSE-II	Plant Breeding	4	100
DSE-II Practical	Plant Breeding (Practical)	2	50
	Total	24	600

SEMESTER -VI

Paper Code	Title	Credit	Total Marks
BSB-601	Molecular Biology (Theory)	4	100
BSB-602	Applied Botany (Theory)	4	100
BSB-603	Molecular Biology (Practical)	2	50
BSB-604	Applied Botany(Practical)	2	50
DSE-III	Plant Resource Utilization(Theory)	4	100
DSE-III Practical	Plant Resource Utilization (Practical)	2	50
DSE-IV	Horticultural Practices and Post Harvest Technology(Theory)	4	100

DSE-IV Practical	Horticultural Practices and Post Harvest Technology (Practical)	2	50
	Total	24	600

Semester-1

Paper code: BSB-101
Paper Title: Phycology and Lichen(Theory)

Course outcome:

CO1. **(0.25)**To get knowledge about different classes of algae, their habitat, habit, reproduction and life history

CO2. **(0.25)** To learn about the proper documentation of algae of N.E. India

CO3.**(0.15)** Understand the role of algae in the environment biotechnology and industry

CO4. **(0.15)**Blue green algae are used as bio fertilizer. The student will learn how to identify and culture the algae and also their practical aspects.

CO5. **(0.2)**To learn the basic knowledge of various classes of lichen, their habit, habitat, classification, reproduction and ecological significance

Course Content:

Credit: 4

Unit I:

Algae: General characteristics, Habitat, classification of algae and basic criteria for classification. Range of thallus structure, reproduction, alteration of generation.

Unit II:

Life history of:

Cyanophyceae (*Anabaena*, *Oscillatoria*)

Chlorophyceae (*Chlorella*, *Volvox*, *Chara*),

Xanthophyceae (*Vaucheria*)

Bacillariophyceae (General account-Diatoms),

Phaeophyceae (*Ectocarpus*, *Fucus*),

Rhodophyceae (*Batracospermum*, *Polysiphonia*).

Unit III:

Applied Phycology: Role of algae in the environment, biotechnology and industry. Role of algae in soil fertility.

Unit IV:

Lichen: Introduction, general description, classification, distribution and thallus structure.

Reproduction of Lichen: Vegetative, Asexual and Sexual reproduction. Ecological significance and role in succession. Economic importance of Lichen.

Suggested books:

1. Textbook of Algae. B.P Sarabhai, C.K Arora, Anmol Publishing Pvt. Ltd. New Delhi
2. Textbook of Algae. O.P Sharma, Tata McGraw Hill Company, New Delhi.
3. Botany for degree students Algae. B.R Vashista, A.K. Sinha, S. Chand Publishing, New Delhi.
4. Botany for degree students. A.C Dutta, Oxford publication.
5. Studies in Botany-Vol-I. J. N. Mitra, D. Mitra and S.K. Chowdhuri, D. N. Moulik Publishing, Kolkata.
6. The structure and reproduction of- The Algae. F.E. Fritsch (Vol-II), Vikas Publishing house, New Delhi, Bombay, Calcutta, Kanpur, Bangalore.

Paper code: BSB-102**Paper Title: Archegoniate and Palaeobotany (Theory)****Course outcome:**

CO1. **(0.25)** To give the students some basic idea about the origin, evolution, classification of the group of Bryophyta, its comparative morphological, anatomical and reproductive differences within the group.

CO2. **(0.125)** Deals with the basic understandings of the origin and evolution of pteridophytes.

CO3. **(0.125)** The students will have a understandings of classification of vascular cryptogams, morphological, anatomical and reproductive diversity of pteridophytes.

CO4. **(0.25)** To give students some basic understandings of classification and salient features of major taxa of Gymnosperm, its characteristics, affinities and relationships among different taxa and finally the economic importance of Gymnosperms.

CO5. **(0.25)** It was designed to give an understanding of fossilization process. General account, anatomy and reproduction of Psilophyta (*Rhynia*), Lepidodendrales (*Lepidodendron*) and Sphenophyllales (*Sphenophyllum*), Cycadofilicales (*Lyginopteris*), Bennettitales (*Williamsonia*) and Cordaitales (*Cordaites*)

Course Content:**Credit: 4****Unit I: Bryophytes**

Classification and general account of structure, morphology, anatomy, reproduction and Economic importance of Bryophytes. Phylogenetic relationship among Hepaticopsida with reference to *Riccia*

and *Marchantia*, Anthocerotopsida with reference to *Anthoceros*, Bryopsida with reference to *Sphagnum* and *Polytrichum*.

Unit II: Pteridophyte

Classification, comparative study of morphology, anatomy, reproduction, steelar diversity, heterospory and seed habit with reference to Psilopsida (*Psilotum*), Lycopsida (*Lycopodium*, *Selaginella*), Sphenopsida (*Equisetum*) and Pteropsida (*Adiantum* and *Marsilea*).

Unit III: Gymnosperms

Classification, evolutionary significance and salient features, Comparative study of morphology, anatomy and reproduction of Cycadales (*Cycas*), Coniferales (*Pinus*, *Cryptomeria*, *Thuja*), Ginkgoales (*Ginkgo*) and Gnetales (*Gnetum*)

Unit IV: Paleobotany

Process of fossilization, General account, anatomy and reproduction of Psilophyta (*Rhynia*), Lepidodendrales (*Lepidodendron*) and Sphenophyllales (*Sphenophyllum*), Cycadofilicales (*Lyginopteris*), Bennettitales (*Williamsonia*) and Cordaitales (*Cordaites*).

Suggested books:

1. Morphology of Pteridophytes, Hutchinpn Univ. Liabray (1966) -K.R. Spome,
2. An introduction to paleobotany- C.A. Arnold,
3. An introduction to Embryophyta&Bryophyta, Surajeet Publication,(2012), Vol I &Vol II,- N.S Paharihar.
4. Botany for Degree Students Bryophyta,S. Chand. (2010) ,Ist Ed, B.R Vashishta, A.K Sinha.
5. Botany for Degree Students Pteridophyta, S. Chand. (2010) , Ist Ed P.C Vashistra, A.KSinha, Anil Kumar.
6. An introduction to Pteridophyta, Vikash Publ. (1999), 2nd Ed. A. Rashid.
7. Studies in Botany-(2005)- S.K. Guna and S.K. Chowdhary, Moulik Library Vol-I
8. College Botany- VolIII ,New Central Book Agency,(2006), 6th Ed.H.C. Gangulee, K. S. Das
9. An introduction to systematic Botany & Ecology. J.N Mitra
10. PlantTaxnomy.Dr. N.B Saxena, S.Saxena
11. Modern plant taxonomy. N.S Subrahmanyam

Paper code: BSB-103

Paper Title: Phycology and Lichen(Practical)

Course Content:

Credit: 2

1. Study of morphology and reproductive structures of the following Algal types:
Cyanophyceae (*Anabaena*, *Oscillatoria*)

Chlorophyceae (*Chlamydomonas*, *Volvox*, *Cladophora*, *Chara*),
Xanthophyceae (*Vaucheria*),
Bacillariophyceae (Diatoms),
Phaeophyceae (*Ectocarpus*, *Fucus*),
Rhodophyceae (*Polysiphonia*).

2. Lichen: Thallus morphology of Foliose; Crustose; Fruticose types.

Field studies with field reports and collections and Practical records.

Paper code: BSB-104

Paper Title: Archegoniate and Palaeobotany (Practical)

Course Content:

Credit: 2

Study of morphology and reproductive structures of the following types:

Bryophytes: *Riccia*, *Marchantia*, *Anthoceros*, *Polytrichum*, *Sphagnum*

Pteridophytes: *Lycopodium*, *Selaginella*, *Equisetum*, *Adiantum*, *Marsilea*

Gymnosperm: *Cycas*, *Pinus*, *Gingo*, *Gnetum*.

Paleobotany: Specimen and slides studies in theory paper.

Field studies with field reports and collections and Practical records.

Semester-2

Paper code: BSB-201

Paper Title: Anatomy, Palynology and Embryology (Theory)

Course outcome:

CO1. **(0.2)** Study of anatomy will help students to understand the structural adaptations of plants with respect to diverse environmental conditions. It also helps them to distinguish between monocots, dicots and gymnosperms. Such a study is linked to plant physiology. Hence, it helps in the improvement of food crops.

CO2. **(0.2)** By studying plant tissues and cells they will learn how the plants constructed and how they work. These studies are very important because they lead to be a better understanding of how to take care for plants and fight plant diseases.

CO3. **(0.2)** Study of embryology will help students to understand the growth and development of a species and it will help to know how it evolved and how various species are related. In various field of research work embryology will help to link various species on the phylogenetic tree of life. It also helps to understand other branches of biology like genetics, cytology, physiology, evolution, etc.

CO4. **(0.2)** By studying palynology students will learn about the past vegetation (land plants) and marine and freshwater phytoplankton communities, and so infer palaeoenvironmental and palaeoclimatic conditions.

CO5. **(0.2)** Forensic palynology is a branch where palynology is beneficial to criminal investigators in revealing the history of evidence based on pollen and spore traces. Palynology has several unique uses in the modern world. Thus study of palynology has a plethora of potential career opportunities.

Course Content:

Credit: 4

Unit I:

Anatomy: primary structure of root, stem and leaf of monocot and dicot, secondary growth in root and stem, wood anatomy: growth rings, heart wood and sap wood, periderm: origin, structure and functions.

Unit II:

Embryology: microsporogenesis and development of male gametophyte, megasporogenesis and development of female gametophyte, double fertilization.

Unit III:

Development of dicot embryo, structure, development and types of endosperm, fruit: development and maturation of fruit, types and parts of fruits, vegetative propagation: grafting, layering and budding

Unit IV:

Definition of palynology. Palynology as an interdisciplinary science, historical perspective. Pollen morphology, Types of Pollen, pollen sterility, pollen pistil interaction and its significance.

Paper code: BSB-202

Paper Title: Instrumentation and laboratory techniques (Theory)

Course outcome:

CO1. **(0.25)**To get the knowledge of different instrument used in the laboratory .

CO2. **(0.2)**To know about the chromatography.

CO3. **(0.15)**It will provide the knowledge of sterilization, fixative and staining technique and different concept of solution

CO4. **(0.2)** Students can learn about the process of herbarium technique and future preservation of the species as many of the species are becoming rare day by day due to deforestation, over-collection of the lay people, building activities etc.

CO5. **(0.2)**They can make different types of hebarium sheets particularly for medicinal plants locally available on their area, keeping them in safe, further they can deliver their lectures in schools and colleges and can teach them about the dry specimens keeping in the herbarium sheet to prevent any damage and also for their further need.

Course Content:

Credit: 4

Instrumentation:

Unit I:

Microscopy: working principles of Simple and compound light microscope. Camera lucida principle, Micro technique, hot air oven, incubators, autoclave, and laminar air flow chamber, centrifuge, pH meter.

Unit II: Chromatography: Introduction, principle, methods and application of paper chromatography and column chromatography.

Laboratory techniques:

Unit III: Fixatives and stains: principles, types, procedures and application; methods of sterilization and culture media; mounting media,

Concept of solutions, indicators, pH and buffers (Preparation of normal, molal, molar, ppm and percent solutions; reagents (Acid & Base), different indicators, pH and buffer).

Unit IV: Field and herbarium techniques, preservation of museum and herbarium specimation , preservation techniques for special types of plant (submersed aquatic plant , succulent and xerophytes, palm, canes and bamboos)

Suggested books:

1. Biological Instrumentation & methodology (Tools and Techniques of Biology) (2012). P.K. Bajpai. S Chand & Company Pvt Ltd, Ram Nagar, New Delhi-110055

2. Narayanan P(2008) Essential of biophysics, New Age International Publishers, New Delhi.
3. Herman EB (2008) Media and Techniques for Growth, Regeneration and Storage 2005-2008. Agritech Publications, New York, USA.
4. Baruah BN (2006). B. Sc. Botany, Part I, Part II, Kalyani Publisher, Ludhiana.
5. Baruah BN (2011). B. Sc., Botany First and Second Semester, GU, Kalyani Publisher, Ludhiana.
6. Baruah BN (2016). Economic Botany, Sem III, Odisha University, Kalyani Publisher, Ludhiana.

Paper code: BSB-203

Paper Title: Anatomy, embryology and palynology(Practical)

Course Content:

Credit: 2

1. Study of elements of tissues and types.
3. Anatomical study of stem and root (Dicots and Monocots) by making double stained temporary/permanent slides
4. Anatomical studies of anomalous secondary structure in stem of *Mirabilis*, *Amaranthus*, *Bougainvillea*, *Canna* and *Dracaena* by making double stained permanent slides
5. Study the pollen morphology of *Hibiscus*, *Datura*, and pollinia of *Cryptostegia* and *Calotropis* by acetolytic method
6. T.S. of young Anther; T.S. of mature Anther.
7. L.S. of different types of Ovules.
8. L.S. of Embryo – Dicotyledonous, Monocotyledonous.

Paper code: BSB-204

Paper Title: Instrumentation and laboratory techniques(Practical)

Course Content:

Credit: 2

1. Preparation of solutions (normal, molal, molar, ppm and percent solutions) of known concentrations using pure samples and stock solutions.
2. Measurement of pH using pH meter.
3. Preparation of buffers (phosphate/ acetate buffer)
4. Paper chromatographic separation of any plant material,
5. Preparation of Reagents, Fixatives, stains and Indicators,
6. Determination of Plant pigments by Spectrophotometric method (absorption spectra).
7. Visit to some Laboratories outside the state.

Semester-3

Paper code: BSB-301

Paper Title: Angiosperm Taxonomy (Theory)

Course outcome:

CO1. **(0.2)** Understand the basic idea of flowering plants and their systematic position or classification.

CO2. **(0.2)** Students may visit the forest area for collection of plants and identify with upto their knowledge learnt at the class

CO3. **(0.2)** Students may know the uses of unknown plants used by the tribal people of the society with ethnobotanical uses.

CO4. **(0.2)** Students may visit some research organisaions like BSI, NBRI, FRI and can gather knowledge about the herbarium technique with up to date nomenclature of the plant

CO5. **(0.2)** They can apply for Research fellowship for Ph. D and other higher Degree in Plant Taxonomy in Universities and Deem Universities for their future employment.

Course Content:

Credit: 4

Unit I:

Field and Herbarium technique. General structure of typical leaf; types of leaf, leaf venation, inflorescence, flower, stamen, carpel, pollination and fertilization.

Unit II:

Aims and objective of Plant Taxonomy. Basic component of Taxonomy. Binomial nomenclature. Different systems of classification. Artificial, natural, phylogeny. Phanitic, Cladistic, Linnaeus and Bentham and Hooker's system. H. John Hutchinson's phylogenetic system.

Unit III:

Dicotyledones: Study of families- Ranunculaceae, Acanthaceae, Lamiaceae, Euphorbiaceae, Asteraceae.

Unit IV:

Monocotyledones: Study of families- Poaceae, Zingiberaceae, Liliaceae, Orchidaceae.

Paper code: Paper code: BSB-302

Paper Title: Mycology and Plant Pathology (Theory)

Course outcome:

CO1. **(0.2)** Understand history of Mycology, Fungal cell structure and classification, reproduction, growth and nutrition. Economic importance of fungi.

CO2. **(0.2)** Morphology and reproduction of few important fungal genera.

CO3. **(0.1)** Understanding history of Plant pathology.

CO4. **(0.25)** To get knowledge about Plant diseases caused by fungi and their control measures:

CO5. **(0.25)** Plant disease: symptoms of Plant Diseases viral, fungal and bacterial.

Course Content:

Credit: 4

Unit I:

History of Mycology; cell structure of Fungi classification of fungi, reproduction of fungi and growth types of spores of fungi; spore dispersal mechanism; economic importance of fungi; Growth and nutrition of fungi.

Unit II:

Morphology and reproduction of *Mucor*, *Penicillium*, *Peziza*, *Yeast*, *Agaricus*, *Clavaria*, *Helminthosporium*, *Fusarium*, *Alternaria*.

Unit III:

History of Plant pathology. Plant disease: symptoms of Plant Diseases viral, fungal and bacterial.

Unit IV:

Plant diseases caused by fungi and their control measures:

- a) Late blight disease of potato
- b) White rust of Brassicaceae
- c) Blast disease of rice
- d) Rust diseases-
 - Black stem rust of wheat
 - Yellow rust of wheat

- Rust of bean
- e) Sugarcane disease : Red rot of sugarcane
- f) Loose smut of wheat
- g) Grey blight of tea
- h) Citrus cancer
- i) TMV

Paper code: Paper code: BSB-303
Paper Title: Cytology, Genetics and Plant Breeding (Theory)

Course outcome:

CO1. **(0.2)** Genetics is a branch of biology that is used for the study of the mechanism of heredity and variation

CO2. **(0.2)** Genetics, in fact provides the modern paradigm (a prototype) for whole of biology.

CO3. **(0.2)** Cytogenetic tests are often used in the diagnoses of genetic diseases and in parental diagnostics.

CO4. **(0.2)** To produce a health forecast by analysing database of genetic and cell biology information.

CO5. **(0.2)** It is also important for the researchers or biologists in generating vaccines, medicines etc.

Course Content:

Credit: 4

Unit I:

Cell and its organization.

Nucleus-structure, composition, function, Mitochondria, Golgi bodies, Endoplasmic reticulum, Lysosome, Vacuoles).

Chloroplast: structure, function. Cytoskeleton.

Chromosome morphology

Cell division: Mitosis and meiosis- process and significance.

Unit II:

Principles of inheritance- Mendel's laws of Inheritance, sex linked inheritance, non mendelian inheritance, extra chromosomal inheritance.

Unit III:

Linkage and crossing over, Sex chromosome and sex determination. Chromosomal aberrations: structural and numerical, euploidy and aneuploidy, their importance in inheritance.

Unit IV:

Double helical structure of DNA: A, B, Z DNA, Transcription, Translation, DNA replication, concept of exons and introns, DNA packaging.

Paper code: Paper code: BSB-304

Paper Title: Angiosperm Taxonomy and Mycology (Practical)

Course Content:

Credit: 2

1. Study of vegetative and reproductive structures of the selected angiospermic plants of monocotyledons and dicotyledones families. Identification of the specimens up to the genus.
2. Field study (local): Specimen collection, preservation, preparation of herbarium sheet and submission in the examination (at least 10 nos).
3. Morphology and reproductive structure of:
Mucor, Yeast, Peziza, Penicillium, Agaricus, Clavaria, Helmenthosporium, Fusarium
4. Field report

Paper code: Paper code: BSB-305

Paper Title: Plant Pathology, Cytology and Genetics (Practical)

Course Content:

Credit: 2

1. Plant diseases:
 - Late blight disease of potato
 - White rust of Brassicaceae
 - Black stem rust of wheat
 - Rust of bean
 - Grey blight of tea
 - *Alternaria* leaf spot of cabbage
2. Study of mitosis in root tip cells.
2. Study of meiosis
3. Pre treatment of root tips with colchicine and study of the Chromosome
4. Karyotype study in onion, garlic.

Paper code: Paper code: BSB-306 (SEC-I)

Paper Title: Biofertilizer (Theory)

Course outcome:

CO1. **(0.25)**To get the knowledge of different microorganism involve in improving soil health .

CO2. **(0.25)** It will also give the knowledge of organic farming.

CO3. (0.25) Students will learn different techniques to produce biofertilizer

CO4. (0.25) Students will learn about the methods of isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.

Course Content:

Credit: 4

Unit 1

Introduction , Benefit and limitation of biofertilizer, Role of microorganism in improving soil health, Mode of action of bio fertilizer, Benefit over chemical fertilizers, application: Seed treatment; Root dipping, Soil application .

Unit 2

Types of biofertilizer : Rhizobium, Azotobacter, Azospirillum, Cynobacter, Azolla, Phosphate solubilising micro organism(PSM), PGPR. Mass production of bio fertilizer, Constrains in bio fertilizer technology, Carrier materials, Criteria of a good carrier, Storage of biofertilizer.

Unit 3

Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.

Unit 4

Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, method of vermicomposting – field Application

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 Akta Prakashan, Nadiad

Semester-4

Paper code: Paper code: BSB-401
Paper Title: Microbiology (Theory)

Course outcome:

CO1. **(0.2)**To get knowledge about the Introduction and different scopes of study in various microbial field

CO2. **(0.2)**To attain knowledge about the Germ theory of disease and Koch's postulates. Control of microorganisms, Microbial nutrition, different culture media, isolation of microorganisms, pure culture concept, methods of preservation.

CO3. **(0.2)** Basic knowledge about soil microbiology, air microbiology and water microbiology

CO4. **(0.2)** Understand the basic concept of food microbiology, microbes responsible for spoilage and poisoning of food and precautions for preservation of food.

CO5. **(0.2)**To get knowledge about utilization of microorganisms in dairy industries and ethanol production.

Course Content:

Credit: 4

Unit I

Introduction to microbiology. History of microbiology, Scope of microbiology, Major groups and their characteristics (three domain system, five kingdom system and eight kingdom system of classification). Virus, Bacteria, Fungi, Archaeobacteria, Mycoplasma, Rickettsia, Chlamydiae.

Unit II

Germ theory of disease and Koch's postulates. Control of microorganisms, Microbial nutrition, different culture media, isolation of microorganisms, pure culture concept, methods of preservation.

Unit III

Soil microbiology: soil microbes. Microbial interactions with microbes, plants and animals, biogeochemical cycles.

Air microbiology: distribution of microbes in air, allergic disorders of air microflora.

Water microbiology: microbial components of water, role and importance of aquatic microorganisms.

Unit IV

Food microbiology: food spoilage, food poisoning, preservation of food.

Milk and milk products, sources of microorganisms in milk.

Enzyme immobilization.

Production of ethanol.

Suggested books:

1. Microbiology by R. P. Singh, Kalyani Publications.

2. Microbiology by Lansing M Prescott, Donald A Klein, John P Harley, McGraw Hill
3. Principles of Microbiology by Ronald M. Atlas (1995), Amy Mc Cullen
4. Microbiology: Principles and Explorations by Jacquelyn Black
5. General Microbiology by Roger Y Stanier, John L Ingraham, Mark L Wheelis
6. Microbiology by Michael J Pelczar
7. Fundamental Principles Of Bacteriology A J Salle
8. General Microbiology by Power and Dagainawala, Himalaya Publishing House,
9. Foundations in Microbiology by Kathleen park Talaro, McGraw Hill. Science
10. Microbiology: An Introduction by Gerard J Tortora, Berdell R Funke, Christine L Case, DorlingKindersley (india) Pvt Ltd
11. Microbiology by Stuart Walker, W B Saunders

Paper code: Paper code: BSB-402
Paper Title: Paper Title: Plant physiology (Theory)

Course outcome:

CO1. **(0.2)** Understand the basic physiological relationship of Plant, water and soil and translocation of organic solutes

CO2. **(0.2)** Understand the basic biochemical and physiological knowledge about the utility of different minerals present in the soil for the growth and development of plants and the deficiency symptoms of micro and macro nutrients to plants

CO3. **(0.2)** Understand the basic knowledge about the Physiology and biochemistry of photosynthesis, chemosynthesis and respiration i.e., breakdown of sugar

CO4. **(0.2)** Understand detail knowledge about the physiology of flowering, senescens and abscission in plants and dormancy of seed

CO5. **(0.2)** Basic knowledge about the physiological role of phytohormones in the growth and development of plants

CO6. Basic knowledge about the Biochemistry of enzymes

Course Content:

Credit: 4

Unit I:

Plant-soil-water relationship: absorption, osmosis, diffusion, transpiration, ascent of sap, Mineral nutrition and mineral salt absorption, criteria of essentiality of elements, deficiency symptoms.

Unit II:

Photosynthesis: C₃, C₂, C₄ cycle, CAM pathway and chemosynthesis, Respiration- Breakdown of sugar.

Unit III:

Translocation of organic solutes, Pressure–Flow Model; Phloem loading and unloading; Source–sink relationship.

Unit IV:

Enzymes, Growth and development, Growth Hormones, Application of plant growth regulators in agriculture, physiology of flowering- photoperiodism and vernalization; seed dormancy; senescence and aging; stress physiology –concept of biotic and abiotic stress.

Paper code: Paper code: BSB-403

Paper Title: Paper Title: Ecology and Phytogeography (Theory)

Course outcome:

CO1. **(0.2)**To highlight the students with some basic understandings of plant ecology and ecosystem, food chain and its types, food webs, energy flow in an ecosystem. Understanding on habitat and niche, types of niche.

CO2. **(0.2)**Deals with the understanding of plant population and community ecology, various attributes of population and community. The students will have an understanding on coexistence, intra-specific interactions, and interspecific interactions among various population, ecological succession and its significance

CO3. **(0.2)**Deals with the understanding of phyto-geographical regions of India, detail idea about the floras of North-East India. Understanding on mechanism of migration and barrier of plant distribution and also about biodiversity hotspots and endemism, the unit also give the preliminary understanding on pollution its cause and remedies.

CO4. **(0.2)**Deals with the understanding of biodiversity, its concept and status in India. It will give an understanding of loss of biodiversity, its causes and management and also various strategies involved in the conservation of biodiversity.

CO5. **(0.2)**To give an understanding on protected area regime, acts and legislations.

Course Content:**Credit: 4****Unit I:**

Introduction to ecology: Nature of ecosystem, food chain: types of food chain. Food webs, energy flow. Concept of Habitat, Ecological Niche: types of niche.

UNIT II:

Population ecology, Characteristics of population, age structure, population growth, Competition and coexistence, intra-specific interactions, interspecific interactions, Mutualism and commensalism, prey-predator interactions

Concepts of community, Species Diversity, Ecological succession, types of succession, general process of succession, Significance of succession.

Unit III:

Concept of Phyto-geography, Phyto-geographic regions of India, Plants migration and barrier of plant distribution, Endemism

Pollution and its management, Types of pollution, causes, effect and control of pollution

Unit IV:

Biodiversity: Concept, status in India. Loss of biodiversity, causes and management, Strategies for conservation –Ex situ and in situ conservation, protected area regime, acts and legislations

Paper code: BSB-404**Paper Title: Microbiology and Water relations(Practical)****Course Content:****Credit: 2**

1. Techniques on cleaning and Sterilization of equipments.
2. Preparation of media
3. Pure culture technique: slant, Streak-plate methods; Pour-plate method.
4. Isolation and enumeration of microbes from air, soil and water.
6. Study of Gram positive and Gram negative bacteria.
7. Determine the osmotic potential of cell sap by plasmolytic method.tissue.
8. Determine the stomatal index, stomatal frequency and estimate the transpiration rate of different types of leaves.

Paper code: BSB-405**Paper Title: Plant Physiology and Ecology (Practical)****Course Content:****Credit: 2**

1. Study the effect of temperature on the rate of imbibitions and determine the Q₁₀.
2. Assay of effect of auxin in split pea test.
3. Extract and separate chloroplast pigments by solvent method and Paper chromatography.
4. To study about the working principle and uses of instruments for the measurement of: Temperature (air and soil);
Moisture (rainfall and relative humidity);

- Wind velocity;
Light intensity.
5. To determine minimum size and number of quadrat required for reliable estimate of biomass in grasslands.
 6. To measure the dissolved oxygen content in polluted and unpolluted water samples.
 7. Quantitative analysis of abundance, density and frequency of herbaceous vegetation by quadrat method.

Paper code: BSB-307(SEC II)
Paper Title: Nursery and Gardening (Theory)

Course outcome:

- CO1. **(0.25)**It will provide the knowledge, how to open a nursery.
- CO2. **(0.25)**To know about the different method of gardening and land scaping.
- CO3. **(0.25)**To get the knowledge of cultivation, storage and marketing of various vegetable crops
- CO4. **(0.25)** To get knowledge about how to develop different types of garden and their management strategies.

Course Content:

Credit: 2

Unit 1

Nursery: definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities – Planting – direct seeding and transplants. Seed: Structure and types – Seed dormancy; causes and methods of breaking dormancy – Seed storage: Seed banks, factors affecting seed viability. Seed testing and certification.

Unit 2

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.

Unit 3

Gardening: definition, objectives and scope – different types of gardening – landscape and home gardening – parks and its components – plant materials and design – computer applications in landscaping – Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.

Unit 4

Sowing/raising of seeds and seedlings – Transplanting of seedlings – Study of cultivation of different vegetables: cabbage, brinjal, lady's finger, onion, garlic, tomatoes, and carrots – Storage and marketing procedures.

Suggested Readings

7. 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.
8. Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National _Seed Corporation Ltd., New Delhi.
9. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA

Semester-5

Paper code: BSB-501

Paper Title: Pharmacognosy (Theory)

Course outcome:

- CO1. **(0.2)**To get knowledge about the history and scope of pharmacognosy, traditional and alternative systems of medicine
- CO2. **(0.1)**To get knowledge about Tridosha concept, Nutraceuticals & Cosmeuticals
- CO3. **(0.1)**Basic knowledge about Drug adulteration, Methods of drug evaluation.
- CO4. **(0.2)**To get knowledge about occurrence, distribution cultivation, microscopic characters, constituents and uses of root rhizome drugs, stem, bark, leaf flower and fruit drugs.
- CO5. **(0.2)**Understand the various branches of Ethno-botany, Methodology, importance of Ethnobotany in research and conservation.
- CO6. **(0.2)** Basic knowledge about various ethnic Societies of North-East India and use of some plant by the tribes.

Course Content:

Credit: 4

Unit I:

Introduction to Pharmacognosy, Ayurvedic Pharmacy

History, definition and Scope of Pharmacognosy, Traditional and alternative systems of medicine, Classification of crude drugs.

Introduction, Tridosha concept, Humoral, Indigenous Systems of medicine, Ayurvedic principles, Ayurvedic formulations, Nutraceuticals & Cosmeuticals.

Unit II:
Analytical Pharmacognosy

Drug adulteration, Methods of drug evaluation- Morphological, Microscopic, Chemical and Physical methods, Biological and chemical evaluation of drugs

Unit III:
Study of drugs

Study of drugs: occurrence, distribution cultivation, microscopic characters, constituents and uses of the following.

Root Rhizome drugs: - Zinziber, Asparagus, Turmeric

Stem drugs: - Ephedra

Bark drugs: - Cinnamon, Cinchona

Leaf drugs: - Aloe, Adhatoda, Basil, Andrographis, Brahmi

Flower drugs: - Clove

Fruit drugs: - Coriandrum, Amla, Piper

Unit IV:
Ethno-botany

Introduction, Definition, concepts and relevance's, Branches of Ethno-botany, Methodology, importance of Ethnobotany in research and conservation, Ethnic Societies of North-East India and use of some plant by the tribes.

Suggested Books:

1. A Pharmacognosy and Pharmaco-biotechnology. New Age international (P) Limited, Publishers (formerly wileyEastern Limited)
2. Kokate C.K. Practical Pharmacognosy, Vallabh prakashan, New Delhi,
3. Kokate C.K. Purohit A.P. and Gokhale S.B. Pharmacognosy, NiraliPrakashan pune
4. Trease G.E. and Evans. W.C. Pharmacognosy ELBS Twelfth Edition Tyler V.E Brady L,R and Robbers J.E. Pharmacognosy Lea and Febiger. Philadelphia. 8th edition KM Varghese and Co. Mumbai,
5. Vaidya S.S. and Dole. V.A. Bhaishyajakalpana, Anmol Prakashan, pune
6. Wallis, T.E. Test books of pharmacognosy CBS publishers and distributors New Delhi (Latest Edition)

7. Ashalota Razarioetal. A Hand Book of Ethno biology Kalyani Pablishes 1999
8. Sinha R.R.& Sinha starlit 2005 Ethnobiology, Surabhi

Paper code: BSB-502
Paper Title: Economic Botany (Theory)

Course outcome:

CO1. **(0.2)** Students may know the plant kingdom and economic importance of the various categories of plants such as cereals, beverages, pulses, timber, fibers and sugar yielding plants.

CO2. **(0.2)** Now a days Ethnobotany is very important part of economic botany. Hence students may gather knowledge about the traditional knowledge of the plants used by the primitive people of the society

CO3. **(0.2)** To gather knowledge about the major spices, condiments, narcotics, mastigatories and funmitories, beverages.

CO4. **(0.25)** To gather knowledge about the different types of ornamental plants. Plants used as avenue trees for shade, pollution control and esthetics.

CO5. **(0.15)** To gather knowledge about the plants used in Sericulture.

Course Content:

Credit: 4

Unit I:

Plants for man, Classification of Plants on botanical resources, History, Origin of Cultivated Plants: Concept of centers of origin; Plant introduction; Crop domestication.

Unit II:

History, Origin, cultivation and processing of Cereals wheat & rice, History, Origin, cultivation and processing of Tea, Sugarcane and Rubber. Characteristics and uses of Medicinal (Rawolfia, Cinchona, Azadirachta, Androgaphis, Taxus), Fiber (Cotton, Jhut), timber yielding plants (Sal, Sissoo, Teak). Fruits; Products and by-products of sugar industry.

Unit III:

A brief account of major spices, condiments, narcotics, mastigatories and funmitories, beverages. Plants used in Sericulture (example of two plants).

Unit IV:

Ornamental plants. Plants used as avenue trees for shade, pollution control and esthetics.

Paper code: BSB-503
Paper Title: Pharmacognosy (Practical)

Course Content:

Credit: 2

1. Organographic studies of Ginger, Turmeric, Rauwolfia, Adhatoda, Basil, Andrographis & Cinnamomum.
2. Study of select plant *Hollorhena antidysentrica*, Jaluk (*Piper longum*), Amlokhi (*Phyllanthus emblica*), Brahmi (*Bacopa monnieri*), Kalabanda (*Aloe vera*), Bay leaf.

(All Practical's should be supported with field studies, field reports, herbariums and collections or photographs and Practical records).

Paper code: BSB-504
Paper Title: Economic Botany (Practical)

Course Content:

Credit: 2

Acquaintance with common medicinal plants and their useful parts: *Terminalia arjuna*, *Centella asiatica*, *Saraca asoca*, *Adhatoda vasica*, *Andrographis paniculata*, *Hygrophila Schulii*, *Eclipta alba*, *Aloe barbadensis*, *Rauwolfia serpentina*, *Vitex negundo*, *Bacopa moniaria*, *Holarh hena antidysenterica*, *Boerhaavia repens*.

(All Practical's should be supported with field studies, field reports, herbariums and collections or photographs and Practical records).

Paper code: DSE-I
Paper Title: Stress Biology (Theory)

Course outcome:

- CO1. (0.2) Understand the basic concept of stress physiology of plants
- CO2. (0.2) To learn about the physiological effect of various abiotic stress to plants such as Water stress; Salinity stress, High light stress; Temperature stress
- CO3. (0.2) To learn the physiological effect of various biotic stress
- CO4. (0.2) To understand the developmental and physiological mechanisms that protects plants against environmental stress. Adaptation in plant to various stress

CO5. (0.2) Understand about reactive oxygen species: Production and scavenging mechanisms.

Course Content:

Credit: 4

Unit 1: Defining plant stress Acclimation and adaptation.

Unit 2: Environmental factors .Water stress; Salinity stress, High light stress; Temperature stress; Hypersensitive reaction; Pathogenesis– related (PR) proteins; Systemic acquired resistance; Mediation of insect and disease resistance by jasmonates.

Unit 3: Developmental and physiological mechanisms that protect plants against environmental stress. Adaptation in plants; Changes in root: shoot ratio; Aerenchyna development; osmotic adjustment; Compatible solute production.

Unit 4: Reactive oxygen species: Production and scavenging mechanisms.

Paper code: DSE-I

Paper Title: Stress Biology (Practical)

Course Content:

Credit: 2

1. Quantitative estimation of peroxidase activity in the seedlings in the absence and presence of salt stress.
2. Superoxide activity in seedlings in the absence and presence of salt stress.
3. Quantitative estimation of proline activity in the seedlings in the absence and presence of salt stress.
5. Study of water stress in plants (RLWC)
6. Anatomical study of stressed plants

Paper code: DSE-II

Paper Title: Plant Breeding (Theory)

Course outcome:

CO1. (0.2) The study of plant breeding is necessary for changing the traits of plants in order to produce desired characteristics.

CO2. (0.2) The knowledge of how to improve the quality of nutritional crop products for humans and animals can be initiated by plant breeding techniques.

CO3. (0.2) Plant breeding technique can be used for producing disease resistant plants.

CO4. (0.2) New plant varieties can be produced by plant breeding.

CO5. (0.2) International development agencies believe that breeding new crops is important for ensuring food security by developing new varieties that are higher yielding.

Course Content:

Credit: 4

Unit1:

Definition and objectives of plant breeding. Principles involved in plant breeding. Important national and international plant breeding institutes

Unit 2:

Breeding techniques (outlines only): a) plant introduction; b) selection-mass selection, pure line

selection and clonal selection; c) hybridization techniques, hybrid vigour, inbreeding depression;

d) mutation breeding

Unit 3:

Polyploidy in plant breeding, Breeding for disease resistance. Improved seed production and testing techniques. Heterosis

Unit 4:

Achievements with reference to the following crops in India: Green revolution with reference to Wheat, Rice and Cotton.

Paper code: DSE-II

Paper Title: Plant Breeding (Practical)

Course Content:

Credit: 2

1. Techniques of emasculation of any bisexual flower
2. Identification of economic plants for hybridization.
3. Techniques of hybridization of any bisexual flower.

Semester-6

Paper code: BSB 601

Paper Title: Molecular Biology and Bioinformatics (Theory)

Course outcome:

CO1. **(0.2)** Molecular biology is the basic science that has as its goal an explanation of life processes at the subcellular and molecular level.

CO2. **(0.2)** Molecular biology deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development.

CO3. **(0.2)** This course will emphasize on the molecular mechanisms of DNA replication, repair, protein synthesis, mutation etc.

CO4. **(0.2)** Developments in molecular biology have opened new areas of study and provided powerful techniques that are revolutionizing the pharmaceutical, health, and agricultural industries.

CO5. **(0.2)** The knowledge of bioinformatics involves in analysis of plant and human genome, identification of targets for drug discovery, the study of structural and functional relationships and molecular evolution.

Course Content:

Credit: 4

Unit I:

Structure and organisation of gene, expression and regulation of gene in prokaryotes (Lac operon concept).

Unit II:

Genetic code; properties and evidences. Amino acid structure and classification. Protein structure and modification.

Unit III:

Mutation: point mutation – deletion, insertion and substitution, chemical mutagenesis (tautomerization, alkylation, deamination, base analogues, dimerization). Agents of mutation.

Unit IV:

Bioinformatics: concept and scope, biological database, NCBI, EMBL, Sequence alignment, Phylogenetic analysis.

Reference books:

1. GeneticsP.K.Gupta
2. GeneticsB.D.Singh
3. Genetics.....Verma and Agarwal

Paper code: BSB 602
Paper Title: Applied Botany (Theory)

Course outcome:

- CO1. **(0.2)**To get basic knowledge on plant breeding
- CO2. **(0.2)**To get basic knowledge on mushroom cultivation
- CO3. **(0.2)**Understanding application of Biotechnology in conservation of plant generic resources
- CO4. **(0.2)**Importance of tissue culture and it's application
- CO5. **(0.2)** Understanding the role of plant growth regulators in Agriculture and Horticulture and mode of applications of plant growth regulators.

Course Content:

Credit: 4

Unit I:

Plant Breeding: Objectives of Plant Breeding, Domestication, Selection under domestication; Introduction, Quarantine; and Acclimatization of plants. Mode of reproduction.

Unit II:

Mushroom cultivation:

General morphology, nutritional properties and distinguishing characteristics. Different techniques in mushroom cultivation and its processing..

Unit III:

Application of Biotechnology in conservation of plant generic resources: Gene banks. Importance of tissue culture and it's application.

Unit IV:

Plant growth regulators in Agriculture and Horticulture

Mode of applications of PGRs

- i) Pre sowing soaking treatment
- ii) Foliar application
- iii) Other modes

Paper code: BSB 603
Paper Title: Molecular Biology (Practical)

Course Content:

Credit: 2

1. Prepare the standard curve of protein and determine protein content in plant materials by Biuret method.
2. Separate and identification of amino acids by Paper Chromatography method

Paper code: BSB 603
Paper Title: Applied Botany (Practical)

Course Content:

Credit: 2

1. Demonstration of Tissue culture techniques
2. Demonstration of mushroom cultivation
3. Effect of pre sowing-soaking treatments of PGRs on crop growth.

Paper code: DSE-III
Paper Title: Plant Resource Utilization (Theory)

Course outcome:

CO1. **(0.2)** By studying "Plant resource utilisation" students will learn about different dimensions of plant identification as a resource for self- sustenance, their domestication, commercialization based on the need and induction of modification using modern techniques.

CO2. **(0.2)** They will learn about the utilization of wild plants as it is more limited and how to improve it for the new need and imperatives of mankind.

CO3. **(0.1)** Study of medicinal plants would help them in research and development of newer organic drugs that would help to minimize adverse effect that are usually evident in synthetic and semi-synthetically processed drugs. Thereby proving to be a boon to medical science.

CO4. **(0.2)** They will learn about the different conservation processes like in-situ and ex-situ conservation of plants that are going to be extinct very soon due to biotic, abiotic and anthropogenic causes.

CO5. **(0.2)** Study of plant resource utilisation will enhance their specific knowledge and technological skills in converting the rich bio-resource into economic wealth.

CO6. **(0.1)** Students can discover wild tea germplasm using genetic markers for developing better variety of tea with better quality, productivity and resistance to pests and stress conditions. India is major tea producer and Assam produces 13% tea in the world, hence of extreme economic importance.

Course Content:

Credit: 4

Unit-I:

Introduction: Concept, natural resources, biological resources, plants as natural resources
Management practices – need and methods Utilization – Bioenergy, food, fodder, fibre, medicine and essences.

Unit-II:

Forest as potential resource: Introduction and scope, Major forest products and their uses – Timber, fuel. NTFPs and their uses – Gum, resin, tannin, dyes and pigments (two examples of each).

Unit-III:**Plant resources used in cosmetics, aromatics and pharmaceuticals:**

Introduction and scope, Herbal preparations Methods of extraction – Maceration, digestion, decoction, aromatic waste, extracts and tinctures i) Aloe, ii) Henna, iii) Lemon grass, iv) Rose, v) Jasmine vi) Turmeric, vii) Ginger, viii) Neem, ix) Holy basil, x) Amala with reference to part used, products and uses.

Unit-IV:

Bioprospecting: Introduction, concept and scope, Biochemical resources from plants and fungi, Untapped plant resources as potential resources, Sea weeds as a potential resource – Food, fodder and fertilizer Applications

References:

1. Plant Resource Utilization and Conservation by P. C. Trivedi, Niranjana Sharma
2. A Handbook of Plant Resource Utilization and Conservation by Bijan Bihari Dutta
3. Botany for Degree Students by B.P. Pandey
4. Plant Resource Utilization, Palynology and Biostatistics by Pandey, Jain & Singh

Paper code: DSE III**Paper Title: Plant Resource Utilization (Practical)****Course Content:****Credit: 2**

1. Extraction of essential oil from lemon grass and Holy basil.
2. Collection and preparation of Henna powder, Amala and Ginger
3. Collection and preparation of Aloe gel.
4. Study of plant resources and products: Ficus (Rubber), *Acacia 33rabica* (gum), fibre (Cotton or Jute), and tannins (Tea).

Paper code: DSE IV**Paper Title: Horticultural Practices and Post Harvest Technology (Theory)****Course outcome:**

- CO1. **(0.2)** It will give the knowledge, how to identify the different important plants.
- CO2. **(0.2)** To know about the production of different fruit and vegetable crops.
- CO3. **(0.2)** To know about the different horticultural technique of weed control and irrigation.
- CO4. **(0.2)** To know about the different method of propagation.
- CO5. **(0.2)** To get the knowledge of post harvest technology of fruits and vegetables.

Course Content:

Credit: 4

Unit 1

Introduction, Scope and importance, Branches of horticulture; Role in rural economy and employment generation; Ornamental plants :Types, classification (annuals, perennials, climbers and trees); Identification and salient features of some ornamental plants [rose, marigold, gladiolus, carnations, orchids, poppies, gerberas, tuberose, cacti and succulents (opuntia, agave and spurges)] Ornamental flowering trees (Indian laburnum, gulmohar, Jacaranda, Lagerstroemia, fishtail and areca palms,).

Unit 2

Fruit and vegetable crops: Production, origin and distribution; Description of plants and their economic products; Management and marketing of vegetable and fruit crops; Identification of some fruits and vegetable varieties (citrus, banana, mango, chillies and cucurbits).

Unit 3

Horticultural techniques:Application of manure, fertilizers, nutrients and PGRs; Weed control; Biofertilizers, biopesticides; Irrigation methods (drip irrigation, surface irrigation, furrow and border irrigation); Hydroponics; Propagation Methods: asexual (grafting, cutting, layering, budding), sexual (seed propagation), Role of micropropagation and tissue culture techniques; Scope and limitations.

Unit 4

Landscaping and garden design:Planning and layout (parks and avenues); gardening traditions - Ancient Indian, European, Mughal and Japanese Gardens. Importance of post harvest technology in horticultural crops; Field and post-harvest diseases; Identification of deficiency symptoms; Evaluation of quality traits; Harvesting and handling of fruits, vegetables and cut flowers; Principles, methods of preservation and processing; Methods of minimizing loses during storage and transportation;

Paper code: DSE IV

Paper Title: Horticultural Practices and Post Harvest Technology (Practical)

Course Content:

Credit: 4

1. Field visits to gardens, standing crop sites, nurseries, vegetable gardens and horticultural fields.
2. Propagation technique of horticultural crops-
 - a. Cutting , b. Budding c. Grafing d. Layering
3. Container cultivation of ornamental and flowering plants.
4. Nursery bed preparation and seed sowing.
5. Maintenance of ornamental plants.
6. Preparation of Jam, Jelly and pickle.

