

SEMESTER I

CODE	COURSE TITLE
18BOUC101	PLANT DIVERSITY –I (ALGAE, FUNGI, LICHENS, BACTERIA, VIRUS AND PLANT PATHOLOGY)

Category	CIA	ESE	L	T	P	Credit
Core	25	75	85	5	-	4

Preamble

To evaluate plant diversity in terms of structure, reproduction and environmental relationships in order to ensure an up-to-date level of understanding of primitive plant groups
 To develop an understanding of biological facts and appreciation of their economic significance
 To understand the characteristics of microorganisms, nature of plant disease epidemics and how to manage them

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate the various trends for classification of Algae, Fungi and lichens and to relate the different classification systems to gain knowledge on the lower plants in plant kingdom	K1, K2
CO2	Compare and contrast the characteristics of lower group of plants and compare the diversity with other forms of plant kingdom	K2 , K3
CO3	Provide a framework approaches in plant disease management that can be used for their profession	K2 , K3
CO4	Familiarize with basic information in Botany with special attention to the economic importance of lower group of plants	K2, K3
CO5	Analyze the skills in culturing microorganisms and identify the future use in industries	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	S	M	M	S	S
CO3	S	S	M	S	S
CO4	S	M	M	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

(18hrs.)

Algae - Classification of Algae (G.M. Smith, 1955) - Study of the Structure - Reproduction and Life cycle of Anabaena –Chlamydomonas – Volvox – Oedogonium - Caulerpa and Chara

UNIT II(18hrs.)

Structure - Reproduction and Life cycle of Diatoms – Pennate and Centric–Dictyota and Polysiphonia- Economic importance of Algae

UNIT III(18 hrs.)

Fungi -Classification of Fungi (Alexopoulos, 1962) - Structure - Reproduction and Life cycle of Albugo– Rhizopus – Saccharomyces – Aspergillus– Puccinia and Agaricus

UNIT IV(18hrs.)

Structure - Reproduction and Life cycle of Lycoperdon - Cercospora – Fusarium and Alternaria- Economic importance of Fungi. Structure and Reproduction of Lichens – Crustose - Foliose and Fruticose

UNIT V(18 hrs.)

Structure and Reproduction of Bacteria and Bacteriophage (T₄). Plant Diseases: Bunchy top of banana – Leaf spot disease of groundnut- Blight disease of paddy – Red rot of sugarcane (symptoms- causal organisms and control measures)

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Vashishta, B.R.	Botany for Degree Students – Algae	S. Chand & Co., New Delhi	2010, Revised Edition
2.	Vashishta, B.R.	Botany for Degree Students – Fungi	S. Chand & Co., New Delhi	2014, Revised Edition
3.	Pandey, B.P.	Plant Pathology – Pathogen and Plant Disease	S. Chand & Co., New Delhi	2012, Revised Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Vandenhoeck, C. Mann, D.G. and Jahns, H.M.	Algae - An introduction to Phycology	Cambridge University Press	2009, 1 st South Asian Edition
2.	Aneja, K.R. and Mehrotra, R.S.	An Introduction to Mycology	New Age International Publishers	2015, 2 nd Edition

SEMESTER II

CODE	COURSE TITLE
18BOUC202	PLANT DIVERSITY – II (BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY)

Category	CIA	ESE	L	T	P	Credit
Core	25	75	85	5	-	4

Preamble

To acquaint the students about the classification, morphology, anatomy, reproduction and economic importance of bryophytes, pteridophytes and gymnosperms with an evolutionary link
To interpret the evolutionary history of heterospory and seed habit of pteridophytes
To study the plants forms and diversity in the past with reference to Geological time scale

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Distinguish the classification of Bryophytes, Pteridophytes and Gymnosperms in plant kingdom and relate their characteristic features	K1, K2
CO2	Understand the phylogenetic evidence between the fossils and the living plants	K2, K3
CO3	Recall the biological facts, concepts and principles and appreciating significance of plant kingdom	K1, K2
CO4	Familiarize with basic information in Bryophytes, Pteridophytes and Gymnosperms with special attention to the economic importance of plants to society	K2, K3
CO5	Develop the ability for the application of acquired knowledge in various fields of plant sciences	K2, K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	S	M	M	M	M
CO3	S	S	M	M	S
CO4	S	M	M	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

(18 hrs.)

Bryophytes -Classification of Bryophytes (Reimer's, 1954 - Outline only) Structure and Reproduction of Marchantia–Anthoceros and Funaria - Economic Importance of Bryophytes

UNIT II (18 hrs.)

Pteridophytes– Classification of Pteridophytes (Sporne, 1962 - Outline only) Stellartypes- Structure and Reproduction of Psilotum–Lycopodium- Selaginella and Equisetum

UNIT III

(18 hrs.)

Structure and Reproduction of Ophioglossum- Adiantum–Marsilea- Heterospory and Seed Habit

UNIT IV

(18 hrs.)

Gymnosperms -Classification of Gymnosperms (Sporne, 1965- Outline only) - Structure and Reproduction of Cycas and Gnetum. Angiospermic characters in Gnetum, Economic Importance of Gymnosperms

UNIT V

(18 hrs.)

Palaeobotany- Geological time scale- Radio carbon dating- Fossils and kinds of fossils- Study of the following: Lepidodendron (Stem)- Lepidophyllum (Leaf)-Lepidocarpon (Fruit)- Calamites (Stem) and Williamsonia

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Vashishta, B.R. Sinha, A.K. and Adarshkumar	Botany for degree students – Bryophyta	S. Chand & Company Ltd., New Delhi	2011, Revised Edition
2.	Vashishta, P.C. Sinha, A.K. and Anilkumar	Botany for degree students – Pteridophyta	S. Chand & Company Ltd., New Delhi	2008, Revised Edition
3.	Vashishta, P.C. Sinha, A.K. and Anilkumar	Botany for degree students – Gymnosperms	S. Chand & Company Ltd., New Delhi	2008, Revised Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Foster, A. S. and Gifford, E. M.	Comparative Morphology of Vascular Plants	W.H. Freeman and Co.	1973, 1 st Edition
2.	Peter George	Introduction to Palaeobotany	Rajat Publications, New Delhi	2008, 1 st Edition

Web Resource

www.biology.lifeeasy.org/5290/economic-importance-of-bryophytes

www.skyandtelescope.com/observing/stellar-spectral-types-03302016/

<https://www.britannica.com/science/heterospory>

<https://www.plantscience4u.com/2014/05/economic-importance-of-gymnosperms.html>

www.enchantedlearning.com/subjects/dinosaurs/dinofossils/Fossiltypes.html

Pedagogy

Lecture-- Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar

SEMESTER II

CODE	COURSE TITLE
18BOUCP01	CORE PRACTICAL - I (ALGAE, FUNGI, LICHENS, BACTERIA, VIRUS, PLANT PATHOLOGY, BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY)

Category	CIA	ESE	L	T	P	Credit
Core Practical	40	60	-	-	45	4

Preamble

To enable the student to identify the different organisms by morphological and anatomical studies

To demonstrate the principle of microscopes – Dissection and Compound and to obtain hands on training on sectioning, staining and mounting of plant materials

To learn about the fossilized plant forms and plant evolution

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Develop skill in sectioning staining and mounting, instrumentation techniques along with collection and interpretation of biological materials	K1,K2,K3
CO2	Acquire knowledge on various forms of lower plants	K2,K3
CO3	Diagnose the structural features of plant organs and differentiate microscopically their tissue elements	K2, K3
CO4	Analyze the age and scientific perspective of most important fossils	K2, K3
CO5	Think critically, design and execute an experiment which will serve as a practical basis for a career in research	K2

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	M	S	S
CO3	S	M	M	M	M
CO4	S	S	M	S	S
CO5	S	S	M	S	S

S- Strong; M-Medium; L-Low

Syllabus

PRACTICALS

1. Demonstration of simple microscopes – Dissection and Compound
2. Demonstration of sectioning, staining and mounting
3. Study of the habit / anatomy / reproduction of the types mentioned below:

Algae -Sectioning:Caulerpa - Dictyota

Spotters: Anabaena – Chlamydomonas – Volvox – Oedogonium - Caulerpa –Chara - Diatoms – Pennate– Dictyota–Polysiphonia

Fungi -Sectioning:Albugo – Puccinia - Cercospora

Spotters: Albugo – Rhizopus – Saccharomyces -Aspergillus - Puccinia – Agaricus–Lycoperdon- Cercospora –Lichens- Bacteria - Virus

Plant Diseases - Spotters: Bunchy top of banana – Leaf spot disease of groundnut - Blight disease of paddy- Red rot of sugarcane

Bryophytes – Sectioning:Marchantia, Anthoceros

Spotters: Marchantia -Anthoceros-Funaria

Pteridophytes - Sectioning:Lycopodium – Selaginella – Equisetum - Adiantum

Spotters: Lycopodium – Selaginella – Equisetum –Ophioglossum –Adiantum- Marsilea.

Gymnosperms - Sectioning:Cycas

Spotters: Cycas and Gnetum

Palaeobotany - Spotters: Lepidodendron –Lepidophyllum - Lepidocarpon- Calamites - Williamsonia.

SEMESTER II

CODE	COURSE TITLE
18BOUA202	ALLIED BOTANY- PAPER - II

Category	CIA	ESE	L	T	P	Credit
Allied Botany	20	55	55	5	-	4

Preamble

To study the histology, ecological adaptations and physiology of plants

To learn the essential horticultural techniques

To understand the medicinal properties and active principles of medicinal plants

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge on tissues and histological structures of plants	K1,K2
CO2	Understand the Structure and functions of ecosystems and adaptations of plants	K1,K2
CO3	Recall the physiological functions of plants	K1,K2
CO4	Analyse and apply the skill of commercial horticultural techniques	K3
CO5	Gain knowledge on identification of medicinal plants and apply the skill to cultivate and marketing of commercial plants	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	M	M	S	S
CO3	S	M	S	M	M
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

(12hrs.)

Anatomy -Meristem –Types. Simple and Complex tissues - Primary structure of Dicot and Monocot root, Dicot and Monocot stem, Dicot and Monocot leaf

UNIT II**(12hrs.)**

Ecology -Ecosystem – Structure (Biotic and Abiotic) and functions-food chain, food web- Morphological and Anatomical adaptations of Hydrophytes and Xerophytes

UNIT III**(12 hrs.)**

Physiology – Photosynthesis- Photosynthetic apparatus- Light and Dark reactions (Calvin cycle) - Respiration- Glycolysis and Kreb`s cycle

UNIT IV**(12hrs.)**

Horticulture -Scope and importance - Propagating methods of Horticultural Plants – Layering, Grafting, Kitchen garden, Terrace garden and flower arrangement-Cultivation methods of commercial flowers – Rose- Jasmine

UNIT V**(12 hrs.)**

Pharmacognosy -A brief account on the identifying features- medicinal properties and active principles of the following: Ginger – Vasaka – Curcuma – Brahmi- Cultivation and marketing of commercial medicinal plants – Vinca and Aloe vera

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Tayal, M.S.	Plant Anatomy	Rastogi Publications	2001, 5 th Edition
2.	Shukla,R.S. &Chandel,P.S.	A text book of plant Ecology Including Ethnobotany and soil science	S.Chand& company Ltd. New Delhi	2003, 1 st Edition
3.	Jain,V.K.	Fundamentals of Plant Physiology	Chand and Company Ltd.	2017, 19 th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Kokate, C.K.Purohit,A.andGokhal, S.R.	Pharmacognosy	NiraliPrakashan, Pune	2009, 43 rd Edition
2.	K. ManibhushanRao	Textbook of Horticulture	Macmillan India Ltd.	2000, 1 st Edition
3.	G. Ray Noggle and George J. Fritz	Introduction to Plant Physiology	Prentice – Hall of India Pvt Ltd., New Delhi	1986, 2 nd Edition

Web Resource

<https://www.pmfias.com/plant-tissue-meristematic-simple-complex-permanent-tissue/>

<https://www.nature.com/scitable/.../food-web-concept-and-applications-84077181>

www.eschooltoday.com/photosynthesis/dark-and-light-reactions.html

<https://www.omicsonline.org/.../propagation-methods-of-selected-horticultural-crops-...>

<https://discuss.farmnest.com/t/need...medicinal-plant-cultivation-and-marketing/1229>

Pedagogy

Lecture - Chalk & Talk, PPT, Quiz, Assignment, Seminar, Nursery visit

Core Paper - V

TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

Ins. Hrs. : 75

Sub. Code : 16BOUC505

Max. Marks : CIA- 25; ESE -75

Credits: 4

Objectives : To identify the families of the plants in the theory syllabus. To identify medicinally and economically important plants and plant products.

UNIT – I

15 Hrs.

Descriptive terms used in taxonomy -*stem*- leaf- inflorescence- flower - fruit. Systems of classification – Natural - (Bentham and Hooker) - Modern – (Takhtajan) (outline only).

UNIT – II

15 Hrs.

Herbarium techniques and uses- Nomenclature - ICBN-Priority - Typification- Effective and Valid publication- *Author citation*.

UNIT – III

15 Hrs.

A detailed study of the following families - Systematic position- Description and the *economic importance of the types* and pollination mechanisms wherever applicable - Annonaceae- Capparidaceae- Sterculiaceae- Rutaceae- Anacardiaceae- Curcubitaceae- Apiaceae.

UNIT – IV

15 Hrs.

Rubiaceae - Sapotaceae - Convolvulaceae- Scrophulariaceae- Acanthaceae-Verbenaceae- *Lamiaceae*.

UNIT - V

15 Hrs.

Amarantaceae- Euphorbiaceae- Moraceae- Orchidaceae -Liliaceae- Arecaceae and *Poaceae*.

Note : Bold and Italics denote Self Study Topics

PRACTICALS

1. Taxonomical studies of selected plant species included in the families mentioned in the theory.
2. Study of economic products of the plants belonging to the families mentioned.
3. Students should submit 20 herbarium sheets at the time of Practical examinations.
4. Field trip for 5 days to study vegetation and for specimen collection.
5. Visit to BSI / Nilgiri Biosphere Nature Park.

TEXT BOOKS:

1. **Pandey, B.P.**, “*Taxonomy of Angiosperms*”, S. Chand & Company Ltd. 1982, New Delhi.
2. **Pandey, B.P.**, “*Economic Botany*”, S. Chand & Company Ltd., New Delhi, 2007.
3. **Singh, V. and Jain, D.K.**, “*Taxonomy of Angiosperms*”, Rastogi Publications, Second Edition, 2004.

REFERENCE BOOKS:

1. **Lawrence- G.H.M.**, “*Taxonomy of Vascular plants*”, Oxford and IBU Publishing Co. Pvt.. Ltd., New Delhi, 1951.
2. **Saxena, N.B. and Saxena, S.**, “*Plant Taxonomy*”, Pragati Prakashan, Revised Edition, 2001.

Core Paper –VIII
ECOLOGY AND PHYTOGEOGRAPHY

Ins. Hrs. : 60

Sub. Code : 16BOUC608

Max. Marks : CIA 25;ESE - 75

Credits: 4

Objectives : To enable the students to acquire knowledge about the environment and to identify the environmental problems. To facilitate the students to find out remedial solutions.

UNIT- I

12 Hrs.

Ecological factors: Principles- Role of Climatic - Edaphic - Biotic factors on plants – Kinds and Structure of Ecosystem - Biogeochemical cycles (Water, *Nitrogen* and Sulphur cycle).

UNIT - II 12 Hrs.

Autecology– Ecological life history of species- Characteristics of Population- Dispersal and migration - Synecology – Vegetation types - Methods of studying vegetation – Quadrat-Belt and *Line transect*.

UNIT – III 12 Hrs.

Ecological Adaptations - Hydrophytes –Mesophytes- Xerophytes – *Halophytes*- Morphological and Anatomical features in relation to their habitats - Plant succession- Hydrosere- Xerosere.

UNIT – IV 12 Hrs.

Plant Distribution – Factors affecting distribution- Concept of Barriers - Continental drift – Endemism - Major and Minor biomes of the world- *Ecological indicators*.

UNIT – V 12 Hrs.

Plant geography and Climate of India- Principles and vegetational types of India – Tropical, Sub tropical and Temperate forests, Grass land vegetation. *Phytogeographical regions of India*.

Note : **Bold** and *Italics* denote Self Study Topics

PRACTICALS:

1. Structure of ecosystem – Food chain , Food web and Ecological Pyramid
2. Study of morphological and anatomical adaptations of hydrophytes, xerophytes, halophytes and

mesophytes using representative samples.

3. Determination of frequency and density constituent of plant species in a terrestrial community through Quadrat and Transect (line, belt).
4. Phytogeographical regions of India.
5. Analysis of Physico – chemical characters of soil
6. Analysis of Physico – chemical characters of water.
7. Analysis of Physico – chemical characters of effluent

TEXT BOOKS:

1. **Sharma P.D.**, “*Ecology & Environment*”, Rastogi Publications, Meerut, Eleventh Edition, 2005.
2. **Shukla, R.S, Chandel,P.S.**, “*A text book of plant Ecology Including Ethnobotany and soil science*”,S.Chand& company Ltd. New Delhi, First edition, 2003.
3. **Vasishta. P.C.**, “*A text book of Plant Ecology*”, Vishal Publications, NewDelhi, Second Edition, 1979.

REFERENCE BOOKS:

1. **Eugene P. Odum** , “*Fundamentals of Ecology*”, W.B Saunders company, Philadelphia and London, Third Edition, 2005.
2. **Verma, P.S. and Agarwal,V.K.**, “*Environmental Biology*”, S. Chand & Company Ltd, New Delhi, Fourth edition. 1993.
3. **Subrahmanyam, N.S. andSambamurthy, A.V.S.S.** “*Ecology*”, Narosa Publishing House Pvt. Ltd. Second edition, 2006.

Core Paper - IX
GENETICS AND BIOSTATISTICS

Instructional Hrs. : 60

Sub.Code : 16BOUC609

Max. Marks : CIA 25; ESE - 75

Credits: 4

Objectives : To study the basics of Mendelian genetics. To understand the mechanism and concept of gene expression and mutation. To apply statistics in plant science.

UNIT- I

12 Hrs.

Mendelism and Interaction –Mendel's law of inheritance -Monohybrid - Dihybrid Cross - Back Cross - Test cross - Incomplete dominance - Complementary – Supplementary and *Duplicate factors*.

UNIT- II

12 Hrs.

Classical Genetics - *Linkages* and Crossing over - Multiple alleles - Blood groups in man -- Sex determination in plants and *Drosophila* .

UNIT-III

12 Hrs.

Gene and Extra chromosomal inheritance – Gene definition, Classification and Structure. Cytoplasmic inheritance (Plastid only) – Extra nuclear Inheritance in Prokaryotes – Episomes and *Plasmids*.

UNIT-IV

12 Hrs.

Mutation and Gene Regulation– Mutation – Kinds of mutation - Somatic mutation- Spontaneous mutation- Induced mutation --Physical and chemical mutagens – Reverse mutation Polyploidy - Genetic code - gene regulation in prokaryotes – *Operon concept*.

UNIT- V

12 Hrs.

Biostatistics – Collection of data – Primary Data and Secondary Data - Sampling methods- Measures of Central tendency - *Arithmetic Mean*- Median and Mode. Measures of Dispersion- Range- Standard deviation and Standard error (only theory).

Note : **Bold** and *Italics* denote Self Study Topics

PRACTICALS:

1. Genetic Problems- Monohybrid & Dihybrid cross, Backcross, Test cross, Incomplete dominance, Complementary factors, Supplementary factors & Duplicate factors.
2. Simple problems in Biostatistics - Mean, Median, Mode, Standard deviation, Standard error.

TEXT BOOKS:

1. **Rama Krishnan, P**, "*Biostatistics*" Saras Publications, Nagercoil, First Edition, 2001.
2. **Verma, P. S., Agarwal, V.K**, "*Genetics*", First Edition , S. Chand & Company Ltd, New Delhi, 2002.

REFERENCE BOOKS:

1. **Allard, R.W**, "*Principles of plant breeding*", John Wiley & sons, INC. Singapore, 2000.
2. **Sharma, J.R**, "*Principles and Practice of Plant breeding*", Tata MCG raw–Hill publishing Company Ltd., New Delhi, 1994.
3. **Singh, J. R**, "*Plant breeding principles and methods*", Kalyani Publishers, Ludiana, Seventh Edition, 2008.

Core Paper- X
BIOTECHNOLOGY I – CONCEPTS AND TECHNIQUES

Ins. Hrs. : 60

Sub. Code : 16BOUC610

Max. Marks : CIA 25; ESE - 75

Credits: 4

Objectives : To know the outlines of genetic engineering. To develop the skill on gene transfer methods. To understand the applications and the uses of various bio molecules separation techniques. To study the extraction and separation of enzymes used in industries.

UNIT- I **12 Hrs.**

Biotechnology – Scope and its branches - Modern Biotechnology- Gene Bank and Commercial potential of Biotechnology- Enzymes used in gene cloning – Restriction enzymes, Polymerases, Ligases and *Reverse transcriptase*.

UNIT- II **12 Hrs.**

Cloning vectors – Plasmid – Phage - YAC – Transposons - *CaMV* -Ti plasmid -Methods of Gene cloning - Applications of Genetic Engineering.

UNIT- III **12 Hrs.**

Gene transfer Methods - Direct gene transfer methods- Electroporation, *Microinjection*, Liposome fusion, Biolistics, Transfection in plants and Agroinfection-Vector mediated gene transfer in higher plants – Agrobacterium mediated Ti Plasmid - Advantages and disadvantages of gene transfer - Genomic Library.

UNIT - IV **12 Hrs.**

Techniques in biotechnology – PCR techniques - Applications of PCR- Southern, Northern and Western blotting techniques - DNA finger printing –*Agarose gel electrophoresis*.

UNIT - V **12 Hrs.**

Enzyme technology – Microbial production - Extraction- separation - purification of enzymes – Immobilization methods -*Application of enzymes*.

Note : **Bold** and *Italics denote Self Study Topics*

TEXT BOOKS:

1. **Kumaresan, V.**, “*Biotechnology*”, Saras Publications, Nagercoil, 2009.
2. **Dubey, R.C.**, “*A text book of Biotechnology*”, S.Chand& Company Ltd, New Delhi, Third Edition, 2004.
3. **Gupta, P.K.**, “*Elements of Biotechnology*”, Rastogi publications – Meerut first edition, 2004.

REFERENCE BOOKS:

1. **Balasubramanian, P.**, Bryce, CFA., Dharmalingam, K. Green,J., Kunthala Jayaraman “*Concepts in biotechnology*”, Universities press India Pvt. Ltd., Hyderabad, 2004.
2. **Joshi, P.**, “*Genetic Engineering and its Applications*”, Student Edition Jodhpur, 2000.
3. **Purohit, S.S., Mathur, S.K.**, “*Biotechnology Fundamentals & Applications*”, Agro botanical Publishers India, 1996.
4. **Purohit, S.S.**,” *Biotechnology Fundamentals & Applications*” Mrs. Saraswathi Purohit for student Edition, India, Third Edition, 2005.
- 5.**Razdan, M.K.**, “*Introduction to plant tissue culture*” , Oxford & IBH publishing Co. Pvt. Ltd., Second Edition, New Delhi, 2008.
- 6.**Trevan, M.D., Boffey, S., Goulding, K.H., Stanbury, P.**, “*Biotechnology - The Biological principles*”, Tata McGraw-Hill publishing company Ltd., New Delhi, 1996.

Core Paper – XI

BIOTECHNOLOGY II – APPLIED BIOTECHNOLOGY

Ins. Hrs. : 60

Sub. Code : 16BOUC611

Max. Marks : CIA 25; ESE - 75

Credits: 4

Objectives : To understand the application of genetic manipulation in Agriculture, Food, Medicines, Biopesticides. To study Bioprocess Technology and their applications.

UNIT - I

12 Hrs.

Food Technology – SCP as microbial food for future - Mass cultivation and nutritional value of Spirulina- *Scenedesmus*, Yeast and Bacteria (Methylophilus) - Mushroom Technology – Cultivation techniques and nutritional value of *Pleurotussajor-caju* – *Agaricusbisporous*.

UNIT - II

12 Hrs.

Biofertilizers – Advantages of mass cultivation and application technique of Rhizobium- Azospirillum- Blue Green Algae (Nitrogen Fixers)- Phosphobacteria- Azolla and *VAM*.

UNIT - III

12 Hrs.

Application of genetic engineering - Agriculture (transgenic plants) -. Medicine - *Insulin*-Gene therapy - Monoclonal antibodies and Hybridoma techniques.

UNIT - IV

12 Hrs.

Biotechnology in pollution control – Xenobiotic Compounds - Phytoremediation – Bioleaching – Biosorption – *Bioplastics*.Waste water treatment.

UNIT - V

12 Hrs.

Biofuels - Bioethanol- Biogas production - Methane – Biohydrogen. Petro plants - Biodiesel - Plant biomass – Types, Composition and *Energy plantation*.

Note : Bold and *Italics denote Self Study Topics*

PRACTICALS:

Demonstration

1. Isolation of DNA
2. PCR Techniques
3. Cultivation of *Pleurotussajor-caju* and *Agaricusbisporous*
4. Culture of Yeast and Azolla.
5. Biofertilizers – Azospirillum- Rhizobium- VAM – Phosphobacteria- Photographs.
6. Blotting techniques – Southern/ Western - Photographs.
7. Petrochemical plants – Materials / Photographs
8. Biogas production - Photographs.

TEXT BOOKS :

1. **Kumaresan, V.**, “*Biotechnology*”, Saras Publications, Nagercoil, 2009.
2. **Dubey, R.C.**, “*A text book of Biotechnology*” , S.Chand& Company Ltd, New Delhi, Third Edition, 2004.
3. **Gupta, P.K.**, “*Elements of Biotechnology*”, Rastogi publications – Meerut first edition, 2004.

REFERENCE BOOKS:

1. **Balasubramanian, P.**, Bryce, CFA., Dharmalingam, K. Green,J., Kunthala Jayaraman , “*Concepts in biotechnology*”, Universities Press India Pvt. Ltd., Hyderabad, 2004.
2. **Joshi, P.**, “*Genetic Engineering and its Applications*”, Student Edition Jodhpur, 2000.
3. **Kumar, H.D.**, “*Modern Concepts of Biotechnology*”, Vikas publishing house Pvt. Ltd., 2001.
4. **Purohit, S.S.**,” *Bitechnology Fundamentals & Applications*” Mrs. Saraswathi Purohit for student Edition, India, Third Edition, 2005.
5. **Trevan, M.D., Boffey, S., Goulding, K.H., Stanbury, P.**, “*Biotechnology the Biological principles*”, Tata McGraw-Hill publishing company Ltd., New Delhi, 1996.

Core Paper - XII

FUNDAMENTALS OF COMPUTER AND BIOINFORMATICS

Ins. Hrs. : 60

Sub. Code : 16BOUC612

Max. Marks : CIA 25; ESE - 75

Credits : 4

Objectives: To acquire the knowledge of worldwide collection of computer networks. To acquire the knowledge of databases and sequence analysis

UNIT – I

12 Hrs.

Introduction to computer– Components of Computer - Capabilities of Computer – Hardware and Software – Input - Output devices - Operating System -*Computer applications*.

UNIT –II

12 Hrs.

Microsoft Office- M.S Word - Creation of documents – Excel - Spread sheet- workbook -*charts and table* - Power Point presentation.

UNIT – III

12 Hrs.

Introduction to Internet – Data communication concepts –WWW - E- mail- Smiley- Service Provider – Internet addressing (Domain IP) - Net Browser- search engine - *News groups*.

UNIT – IV

12 Hrs.

Bioinformatics – Types of Database – Nucleotide sequence Database – NCBI - GENBANK- ENTREZ-EMBL. Protein Sequence Database – SWISS-PROT- Literature Database – Pub Med – AGRICOLA-Data Mining- *Virtual library*.

UNIT – V

12 Hrs.

Sequence analysis – Similarity Search - Gene Finding- Protein prediction- Genome mapping - Phylogenetic analysis Biomolecular visualization –*Drug Designing*.

Note : **Bold** and *Italics* denote Self Study Topics

PRACTICALS:

1. MS - word.
2. Microsoft Excel.
3. Power point presentation
4. Web browsing.
5. E-mailing.
6. Gene finding.
7. Biomolecular visualization using Pymol
8. Retrieving sequence data from Entrez
9. Locating the chromosome of a Gene

TEXT BOOKS :

1. **Mani, K., and Vijayaraj, N,** “*Bioinformatics for beginners*”. Kalaikathir Achchagam, Coimbatore, First Edition, 2002.
2. **SundaraRajan, S. and Balaji, R,** “*Introduction to Bioinformatics*”, Himalaya Publishing Housing, First Edition, Mumbai, 2002

REFERENCE BOOKS :

1. **Arthur M. Lesk,** “*Introduction to Bioinformatics*”, Oxford University Press, First Edition, NewDelhi, 2003.
2. **Attwood, T. K. and Parry Smith, D.J,** “*Introduction to Bioinformatics*”, Pearson Education Ltd., Fifth Edition, NewDelhi, 2003.
3. **Irfan A. Khan and Atiya Khanum,** “*Emerging trends in Bioinformatics*”, Ukaaz Publications, First Edition, Hyderabad, 2002.

Core Paper - V

TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

Ins. Hrs. : 75

Sub. Code : 16BOUC505

Max. Marks : CIA- 25; ESE -75

Credits: 4

Objectives : To identify the families of the plants in the theory syllabus. To identify medicinally and economically important plants and plant products.

UNIT – I

15 Hrs.

Descriptive terms used in taxonomy - *stem*- leaf- inflorescence- flower - fruit. Systems of classification – Natural - (Bentham and Hooker) - Modern – (Takhtajan) (outline only).

UNIT – II

15 Hrs.

Herbarium techniques and uses- Nomenclature - ICBN-Priority - Typification- Effective and Valid publication- *Author citation*.

UNIT – III

15 Hrs.

A detailed study of the following families - Systematic position- Description and the *economic importance of the types* and pollination mechanisms wherever applicable - Annonaceae- Capparidaceae- Sterculiaceae- Rutaceae- Anacardiaceae- Curcubitaceae- Apiaceae.

UNIT – IV

15 Hrs.

Rubiaceae - Sapotaceae - Convolvulaceae- Scrophulariaceae- Acanthaceae-Verbenaceae- *Lamiaceae*.

UNIT - V

15 Hrs.

Amarantaceae- Euphorbiaceae- Moraceae- Orchidaceae -Liliaceae- Arecaceae and *Poaceae*.

Note : Bold and *Italics denote Self Study Topics*

PRACTICALS

1. Taxonomical studies of selected plant species included in the families mentioned in the theory.
2. Study of economic products of the plants belonging to the families mentioned.
3. Students should submit 20 herbarium sheets at the time of Practical examinations.
4. Field trip for 5 days to study vegetation and for specimen collection.
5. Visit to BSI / Nilgiri Biosphere Nature Park.

TEXT BOOKS:

1. **Pandey, B.P.**, "*Taxonomy of Angiosperms*", S. Chand & Company Ltd. 1982, New Delhi.
2. **Pandey, B.P.**, "*Economic Botany*", S. Chand & Company Ltd., New Delhi, 2007.
3. **Singh, V. and Jain, D.K.**, "*Taxonomy of Angiosperms*", Rastogi Publications, Second Edition, 2004.

REFERENCE BOOKS:

1. **Lawrence- G.H.M.**, "*Taxonomy of Vascular plants*", Oxford and IBU Publishing Co. Pvt.. Ltd., New Delhi, 1951.
2. **Saxena, N.B. and Saxena, S.**, "*Plant Taxonomy*", Pragati Prakashan, Revised Edition, 2001.

Core Paper –VIII

ECOLOGY AND PHYTOGEOGRAPHY

Ins. Hrs. : 60

Sub. Code : 16BOUC608

Max. Marks : CIA 25;ESE - 75

Credits: 4

Objectives : To enable the students to acquire knowledge about the environment and to identify the environmental problems. To facilitate the students to find out remedial solutions.

UNIT- I

12 Hrs.

Ecological factors: Principles - Role of Climatic - Edaphic - Biotic factors on plants – Kinds and Structure of Ecosystem - Biogeochemical cycles (Water, *Nitrogen* and *Sulphur cycle*).

UNIT - II

12 Hrs.

Autecology – Ecological life history of species- Characteristics of Population- Dispersal and migration - Synecology – Vegetation types - Methods of studying vegetation – Quadrat- Belt and *Line transect*.

UNIT – III

12 Hrs.

Ecological Adaptations - Hydrophytes – Mesophytes - Xerophytes – *Halophytes*- Morphological and Anatomical features in relation to their habitats - Plant succession- Hydrosere- Xerosere.

UNIT – IV

12 Hrs.

Plant Distribution – Factors affecting distribution- Concept of Barriers - Continental drift – Endemism - Major and Minor biomes of the world- *Ecological indicators*.

UNIT – V

12 Hrs.

Plant geography and Climate of India- Principles and vegetational types of India – Tropical, Sub tropical and Temperate forests, Grass land vegetation. *Phytogeographical regions of India*.

Note : Bold and *Italics* denote Self Study Topics

PRACTICALS:

1. Structure of ecosystem – Food chain , Food web and Ecological Pyramid
2. Study of morphological and anatomical adaptations of hydrophytes, xerophytes, halophytes and mesophytes using representative samples.
3. Determination of frequency and density constituent of plant species in a terrestrial community through Quadrat and Transect (line, belt).
4. Phytogeographical regions of India.
5. Analysis of Physico – chemical characters of soil
6. Analysis of Physico – chemical characters of water.
7. Analysis of Physico – chemical characters of effluent

TEXT BOOKS:

1. **Sharma P.D.**, “*Ecology & Environment*”, Rastogi Publications, Meerut, Eleventh Edition, 2005.
2. **Shukla, R.S, Chandel,P.S.**, “*A text book of plant Ecology Including Ethnobotany and soil science*”,S.Chand & company Ltd. New Delhi, First edition, 2003.
3. **Vasishta. P.C.**, “*A text book of Plant Ecology*”, Vishal Publications, NewDelhi, Second Edition, 1979.

REFERENCE BOOKS:

1. **Eugene P. Odum** , “*Fundamentals of Ecology*”, W.B Saunders company, Philadelphia and London, Third Edition, 2005.
2. **Verma, P.S. and Agarwal,V.K.**, “*Environmental Biology*”, S. Chand & Company Ltd, New Delhi, Fourth edition. 1993.
3. **Subrahmanyam, N.S. and Sambamurthy, A.V.S.S.** “*Ecology*”, Narosa Publishing House Pvt. Ltd. Second edition, 2006.

Core Paper - IX

GENETICS AND BIOSTATISTICS

Instructional Hrs. : 60

Sub.Code : 16BOUC609

Max. Marks : CIA 25; ESE - 75

Credits: 4

Objectives : To study the basics of Mendelian genetics. To understand the mechanism and concept of gene expression and mutation. To apply statistics in plant science.

UNIT- I

12 Hrs.

Mendelism and Interaction –Mendel’s law of inheritance -Monohybrid - Dihybrid Cross - Back Cross - Test cross - Incomplete dominance - Complementary – Supplementary and *Duplicate factors*.

UNIT- II

12 Hrs.

Classical Genetics - Linkages and Crossing over - Multiple alleles - Blood groups in man -- Sex determination in plants and *Drosophila* .

UNIT-III

12 Hrs.

Gene and Extra chromosomal inheritance – Gene definition, Classification and Structure. Cytoplasmic inheritance (Plastid only) – Extra nuclear Inheritance in Prokaryotes – Episomes and *Plasmids*.

UNIT-IV

12 Hrs.

Mutation and Gene Regulation – **Mutation** – Kinds of mutation - Somatic mutation- **Spontaneous mutation- Induced mutation** --Physical and chemical mutagens – **Reverse mutation** Polyploidy - Genetic code - gene regulation in prokaryotes – *Operon concept*.

UNIT- V

12 Hrs.

Biostatistics – Collection of data – **Primary Data and Secondary Data** - Sampling methods- Measures of Central tendency - *Arithmetic Mean*- Median and **Mode**. Measures of Dispersion- Range- Standard deviation and Standard error (only theory).

Note : Bold and Italics denote Self Study Topics

PRACTICALS:

1. Genetic Problems- Monohybrid & Dihybrid cross, Backcross, Test cross, Incomplete dominance, Complementary factors, Supplementary factors & Duplicate factors.
2. Simple problems in Biostatistics - Mean, Median, Mode, Standard deviation, Standard error.

TEXT BOOKS:

1. **Rama Krishnan, P**, “*Biostatistics*” Saras Publications, Nagercoil, First Edition, 2001.
2. **Verma, P. S., Agarwal, V.K**, “*Genetics*”, First Edition , S. Chand & Company Ltd, New Delhi, 2002.

REFERENCE BOOKS:

1. **Allard, R.W**, “*Principles of plant breeding*”, John Wiley & sons, INC. Singapore, 2000.
2. **Sharma, J.R**, “ *Principles and Practice of Plant breeding*”, Tata MCG raw–Hill publishing Company Ltd., New Delhi, 1994.
3. **Singh, J. R**, “*Plant breeding principles and methods*”, Kalyani Publishers, Ludiana, Seventh Edition, 2008.

Core Paper- X
BIOTECHNOLOGY I – CONCEPTS AND TECHNIQUES

Ins. Hrs. : 60

Sub. Code : 16BOUC610

Max. Marks : CIA 25; ESE - 75

Credits: 4

Objectives : To know the outlines of genetic engineering. To develop the skill on gene transfer methods. To understand the applications and the uses of various bio molecules separation techniques. To study the extraction and separation of enzymes used in industries.

UNIT- I **12 Hrs.**

Biotechnology – Scope and its branches - Modern Biotechnology- Gene Bank and **Commercial potential of Biotechnology**- Enzymes used in gene cloning – Restriction enzymes, Polymerases, Ligases and *Reverse transcriptase*.

UNIT- II **12 Hrs.**

Cloning vectors – Plasmid – **Phage** - YAC – Transposons - *CaMV* - Ti plasmid - Methods of Gene cloning - Applications of Genetic Engineering.

UNIT- III **12 Hrs.**

Gene transfer Methods - Direct gene transfer methods- Electroporation, *Microinjection*, Liposome fusion, Biolistics, Transfection in plants and Agroinfection-Vector mediated gene transfer in higher plants – Agrobacterium mediated Ti Plasmid - Advantages and disadvantages of gene transfer - Genomic Library.

UNIT - IV **12 Hrs.**

Techniques in biotechnology – PCR techniques - Applications of PCR- Southern, Northern and Western blotting techniques - DNA finger printing –*Agarose gel electrophoresis*.

UNIT - V **12 Hrs.**

Enzyme technology – Microbial production - Extraction- separation - purification of enzymes – Immobilization methods - *Application of enzymes*.

Note : Bold and Italics denote Self Study Topics

TEXT BOOKS:

1. **Kumaresan, V.**, “*Biotechnology*”, Saras Publications, Nagercoil, 2009.
2. **Dubey, R.C.**, “*A text book of Biotechnology*” , S.Chand & Company Ltd, New Delhi, Third Edition, 2004.
3. **Gupta, P.K.**, “*Elements of Biotechnology*”, Rastogi publications – Meerut first edition, 2004.

REFERENCE BOOKS:

1. **Balasubramanian, P.**, Bryce, CFA., Dharmalingam, K. Green,J., Kunthala Jayaraman “*Concepts in biotechnology*”, Universities press India Pvt. Ltd., Hyderabad, 2004.
2. **Joshi, P.**, “*Genetic Engineering and its Applications*”, Student Edition Jodhpur, 2000.
3. **Purohit, S.S., Mathur, S.K.**, “*Biotechnology Fundamentals & Applications*”, Agro botanical Publishers India, 1996.
4. **Purohit, S.S.**,” *Biotechnology Fundamentals & Applications*” Mrs. Saraswathi Purohit for student Edition, India, Third Edition, 2005.
5. **Razdan, M.K.**, “*Introduction to plant tissue culture*” , Oxford & IBH publishing Co. Pvt. Ltd., Second Edition, New Delhi, 2008.
6. **Trevan, M.D., Boffey, S., Goulding, K.H., Stanbury, P.**, “*Biotechnology - The Biological principles*”, Tata McGraw-Hill publishing company Ltd., New Delhi, 1996.

Core Paper – XI

BIOTECHNOLOGY II – APPLIED BIOTECHNOLOGY

Ins. Hrs. : 60

Sub. Code : **16BOUC611**

Max. Marks : CIA 25; ESE - 75

Credits: 4

Objectives : To understand the application of genetic manipulation in Agriculture, Food, Medicines, Biopesticides. To study Bioprocess Technology and their applications.

UNIT - I

12 Hrs.

Food Technology – SCP as microbial food for future - Mass cultivation and nutritional value of Spirulina- *Scenedesmus*, Yeast and Bacteria (*Methylophilus*) - Mushroom Technology – Cultivation techniques and nutritional value of *Pleurotus sajor-caju* – *Agaricus bisporous*.

UNIT - II

12 Hrs.

Biofertilizers – Advantages of mass cultivation and application technique of Rhizobium- Azospirillum- Blue Green Algae (Nitrogen Fixers)- Phosphobacteria- Azolla and **VAM**.

UNIT - III

12 Hrs.

Application of genetic engineering - Agriculture (transgenic plants) - Medicine - **Insulin**-Gene therapy - Monoclonal antibodies and Hybridoma techniques.

UNIT - IV

12 Hrs.

Biotechnology in pollution control – Xenobiotic Compounds - Phytoremediation – Bioleaching – Biosorption – **Bioplastics**. Waste water treatment.

UNIT - V

12 Hrs.

Biofuels - Bioethanol- Biogas production - Methane – Biohydrogen. Petro plants - Biodiesel - Plant biomass – Types, Composition and **Energy plantation**.

Note : Bold and *Italics denote Self Study Topics*

PRACTICALS:

Demonstration

1. Isolation of DNA
2. PCR Techniques
3. Cultivation of *Pleurotus sajor-caju* and *Agaricus bisporous*
4. Culture of Yeast and Azolla.
5. Biofertilizers – Azospirillum- Rhizobium- VAM – Phosphobacteria- Photographs.
6. Blotting techniques – Southern/ Western - Photographs.
7. Petrochemical plants – Materials / Photographs
8. Biogas production - Photographs.

TEXT BOOKS :

1. **Kumaresan, V.**, “*Biotechnology*”, Saras Publications, Nagercoil, 2009.
2. **Dubey, R.C.**, “*A text book of Biotechnology*” , S.Chand & Company Ltd, New Delhi, Third Edition, 2004.
3. **Gupta, P.K.**, “*Elements of Biotechnology*”, Rastogi publications – Meerut first edition, 2004.

REFERENCE BOOKS:

1. **Balasubramanian, P.**, Bryce, CFA., Dharmalingam, K. Green,J., Kunthala Jayaraman , “*Concepts in biotechnology*”, Universities Press India Pvt. Ltd., Hyderabad, 2004.
2. **Joshi, P.**, “*Genetic Engineering and its Applications*”, Student Edition Jodhpur, 2000.
3. **Kumar, H.D.**, “*Modern Concepts of Biotechnology*”, Vikas publishing house Pvt. Ltd., 2001.
4. **Purohit, S.S.**,” *Bitechnology Fundamentals & Applications*” Mrs. Saraswathi Purohit for student Edition, India, Third Edition, 2005.
5. **Trevan, M.D., Boffey, S., Goulding, K.H., Stanbury, P.**, “*Biotechnology the Biological principles*”, Tata McGraw-Hill publishing company Ltd., New Delhi, 1996.

Core Paper - XII

FUNDAMENTALS OF COMPUTER AND BIOINFORMATICS

Ins. Hrs. : 60

Sub. Code : 16BOUC612

Max. Marks : CIA 25; ESE - 75

Credits : 4

Objectives: To acquire the knowledge of worldwide collection of computer networks.
To acquire the knowledge of databases and sequence analysis

UNIT – I

12 Hrs.

Introduction to computer – Components of Computer - Capabilities of Computer – Hardware and Software – Input - Output devices - Operating System - *Computer applications*.

UNIT –II

12 Hrs.

Microsoft Office - M.S Word - Creation of documents – Excel - Spread sheet- workbook -*charts and table* - Power Point presentation.

UNIT – III

12 Hrs.

Introduction to Internet – Data communication concepts –WWW - E- mail- Smiley- Service Provider – Internet addressing (Domain IP) - Net Browser- search engine - *News groups*.

UNIT – IV

12 Hrs.

Bioinformatics – Types of Database – Nucleotide sequence Database – NCBI - GENBANK- ENTREZ-EMBL. Protein Sequence Database – SWISS-PROT- Literature Database – Pub Med – AGRICOLA-Data Mining- *Virtual library* .

UNIT – V

12 Hrs.

Sequence analysis – Similarity Search - Gene Finding- Protein prediction- Genome mapping - Phylogenetic analysis Biomolecular visualization –*Drug Designing*.

Note : Bold and *Italics* denote Self Study Topics

PRACTICALS:

1. MS - word.
2. Microsoft Excel.
3. Power point presentation
4. Web browsing.
5. E-mailing.
6. Gene finding.
7. Biomolecular visualization using Pymol
8. Retrieving sequence data from Entrez
9. Locating the chromosome of a Gene

TEXT BOOKS :

1. **Mani, K., and Vijayaraj, N,** “*Bioinformatics for beginners*”. Kalaikathir Achchagam, Coimbatore, First Edition, 2002.
2. **Sundara Rajan, S. and Balaji, R,** “*Introduction to Bioinformatics*”, Himalaya Publishing Housing, First Edition, Mumbai, 2002

REFERENCE BOOKS :

1. **Arthur M. Lesk,** “*Introduction to Bioinformatics*”, Oxford University Press, First Edition, NewDelhi, 2003.
2. **Attwood, T. K. and Parry Smith, D.J,** “*Introduction to Bioinformatics*”, Pearson Education Ltd., Fifth Edition, NewDelhi, 2003.
3. **Irfan A. Khan and Atiya Khanum,** “*Emerging trends in Bioinformatics*”, Ukaaz Publications, First Edition, Hyderabad, 2002.