SEMESTER - III

Core Paper- III ANATOMY AND EMBRYOLOGY

Instructional Hrs.: 60 **Sub. Code: 16BOUC303**

Max. Marks: CIA – 25; ESE - 75 **Credits: 4**

Objectives: To study types of tissues and primary, secondary structures & anomaly of stem and root.To study the types and development of male and female gametophyte and embryo.

UNIT – I **12 Hrs.**

Anatomy - Meristem –Types –Structure of Shoot and root apex and theories- General account of simple and complex tissues - Vascular cambium- Types of stomata and ***trichomes.***

UNIT – II **12 Hrs.**

Primary structure -Internal anatomy of Dicot root and stem - ***monocot root***and stem- Nodal anatomy - dicot leaf and monocot leaf.

UNIT – III **12 Hrs.**

Secondary structure- Secondary thickening- Dicot root and stem - Anomalous secondary thickening - ***Cortical vascular bundles (Nyctanthes)***- Medullary vascular bundles (Piper)and primary thickening meristem in arborescent monocots (Dracaena).

UNIT – IV **12 Hrs.**

Embryology - Structure and development of anther- development of male gametophyte - structure and types of ovules, development of female gametophytes (Monosporic – Polygonum-Bisporic – Allium and Tetrasporic – Peperomia)- Fertilization - ***Double fertilization.***

UNIT – V **12 Hrs.**

Endosperm – Nuclear, Cellular, Helobial and Ruminate -Embryo - Structure and development of dicot embryo (*Capsella*) - Structure and development of ***monocot embryo*** (Najas).

Note : Boldand***Italics* denotes Self Study Topics**

PRACTICALS :

Anatomy :

1.Study of tissues mentioned in the theory- Maceration-Vein clearing- Shoot apex and Root apex - Stomata – Trichomes- Stem - Primary structure – Tridax – Sorghum, Root - Primary structure – Bean – Canna, Nodal anatomy –Unilacunar –Calophyllum, Trilacunar - Azadirachta– Multilacunar - Aralia , Leaf – Polyalthia, Maize, Secondary thickening-Stem- Thespesia, Secondary thickening - Root - Ficus- Anomalous secondary thickening – Nyctanthes, Piper - Dracaena.

Embryology:

T.S of anther - types of ovules- - Embryo mounting – Tridax/ Crotalaria. Endosperm – Cellular Endosperm with haustoria

TEXT BOOKS:

1. **Pandey, B.P.,** " Plant Anatomy", S. Chand & Company Ltd., New Delhi, Revised Edition, 2005.

2. **Bhojwani, S.S.** and **Bhatnagar, S.P.,** " *The Embryology of Angiosperms*", Vikas Publishing House Pvt Ltd., New Delhi, Revised Edition, 2007.

REFERENCE BOOKS:

1. **Fahn, A.,** " *Plant Anatomy*", Robert Maxwell, M.C., New York, Revised Edition, 1982.

2.**Katherine Esau,** " *Plant Anatomy"*, Wiley Eastern Private Ltd., New Delhi, Second Edition, 1974.

3. **Maheswari . P.,** "*An Introduction to the embryology of Angiosperms*", Mc Graw-Hill Book Company, Inc. New York, Revised Edition,1994.

SEMESTER – V

Core Paper V - TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

Ins. Hrs. : 75 **Sub. Code : 15BOUC505**

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- Curcurbitaceae- Apiaceae.

UNIT – IV **15 Hrs.**

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

UNIT - V **15 Hrs.**

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

Note : 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, " *Taxonomyof 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.

SEMESTER – V

Core Paper VI - PLANT PHYSIOLOGY

Ins. Hrs. : 75 **Sub. Code : 15BOUC506**

Max. Marks : CIA 25; ESE -75 **Credits:4**

Objectives : To understand the water relations with Plant system. To understand the energy relations and enzymes involved in various metabolic activities.

UNIT - I **15 Hrs.**

Water relations of plant –Structure and properties of water - Diffusion- Osmosis – Osmotic pressure- Turgor pressure- *Plasmolysis*- Imbibition -absorption of water and mineral salts.

UNIT - II **15 Hrs.**

Transpiration- Kinds of transpiration- Mechanism of stomatal transpiration- Factors affecting stomatal movement. Translocation of water solutes and assimilates.

UNIT - III **15 Hrs.**

Photosynthesis – Photosyntheticapparatus and *pigments*- pigment system, Light reaction and photosynthetic electron transport system– Carbon fixation : C_3,C_4 and CAM Pathways.

UNIT - IV **15 Hrs.**

Respiration - Aerobic respiration - Glycolysis - Kreb's cycle - Electron transport system and oxidative phosphorylation - *anaerobic respiration*-an outline of HMP pathway.

UNIT – V **15 Hrs.**

Plant growth regulators – Auxin- Gibberellin- Cytokinin(outline only) **Physiology of flowering** – Photoperiodism- Phytochrome- Plant movements -physiology of seed germination and seed dormanacy.

Note : Italics denote Self Study Topics

TEXT BOOKS :

1.**Verma, S.K.,** "*A Text book of Plant Physiology and Biochemistry",* S. Chand and Company, New Delhi.

2**. Jain, V.K.,** "*Fundamentals of Plant Physiology"*, S. Chand and Company Ltd, 1990.

REFERENCE BOOKS:

1.**Arthur C. Giese** , "*Cell Physiology''*, Toppan Company Ltd.Tokyo, Japan, Fifth Edition, 1979.

2.**Frank B. Salisbury** and **Cleon W. Ross,** "*Plant Physiology*", CBS Publisher and Distributors, New Delhi, Third Edition, 1996.

3.**Gill, P.S.,** "*Plant Physiology"*, S. Chand and Company Ltd., New Delhi, 2001.

4.**Jayaraman, J,** "*Laboratory Manual in Bio-chemistry"*, New Age International (P) Ltd. Publishers, New Delhi, 2008.

5. **Ray Noggle, G**. and **George J. Fritz,** "*Introduction to Plant Physiology"*, Prentice – Hall of India Pvt Ltd., New Delhi, 1986.

6. **Rober M. Devlin,** "*Plant Physiology"*, Lifton Educational Publishing INC, New York , Third Edition, 1979.

SEMESTER –VI

Core Paper VIII - ECOLOGY AND PHYTOGEOGRAPHY

Ins. Hrs. : 60 **Sub. Code : 15BOUC608**

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* Carbon 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 : *Italics* denote Self Study Topics

PRACTICALS:

1. Study of morphological and anatomical adaptations of hydrophytes, xerophytes, including halophytes and mesophytes using representative samples.
2. Determination of frequency and density constituent of plant species in a terrestrial community through Quadrat and Transect (line, belt).
3. Phytogeographical regions of India.

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.

SEMESTER -VI

Core Paper IX - GENETICS AND BIOSTATISTICS

Instructional Hrs. : 60 **Sub.Code : 15BOUC609**

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.**

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

UNIT- II **12 Hrs.**

Classical Genetics - Linkages and Crossing over - multiple alleles - blood groups in man –- Sex determination in plants and in Drosophila - *Meiosis*.

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.**

Mutationand Gene Regulation– Types of mutation - Somatic mutation- Physical and chemical mutagens – Polyploidy - genetic code - gene regulation in prokaryotes – *Operon concept*

UNIT- V **12 Hrs.**

Biostatistics – Collection of data - Sampling types - Measures of Central tendency - *Arithmetic Mean*- Median. Measures of Dispersion- Range- Coefficient of Range- Standard deviation and Standard error (only theory).

Note : *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, "***Principlesof 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.

SEMESTER – VI

Core Paper X - BIOTECHNOLOGY I – CONCEPTS AND TECHNIQUES

Ins. Hrs. : 60 **Sub. Code : 15BOUC610**

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 – Biotechnology and its branches - History –Traditional, Modern Biotechnology- Scope- Biotechnology and Global trends - Gene Bank and Plant conservation- Enzymes used in gene cloning – Restriction enzymes, Polymerases, Ligases and *Reverse transcriptase*.

UNIT- II **12 Hrs.**

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

UNIT- III **12 Hrs.**

Gene transfer Methods - Direct gene transfer methods- Electrophoration, *Microinjection*, Liposome fusion, Biolistics, Transfection in plants andAgroinfection-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 : 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.,"** *Bitechnology 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 Bological principles*", Tata McGraw-Hill publishing company Ltd., New Delhi, 1996.

SEMESTER – VI

Core Paper XI - BIOTECHNOLOGY II –APPLIED BIOTECHNOLOGY

Ins. Hrs. : 60 **Sub. Code : 15BOUC611**

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.

Note : Italics denote Self Study Topics

PRACTICALS:

1. Cultivation of Pleurotus sajor-caju and Agaricus bisporous

2. Culture of Yeast and Azolla.

3. Demonstration of Biofetilizers – Azospirillum- Rhizobium- VAM – Phosphobacteria- Slides or photographs.

4. Blotting techniques – Southern/ Western - Photographs.

5.Petrochemical plants – Materials / Photographs

6. 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 Bological principles*", Tata McGraw-Hill publishing company Ltd., New Delhi, 1996.

SEMESTER - VI

Core Paper XII - FUNDAMENTALS OF COMPUTER AND BIOINFORMATICS

Ins. Hrs. : 60 **Sub. Code : 15BOUC612**

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 (Domine IP) - Net Browser- search engine - *News groups*.

UNIT – IV **12 Hrs.**

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

UNIT – V **12 Hrs.**

Sequence analysis – Similarity Search - Phylogenetic analysis - Protein Prediction –*Drug Designing*. Biomolecular visualization.

Note : *Italics* denote Self Study Topics

PRACTICALS:

Spotters

1. MS - word.
2. Microsoft Excel.
3. Power point presentation
4. Web browsing.
5. E-mailing.
6. Gene finding.
7. Biomolecular visualization

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**, "*Emergingtrends in Bioinformatics",* Ukaaz Publications, First Edition, Hyderabad, 2002.

SEMESTER – V

Core Paper V - TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

Ins. Hrs. : 75 **Sub. Code : 15BOUC505**

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- Curcurbitaceae- Apiaceae.

UNIT – IV **15 Hrs.**

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

UNIT - V **15 Hrs.**

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

Note : 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.

SEMESTER – V

Core Paper VI - PLANT PHYSIOLOGY

Ins. Hrs. : 75 **Sub. Code : 15BOUC506**

Max. Marks : CIA 25; ESE -75 **Credits:4**

Objectives : To understand the water relations with Plant system. To understand the energy relations and enzymes involved in various metabolic activities.

UNIT - I **15 Hrs.**

Water relations of plant –Structure and properties of water - Diffusion- Osmosis – Osmotic pressure- Turgor pressure- *Plasmolysis*- Imbibition -absorption of water and mineral salts.

UNIT - II **15 Hrs.**

Transpiration- Kinds of transpiration- Mechanism of stomatal transpiration- Factors affecting stomatal movement. Translocation of water solutes and assimilates.

UNIT - III **15 Hrs.**

Photosynthesis – Photosynthetic apparatus and *pigments*- pigment system, Light reaction and photosynthetic electron transport system– Carbon fixation : C_3,C_4 and CAM Pathways.

UNIT - IV **15 Hrs.**

Respiration - Aerobic respiration - Glycolysis - Kreb's cycle - Electron transport system and oxidative phosphorylation - *anaerobic respiration*-an outline of HMP pathway.

UNIT – V **15 Hrs.**

Plant growth regulators – Auxin- Gibberellin- Cytokinin (outline only) **Physiology of flowering** – Photoperiodism- Phytochrome- Plant movements -physiology of seed germination and seed dormanacy.

Note : Italics denote Self Study Topics

TEXT BOOKS :

1**. Verma, S.K.,** "*A Text book of Plant Physiology and Biochemistry",* S. Chand and Company, New Delhi.

2**. Jain, V.K.,** "*Fundamentals of Plant Physiology"*, S. Chand and Company Ltd, 1990.

REFERENCE BOOKS:

1. **Arthur C. Giese** , "*Cell Physiology''*, Toppan Company Ltd.Tokyo, Japan, Fifth Edition, 1979.

2. **Frank B. Salisbury** and **Cleon W. Ross,** "*Plant Physiology*", CBS Publisher and Distributors, New Delhi, Third Edition, 1996.

3. **Gill, P.S.,** "*Plant Physiology"*, S. Chand and Company Ltd., New Delhi, 2001.

4. **Jayaraman, J,** "*Laboratory Manual in Bio-chemistry"*, New Age International (P) Ltd. Publishers, New Delhi, 2008.

5. **Ray Noggle, G**. and **George J. Fritz,** "*Introduction to Plant Physiology"*, Prentice – Hall of India Pvt Ltd., New Delhi, 1986.

6. **Rober M. Devlin,** "*Plant Physiology"*, Lifton Educational Publishing INC, New York , Third Edition, 1979.

SEMESTER –VI

Core Paper VIII - ECOLOGY AND PHYTOGEOGRAPHY

Ins. Hrs. : 60 **Sub. Code : 15BOUC608**

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* Carbon 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 : *Italics* denote Self Study Topics

PRACTICALS:

1. Study of morphological and anatomical adaptations of hydrophytes, xerophytes, including halophytes and mesophytes using representative samples.
2. Determination of frequency and density constituent of plant species in a terrestrial community through Quadrat and Transect (line, belt).
3. Phytogeographical regions of India.

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.

SEMESTER -VI

Core Paper IX - GENETICS AND BIOSTATISTICS

Instructional Hrs. : 60 **Sub.Code : 15BOUC609**

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*.

UNIT- II **12 Hrs.**

Classical Genetics - Linkages and Crossing over - multiple alleles - blood groups in man –- Sex determination in plants and in Drosophila - *Meiosis*.

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 – Types of mutation - Somatic mutation- Physical and chemical mutagens – Polyploidy - genetic code - gene regulation in prokaryotes – *Operon concept*

UNIT- V **12 Hrs.**

Biostatistics – Collection of data - Sampling types - Measures of Central tendency - *Arithmetic Mean*- Median. Measures of Dispersion- Range- Coefficient of Range- Standard deviation and Standard error (only theory).

Note : *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.

SEMESTER – VI

Core Paper X - BIOTECHNOLOGY I – CONCEPTS AND TECHNIQUES

Ins. Hrs. : 60 **Sub. Code : 15BOUC610**

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 – Biotechnology and its branches - History –Traditional, Modern Biotechnology- Scope- Biotechnology and Global trends - Gene Bank and Plant conservation- Enzymes used in gene cloning – Restriction enzymes, Polymerases, Ligases and *Reverse transcriptase*.

UNIT- II **12 Hrs.**

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

UNIT- III **12 Hrs.**

Gene transfer Methods - Direct gene transfer methods- Electrophoration, *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 : 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.,"** *Bitechnology 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 Bological principles*", Tata McGraw-Hill publishing company Ltd., New Delhi, 1996.

SEMESTER – VI

Core Paper XI - BIOTECHNOLOGY II – APPLIED BIOTECHNOLOGY

Ins. Hrs. : 60 **Sub. Code : 15BOUC611**

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.

Note : Italics denote Self Study Topics

PRACTICALS:

1. Cultivation of Pleurotus sajor-caju and Agaricus bisporous
2. Culture of Yeast and Azolla.
3. Demonstration of Biofetilizers – Azospirillum- Rhizobium- VAM – Phosphobacteria- Slides or photographs.
4. Blotting techniques – Southern/ Western - Photographs.
5. Petrochemical plants – Materials / Photographs
6. 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 Bological principles*", Tata McGraw-Hill publishing company Ltd., New Delhi, 1996.

SEMESTER - VI

Core Paper XII - FUNDAMENTALS OF COMPUTER AND BIOINFORMATICS

Ins. Hrs. : 60 **Sub. Code : 15BOUC612**

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 (Domine IP) - Net Browser- search engine - *News groups*.

UNIT – IV **12 Hrs.**

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

UNIT – V **12 Hrs.**

Sequence analysis – Similarity Search - Phylogenetic analysis - Protein Prediction –*Drug Designing*. Biomolecular visualization.

Note : *Italics* denote Self Study Topics

PRACTICALS:

Spotters

1. MS - word.
2. Microsoft Excel.
3. Power point presentation
4. Web browsing.
5. E-mailing.
6. Gene finding.
7. Biomolecular visualization

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.