

SCHEME OF STUDY OF BS IN BOTANY

- Total numbers of Credit hours 129
- Duration 4 years
- Semesters 8
- Course Load per Semester as per HEC rules

Item No: 2: Approval of course codes for BS Botany

There are some allied courses taught in BS Botany such as Mathematics; English; Pak Study and others. There was need to assign codes for these courses so that it can be allocated on result cards accordingly. The house had presented their esteemed opinion. The approved courses for BS are enlisted underneath.

1st Semester

Course Code	Course Title	Lect.Hrs	Lab. Hrs	Credit.Hrs
BOT-3101	Diversity of Plants	3	1	4
ZOO-3102	Zoology (Principal of Animal Life-I)	3	0	3
MAT-3103	Math/STAT-1 (Statistical Packages)	3	0	3
CHM-3104	Fundamental Chemistry	3	0	3
ENG-3105	English-I (Functional English)	3	0	3
PST-3106	Pakistan Studies	2	0	2
		17	1	18

2nd Semester

Course Code	Course Title	Lect.Hrs	Lab. Hrs	Credit.Hrs
BOT-3201	Plant Systematics, Anatomy & Development	3	1	4

ZOO-3202	Zoology (Principal of Animal Life-II)	3	0	3
CHM-3203	Physical Chemistry	3	0	3
ENG-3204	English-II (Communication Skills)	3	0	3
ARB-0001	Arabic	2	0	2
IST-3206	Islamic Studies	2	0	2
		17	1	17

3rd Semester

Course Code	Course Title	Lect.Hrs	Lab. Hrs	Credit.Hrs
BOT-4301	Cell Biology, Genetics & Evolution	3	1	4
ZOO-4302	Zoology (Animal Diversity –I)	3	1	4
CHM-4303	Organic Chemistry	3	0	3
ENG-4304	English-III (Technical Report Writing & Presentation Skills)	3	0	3
COM-4305	Introduction to Computer	3	0	3
		15	2	17

4th Semester

Course Code	Course Title	Lect.Hrs	Lab. Hrs	Credit.Hrs
BOT-4401	Plant Physiology and Ecology	3	1	4

BOT-4402	Biodiversity and Conservation	3	1	4
ZOO-4403	Zoology (Animal Diversity –II)	3	0	3
CHM-4404	Analytical Chemistry	3	0	3
BST-4405	Biostatistics	3	0	3
		15	2	17

5th Semester

Course Code	Course Title	Lect.Hrs	Lab. Hrs	Credit.Hrs
BOT-5501	Bacteriology & Virology	2	1	3
BOT-5502	Mycology & Plant Pathology	2	1	3
BOT-5503	Phycology & Bryology	2	1	3
BOT-5504	Diversity of Vascular Plants	2	1	3
BOT-5505	Plant Systematics	2	1	3
		10	5	15

6th Semester

Course Code	Course Title	Lect.Hrs	Lab. Hrs	Credit.Hrs
BOT-5601	Plant Anatomy	2	1	3

BOT-5602	Genetics-I	2	1	3
BOT-5603	Plant Biochemistry-I	2	1	3
BOT-5604	Plant Ecology-I	2	1	3
BOT-5605	Plant Physiology-I	2	1	3
		10	5	15

7th Semester

Course Code	Course Title	Lect.Hrs	Lab. Hrs	Credit.Hrs
BOT-6701	Molecular Biology	2	1	3
BOT-6702	Plant Biochemistry- II	2	1	3
BOT-6703	Plant Ecology-II	2	1	3
BOT-	Research Thesis/ Elective-I	-	-	3
BOT-	Elective-II	2	1	3
BOT-6713	Internship (Opt)	-	-	-
		8	4	15

8th Semester

Course Code	Course Title	Lect.Hrs	Lab. Hrs	Credit.Hrs
BOT-6801	Plant physiology –II	2	1	3
BOT-6802	Genetics-II	2	1	3
BOT-6803	Environmental Biology	2	1	3
BOT-	Research Thesis/ Elective-III	-	-	3
BOT- ----	Elective-IV	2	1	3
	Total	8	4	15

Item No.3: List of Optional Papers for BS Botany (4 Years):

S. No.	Course Title	Course Code
1.	Ethnobotany	BOT-6704
2.	Phytoremediation	BOT-6705
3.	Plant Stress Physiology	BOT-6706
4.	Conservation and Management of Plant Resources	BOT-6707
5.	Plant Nutrition	BOT-6708
6.	Phytosociology	BOT-6709
7.	Economic Botany	BOT-6710
8.	Flora of Azad Jammu and Kashmir	BOT-6711
9.	Research Thesis	BOT-6712
10.	Internship	BOT-6713
11.	Research Techniques	BOT-6804
12.	Plant Metabolism	BOT-6805

13.	Plant Biotechnology	BOT-6806
14.	Applied Mycology	BOT-6807
15.	Plant Microbe Interaction	BOT-6808
16.	Molecular Genetics	BOT-6809
17.	Phytochemistry	BOT-6810
18.	Palynology	BOT -6811
19.	Applied Microbiology	BOT-6812

COURSES OF BS BOTANY FOR DISCUSSION

BOT- 6704

ETHNOBOTANY

3(2+1)

Theory:

Introduction: Definition, Aims & objective of ethnobotany, significance of ethnobotany, History and status in Pakistan, Importance and nature of plant products, Cereals and Millets, Classification of cereals, Legumes and Nuts, Vegetables, Classification of vegetables, Fruits; Classification of fruits. Economic importance of plants with special reference to food fibers, wood, tannins, rubber, sugar, paper, gums, resins, dyes, beverages, spices, fumitories, masticatories and oils.

Practical :

- Collection, identification and preservation of economically important plants and plant products. The students are required to study in nature and in the laboratory economically important local flora.
- Students should be able to write accurate scientific and vernacular name and economic importance of plants and identify them up to species level.
- Cultivation of economically important plants. Germplasm identification

Books Recommended:

- Martin, G. J. (2004). Ethnobotany. Earthscan Publications Ltd. London and Sterling, VA.
- Marty R.K and V.P. Singh (2006). An Introduction to Modern Economic Botany Agrobios India.
- Pandey, S. N. and Chadha, A. (1993). A Textbook of Botany (Plant Anatomy and Economic Botany). Vol. III. Vikas Pub. Co., New Delhi.
- Pandey, B.P. (1984). Economic Botany. S. Chand. Co., New Delhi.
- Simpson, A. (1985). Economic Botany. McGraw Hill Book Co., N. Y.
- Yadav.P.R. and S.R. Mishra. (2004). Environmental Ecology. Discovery Publishing House New Delhi 110002.

BOT-6705

PHYTOREMEDIATION

3(2+1)

Theory:

Plant tolerance to different contaminants, Adaptations, Characteristics of plants suitable for phytoremediation, Metal accumulators – hyperaccumulators and accumulators, Remediation: application, limitations (characteristics of roots, growth rate, pollutant concentration), economic and technical aspects, conservation of ecosystems, Phytoremediation mechanisms, Phytoextraction, Phytodegradation, Rhizofiltration, Rhizodegradation, Phytostabilization, Phytovolatilization, Phytoremediation techniques, Phytoengineering.

Practical:

- Cultivation of plants with addition of excessive amounts of pollutants (heavy metals, organic pollutants).
- Determination of pollutants in plant tissues.
- Bioconcentration degree of certain pollutants.
- Collection of plant under stressed condition (heavy metals).

Recommended Books:

- John T. Cookson, Jr. McGraw-Hill, (1995). Bioremediation Engineering: Design and Application. Inc. New York.

- A. Singh O. P. Ward (Eds), (2004). Applied Bioremediation and Phytoremediation. Springer, New York.
- A. Bhandari etc (Eds), (2007). Remediation Technologies for Soils and Groundwater .
Jan Vymazal, Lenka Kröpfelová, (2008). Wastewater treatment in constructed wetlands with horizontal sub-surface flow. Springer.

BOT-6706

PLANT STRESS PHYSIOLOGY

3(2+1)

Theory:

Types of environmental stresses, Salinity: effects of salinity, physiological changes in plant adaptation to salinity. Water logging: physiological effects on plant growth, plant adaptation. Drought: effect of drought on plant growth, ultra-structural modifications, plant adaptation to drought. Metal ion toxicity: effects on plant growth, physiological adaptation, nutrient deficiency, physiological and biochemical effects. Cold stress: freezing injury and adaptations. High temperature stress: UV, High CO₂ and other minor stresses and plant adaptations. The effects of ionizing radiations on plant metabolism and growth.

Practical:

- Demonstration of effects of various stresses on plants, methods of stress assessments and ultra-structural and physiological changes associated with various stresses.

Books Recommended:

- Hale, M. G. and Orcutt, D. M. (1987). The Physiology of Plants under Stress. JohnWiley and Sons, N.Y.
- Kramer, P.J. (1983). Water Relations of Plants. Academic Press.
- Paleg, L. G. and D. Aspinale, D. (1981). Physiology and Biochemistry of DroughtResistance in Plants. Academic Press London.
- Russel, H. and Staples, R. C. (1979). Stress Physiology in crop plants. by H. Wiley-Interscience, N.Y.

- Staples, R.C. and G.H. Toenniessen. (1984). Salinity Tolerance in Plants – Strategies for crop improvement. John Wiley & Sons.

BOT-6707 CONSERVATION & MANAGEMENT OF PLANT RESOURCES 3(2+1)

Theory:

Introduction of species, Ecology and genetic diversity, Existing wildlife in Pakistan, Phytogeographical zones of Pakistan, Threats to plant diversity, Importance of the Red data book, IUCN categories for threatened species, Concept of *In situ* and *ex situ* conservation of plants, Role of herbaria and botanical gardens in conservation, IUCN protected areas categories, Protected areas of Pakistan, Gene bank management and operation, Biodiversity action plan of Pakistan.

Practical:

- Field visits; visit to National parks, herbarium and gene bank (IABGR).
- Role of NGOs in conservation.
- Preparation of an inventory of the flora of assigned region.

Books Recommended:

- Cunnigham, A. B. (2001). Applied Ethnobotany: People, wild plant use and conservation, Earthspan Publications.
- Dyke, F. V. (2003). Conservation Biology. Mc Graw Hill, New York.
- Gotz S., Gustavo A B, Da Fonseca, C. A Harvey, C. Gascon, H. L Vasconcelos and Anne-Marie Izac, (2004). [Agroforestry and Biodiversity Conservation in Tropical Landscapes](#).
- John T. and G. P. Nabhan, (2001). [People, Plants and Protected Areas: A Guide to "In Situ" Management](#).
- Krishnamurthy, K. V. (2003). A text book of Biodiversity Science, Publishers Inc. Enfield, NH, USA.

- Peter Feinsinger, (2001). [Designing Field Studies for Biodiversity Conservation](#). pp 219.

BOT-6708

PLANT NUTRITION

3(2+1)

Theory:

Plant nutrients, Micro and macro nutrients, Plant water relations; Path of water and nutrient uptake, Mechanisms of nutrient uptake, Photosynthesis, Phloem transport, phloem loading and unloading, Source sink relationship, Function of mineral elements, Toxicity and Deficiency symptoms of Nutrients, Methods of studying Plant Nutrition, Solution culture techniques, chelating agents, Radiotracer technique, Hydroponic, Mycorrhizae and plant nutrition.

Practical:

- Experiments of plant growth under different nutrient supplies.
- Experiments of plant growth with the application of different fertilizers in soil & hydroponic conditions.

Books Recommended:

- Maraschner, H. (1986). Mineral Nutrition in Higher Plants: Academic Press. USA.
- Mengal and Kirkbe. (1987). Plant Nutrition, Academic Press. USA.

BOT-6709

PHYTOSOCIOLOGY

3(2+1)

Theory:

The community: Analytical and synthetic characteristics of a community, Classification of community, Basis and unit of classification, Dynamics of community. Types of changes: Succession on wet and dry habitats, Theories of climax. Ecological characteristics of species and population. Ecosystem ecology: Components of ecosystem, Energy transformation in nature and laws governing energy transformation, Food chain, Food web, Pyramid of number in food chain, Trophic levels, Energy flow in an ecosystem. Biogeochemical cycles with; Nitrogen,

Phosphorus, Sulphur, Carbon and water cycles as examples. Principal vegetation types of Pakistan.

Practical:

- Methods of vegetation sampling.
- Study of floristic composition, preparation of site plan study areas.
- Determination of frequency of occurrence in a plant community, population density and cover of species in a plant community.
- Study of decomposition of leaf litter.
- Preparation of profiles of temperature and relative humidity.
- Measurement of height of tree comparison between natural & man mad ecosystem determination of primary productivity of grassland.

Books Recommended:

- Billings, W.D. (2000). Plant and Ecosystem. Wadsworth Pub. Co., California
- Daubenmire, R.F. (1974). Plant Communities. A Textbook of Synecology. Wiley, N.Y. USA.
- Kimmins, J. P. (1996). Forest ecology, Prentice Hall Upper Saddle River, New Jersey. 70
- Shukla R.S & P.S Chandel. (2006). Plant Ecology S. Chand & Company LTD Ram nagar new Delhi
- Stiling, R. D. (1992). Ecology, theories and applications. Prentice Hall International Inc. U.S.A
- Treshow, M. (1970). Environment and Plant Response. McGraw Hill Book. Co., N. Y.
- Schultz et al., (2005). Plant Ecology. SpringerVerlag, Berlin.
- Ricklefs, R. E. (2000). Ecology. W. H. Freeman and Co., UK.
- Subrahmanyam, N. S. and Sambamurthy, A. V. S. S. (2000). Ecology. Narosa Publishing House, New Delhi.
- Townsend, C. R., Harper, J. L. and Begon, M. E. (2000). Essentials of Ecology. Blackwell Scientific Publications UK.

Theory:

Definition of economic botany, importance of plants, food plants, products from plants, role of plants in soil fertility and phytoremediation. Important cereals; wheat, rice, corn, their morphology, history, cultivation, chemical composition & uses. Fibers, Fiber industry, structure & classification of fibers, fiber yielding plants; cotton, lin, jute, sun hemp, Indian hemp, coir, aak, sumbal, paper mulberry, kapas, their morphology, harvesting procedures, importance, rayon fibers and their uses. Wood industry, wood for timber, timber industry, ply wood, uses of wood, conversion products of wood, distillation products, secondary products, list of wood yielding plants. Rubber industry, physical properties, chemical composition, rubber yielding plants, para rubber, morphology, uses, guayule rubber, asam rubber, panama rubber. Starch, chemical composition, uses, starch yielding plants, rice starch, potato starch, wheat starch, sagu starch. Sugar & sugar yielding plants, sugar beet by products of sugar. Fumatories & masticatories, beverages, spices & condiments.

Practicals:

- Identification and collection of food plants of area.
- Study of morphology of cereal crops and their cultivation techniques.
- Collection of fibre yielding plants from local area.
- Field survey to enlist wood yielding plants.
- Study of spices and condiments used in daily food.
- Submission of 30 economically important plants at final practical time.

Recommended Books:

- H. D.V. Prendergast, et al. (1998). Plants food and medicine. Kew publishing
- Frances E.M. Cook. (1995). Economic botany data collection standard. Kew publishing.
- Pooja. (2005). Economic botany. Discovery publishing house.
- B. P. Pandey. (2000). Economic Botany

BOT-6711

FLORA OF AZAD JAMMU AND KASHMIR 3(2+1)

Theory:

Concept of flora, history of flora, Geomorphology and climatology of plant regions in Pakistan and Azad Jammu and Kashmir, Natural vegetation regions, floristic composition and zones, Types of habitat and their vegetation, Life forms in the flora of Azad Jammu and Kashmir, Plant

groups in the flora of Azad Jammu and Kashmir, endangered, rare, endemic, economic, aromatic, poisonous, grazing, woody and edible species of Azad Jammu and Kashmir, Threats to flora of Azad Jammu and Kashmir, Methods to study flora in field and lab, tools and technique to preserve flora in field and herbarium.

Practical:

- Submission of properly mounted and fully identified 50 herbarium specimens at the time of examination.
- Collection of Flora data from internet and literature.
- Field trips shall be undertaken to study plants from different ecological zones of Pakistan.

Recommended Books:

- Ali, S.I. and Nasir, Y.J. (1970-1992). *Flora of Pakistan*. Nos. 68, 71, 131, 145, 126, 172, 36, 54, 100, 171, 132, 20, 75, 152. Department of Botany, University of Karachi.
- Ali, S.I. and Qaiser, M. (1992-2010). *Flora of Pakistan*. Nos. 204, 207, 201, 215. Department of Botany, University of Karachi.
- Malik, T.A. (1996). *Principles of Botany*. The Carvan Press Darbar Market, Lahore.
- Stewart, R.R., (1972). *An Annotated Catalogue of the Vascular Plants of West Pakistan and Kashmir*. *Flora of West Pakistan*. E. Nasir and S.I. Ali, (eds.) Fakhri Printing Press, Karachi.
- Stewart, R.R., (1957). *The Flora of Rawalpindi District, West Pakistan*. E.E. Press, Rawalpindi.
- Nasir, Y.J. and R.A. Rafique. (1995). *Wild Flowers of Pakistan*. Oxford University Press, Karachi: 298.
- Parker (1956). *A Forest Flora for the Punjab with Hazara and Dehli*. Ed. (3): 230.

BOT-6804

RESEARCH TECHNIQUES

3(2+1)

Theory:

Planning research project: Definition of research, problem identification and feasibility analysis, validity of problem, objectives and goals, literature search, development of hypothesis, source and review of literature,

Reference writing: For books, journals, anonymous, internet etc. use of digital libraries for research.

Preparation of a research report: Types of research reports, structure, Graphics, initial writing, rewriting and editing. Evaluation of a research report, general evaluation criteria, specific evaluation criteria.

Microscopy, Centrifugation, Electrophoresis, Genomic DNA extraction, PCR, DNA fingerprinting, Restriction enzyme analysis and genotyping, Transformation.

Practical:

- To design a report
- Protein Extraction
- SDS- PAGE
- PCR Optimization
- DNA Extraction
- Thin layer Chromatography and Microscopy

Books Recommended:

- Old R.W. and S.B. Primrose (1994). Principles of Gene Manipulation, an Introduction to Genetic engineering (4th edition). Blackwell Scientific Publications.
- John, H.D .and L.W. Roberts (1985). Plant Tissue culture second edition. Cambridge University Press Cambridge.
- Smith R.H (2000). Plant tissue culture techniques and Experiments second Edition Academic Press.
- Arifullah, S and K.M. Bhatti. (1998). Research process simplified. Pan-Graphic (Pvt) Limited. Islamabad.
- Jones, A., R, Reed and J. Weyers. (1994). Practical skills in Biology. Longman Scientific and Technical.
- O' Conner, M. (1993). Writing successfully in science. Chapman and Hall. N. Y.

- Hashmi, N. (1983). Style manual of technical writing. Pakistan Economic Analysis Network Project. Islamabad.

BOT-6405

PLANT METABOLISM

3(2+1)

Theory:

Introduction in Plant metabolism, Carbohydrates metabolism, Fat metabolism, Nitrogen metabolism, Plant hormones, Growth regulators, Mineral nutrition

Practical:

- Phototropism, Geotropism, Nastic movements and Photoperiodism
- Auxin and Elongation of Barley Seedling
- Effect of Gibberellins on Growth of Lettuce
- Effect of Kinetin on Callus, Tissue Culture
- Plant hormones and differentiation

Recommended books:

- Bowsher, Steer & Tobin (2008). Plant Biochemistry. Garland Science, Taylor & Francis Group, LLC, New York.
- Buchanan, Gruissem & Jones (2000). Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists. QK 861.B45.
- Calvin (1962) .The path of carbon in photosynthesis. Science 135: 879-889. QH 9 B6.B29.
- Crozier, Clifford, and Ashihara (2006). Plant Secondary Metabolites: Occurrence, Structure, and Role in the Human Diet. Blackwell Publishing. QK 881.P55 2006.
- Dennis (1997). Plant Physiology, Biochemistry, and Molecular Biology. Longman Publishing. QK 881.P54.
- Heldt (1997). Plant Biochemistry and Molecular Biology. Oxford University Press. QK 861 H4513.
- Taiz & Zeiger (2006). Plant Physiology. Sinauer Associates. QK 711.2 T35.

BOT- 6806

PLANT BIOTECHNOLOGY

3(2+1)

Theory:

Introduction, Plant gene structure, Micro propagation, Organogenesis, De-differentiation, Re-differentiation, Callus culture, Cell culture, ovule culture, seed culture tissue culture. Embryogenesis; Direct Embryogenesis, Indirect Embryogenesis, Protoplast Culture, Somatic Hybridization, Gene, Vector, Restriction enzyme, Methods of genes transfer in plants, PCR base techniques, GMOS and application of Biotechnology.

Practical :

- Over-view of plant bio technology lab
- Preparation of MS media
- Isolation of meristem
- Isolation of protoplast
- Preparation of solution for SDS-PAGE
- PCR

Recommended Books:

- Slater, A., N. Scott, M. Fowler (2008). Plant biotechnology. Oxford Univ. Press Stewart,
- C.N. Jr. (2008). Plant Biotechnology and Genetics: Principles, Techniques and applications.
- Trigiano, R.N., D.J. Gray (Eds) (2010). Plant tissue culture, development and biotechnology. CRC Press.

BOT-6807

APPLIED MYCOLOGY

3(2+1)

Theory:

General Characteristics of fungi, Taxonomic status and Classification of Fungi, Fungi harmful to mankind, Fungi as pathogen to plants, Animal & Human beings, Spoilage of food stuffs.

Fungi as a food: Detailed account of mushrooms & their cultivation, Yeast & its related Industries, Single cell proteins & its production. The Economic importance of the fructification of few edible Fungi.

Fungi as medicines: Industrial production of:- Ergot, Ephedrine , Steroids , Vitamins, Antibiotics

Fungi in Industries: Brewery, Baking and Dairy Industries. Fungi in Enzyme Production:- Invertase, Zymase, Amylase, Cellulase. Fungi in production of organic Acids: Citric Acid, Gluconic Acid, Gallic Acid, Fumaric Acid.

Practical:

- Basic mycological techniques
- Macroscopic and microscopic study of common fungi
- Preparation of nutrient media
- Collection of fungal infected samples

Recommended Books:

- Alexopoulos, G.J., Mims C.W and M. Blackwell. (1996). Introductory mycology (4th ed), Jhon Wiley & Sons, New York.
- Mehrotra, R.S. Aneja L.R. (1990). An introduction to mycology first edition. Wiley eastern limited, new dehli.
- Hafiz, A. (1984). Plant diseases, PARC, Islamabad, Pakistan.
- Ahmed S. (1987 & 1997). Ascomycetes of Pakistan (Vol. I & II), Biological society of Pakistan Lahore.

BOT- 6808

PLANT MICROBE INTERACTION

(2+1)

Theory:

Microbial responses in the Rhizosphere and Agriculture soil, Beneficial type of symbiosis, Beneficial microbe for plants, PGPR and process of nodulation and nitrogen fixation, Microbial products influence plant growth, Biofertilizers, Role of microbe, Precursor inoculums interaction, Physiosignificanse of phytohormones produced by microbes, Effect of root exudates,

Molecular basis of plant microbe interaction with special reference to rhizobial symbiosis, Associative symbiosis, introduction of biofilm, Microbial biofilm, Physiological and molecular characterization of PGPR.

Practical:

- Study of mycorrhizal associations. Clearing and staining of mycorrhizal roots.
- Estimation of root length and colonization by mycorrhizal fungi.
- Bioassay measurements of mycorrhizal inoculums in soil.
- Isolation and identification of Glomalean fungi from field and other soils.
- Synthesis of mycorrhiza from spore inoculums and from root inoculums.
- Assessment of plant growth response by mycorrhizal infection in some seasonal crops.

Books Recommended:

- Hock, B. and A. Verma, (2002). Mycorrhiza. Springer publications.
- Manohara Chary and C. Chamola, (eds) (2002). Techniques in Mycorrhizal Studies.
- Michael, F. Allen, (1991). Ecology of Mycorrhiza. Cambridge University press.
- Peterson, Larry, R., H. B. Massicotte and L. H. Melville, (2004). Mycorrhizas. CABI publications.
- Prell H.H and P.Day. (2001). Plant Fungal Pathogen Interaction. Springer.
Stacey G. and N. T. Keen. (1996). Plant Microbe Interaction. Springer.

BOT-6809

MOLECULAR GENETICS

3(2+1)

Theory: The structure of DNA: DNA the genetic material, DNA replication in eukaryotes, DNA and the gene. **The Nature of the Gene:** How genes work, gene protein relationship, genetic observation explained by enzyme structure, genetic fine structure, mutation sites, complementation. **DNA Function:** Transcription, translation, the genetic code, protein synthesis, universality of genetic information transfer, eukaryotic RNA. **Recombinant DNA:** Restriction enzymes, the formation of recombinant DNA, recombinant DNA methodology, recombinant DNA and social responsibility. Application of Recombinant DNA.

Practicals:

- Numerical problems

- Arrangement of genetic material
- DNA extraction Introduction to PCR technology
- Recombination in virus bacteria and fungi
- Population genetics
- Blood group and RH factors
- Fungal Genetics
- Bacterial genetics

Books Recommended:

- Gelvin, S. B. (2000). Plant Molecular Biology Manual. Kluwer Academic Publishers.
- Pierca, B.A. (2005). Genetics, A conceptual approach. W.H. Fermin and Company, New York.
- Synder, L, and Champness, W. (2004). Molecular Genetics of Bacteria. ASM Press, Washington D.C.
- Hartl, D. L. and Jones, E.W. (2005). Genetics –Analysis of Gene and Genomics, Jones and Bartlett Publishers. Sudbary, USA.
- Hedrick, P.W. (2005). Genetics of Population. Jones and Bartlett Publishers, Sudbary, USA.

BOT-6810

PHYTOCHEMISTRY

3(2+1)

Theory:

Phytochemistry: Definition, purpose of phytochemistry, Brief history, Characteristics and their uses in taxonomy. Chemical constituents or comparative data and their evolutionary interpretation.

Directly visible chemical components: Starch grains, Raphids, Drusses, Silica, Alkaloids, Glycosides, Tannins, Phenolic glycosides, Chemical test character, Flavonoids, Terpenoids Serology.

Practical:

- Electrophoresis.
- Collection of plants for phytochemical study.
- Iodine brown colour pigment.

Recommended Books:

- J, B. Harbora. (2004). Phytochemical methods.
- Markham, Techniques of flavonoid identification.
- Singhal, G.S., Renger, G., Sopory, S.K., Irrgang, K.D. and Govindjee (1999). Concepts in Photobiology: Photosynthesis and Photomorphogenesis, Narosa Publishing House, N.D.
- Goodwin, T.W. and Mercer, E.I. 1987. Plant Biochemistry. Pergamon Press, Oxford.

BOT -6811

PALYNOLOGY

3(2+1)

Theory:

Introduction, scope and branches, Pollen and spore morphology and taxonomy, Composition and structure of pollen, Structure of exine and Intine, Sculpturing types of pollen grain, Apertures of pollen grain, Methods of collecting pollen, Microscopic examination of pollen, Aeropalynology, importance, production of air borne pollen, Role of pollen in allergy, Wind and insect pollinated pollens, Morphology of angiosperm and gymnosperm pollen, Fossil palynology.

Practicals:

- Collection of angiosperm pollen of dicot and preservation.
- Preparation of pollen for microscopic examination.
- Collection of angiosperm pollen of monocot and preservation.
- Preparation and microscopic study.
- Collection of plants responsible for pollen allergy.
- Study of pollinia of different plants.

Recommended Books:

- Palynology by A, Treatise.
- Palynology: spores and pollen by Marjorie D. Munir and Willian Antony S.

- Palynology: new directions other applications and floral history by J. Jansonius and Duncan Colin McGregor.

BOT-6812

APPLIED MICROBIOLOGY

3(2+1)

Theory:

Introduction- Main groups of microorganisms and their characteristics (Prions, Viroids, Viruses Rickettsia, Bacteria, Mycoplasma, Cyanobacteria, protists, Algae & Fungi.

Structure; of microbial cells- prokaryotic and eukaryotic cells, structure of the sub cellular organisms- virus, viroids & prions .

Morphology; ultra-structure, reproduction and classification of bacteria. Major groups of bacteria.

Viruses-; symmetry of viruses, composition, transmission, replication- plant, animal and bacterial viruses.

Immunology-; Cells of immune systems, antigens recognition and antibody formation, acquired immunity, hypersensitivity and allergies; serology.

Microbes in Nature: (1) Microbes in soil, water and air- general account; (2) Nitrifying and denitrifying bacteria, rhizosphere biota, phyllosphere biota and caulosphere micro flora. Microbes and microbial action in Bio-gas production, bio-fertilizers, sewage decomposition and compost formation.

Microbial spoilage of food- aflatoxicosis, staphylococcus poisoning, botulism and salmonellosis.

Industrial microbiology: Alcoholic beverages and bread, Microbes and Oriental fermented food- dosa, idly and appam, Microbes and microbial action involved in dairy products- cheese and butter, Microbiology of single cell proteins and antibiotics.

Practical:

- Isolation of microbes from soil – dilution plate method.
- Isolation of microbes from different water sources – dilution plate method.
- Isolation of microbes from Juices – dilution plate method.
- Isolation of microbes from Meat, Cheese, Milk etc – dilution plate method.
- Streak out a bacterial culture on an agar plate and isolation of colonies.
- Preparation of bacterial smear – staining with methylene blue and Gram's stain.
- Measurement of turbidity of a culture using colorimeter – as indication of microbial growth.

Recommended books:

- Talaro, k. and a. Talaro (1996). Foundation in Microbiology. Wm, .C. Brown. Publ. Co. N.Y.
- K. AT hleen, P. T; Arthur, T. (2001). Foundation in Microbiology, Basic Principles McGraw Book Co. N. Y.
- Ketchum, P. A. (1988). Microbiology, John Wiley and Sons. N. Y.
- Marmion, B. P. (1989). Practical medical microbiology churchil fiving stone. London and New York.
- Mckane, L. and J. Kandel (1986). Microbiology. Essential and application. McGraw Hill Book, Co. N. Y.
- Prescott, L.M; Herley, J. P and Klein, D.A (1999). Microbiology. 4th ed. McGraw Hill Book, Co. N.Y.
- Stainer, R. Y;Adelberg, E.A and Ingraham, J. L (1985). General Microbiology. Macmillan Publ. Co. N.Y.
- Wistreich, G.A and Max D. Lechtman (1984). Microbiology. Macmillan Publ. Co. N.Y.

