

**Department of Bio-Resources,  
Amar Singh College,  
Cluster University,  
Gogji Bagh, Srinagar-190008**

**Learning objectives in the subject of Bio-Resources**

**Semester: 1<sup>st</sup>**

**Paper Title: Fundamentals of Bioresources**

**Core Course: Bioresources Paper-I**

<b>S. No.</b>	<b>Unit</b>	<b>Learning objectives</b>
1.	<b>Unit-I (Biodiversity)</b>	<ul style="list-style-type: none"> <li>✓ To give them brief introduction about bioresources and the availability of plant, animal and microbial resources.</li> <li>✓ To make them aware about biodiversity and to give them idea about genetic, species and ecosystem diversity.</li> <li>✓ To make them aware about mega-biodiverse countries and biodiversity hotspots at regional and global levels.</li> <li>✓ To teach them about the role of remote sensing and GIS techniques in assessing biodiversity.</li> </ul>
2.	<b>Unit-II (Biodiversity Conservation)</b>	<ul style="list-style-type: none"> <li>✓ To make them aware about the causes of species extinction, IUCN threat categories and Red data book.</li> <li>✓ To give them idea about <i>in-situ</i> and <i>ex-situ</i> conservation strategies along with examples.</li> </ul>
3.	<b>Unit-III (Bioresources and livelihood)</b>	<ul style="list-style-type: none"> <li>✓ To give them a brief idea about livelihood, its threats and its role in bioresources management.</li> <li>✓ To make them aware about food insecurity and the role of urbanization and globalization on livelihood.</li> <li>✓ To give them a brief idea about sustainable development, energy crisis and need of green energy.</li> <li>✓ To give them a brief concept about green building, green walls, green washing and eco-labelling</li> </ul>
4.	<b>Unit-IV (Bioresources management policies)</b>	<ul style="list-style-type: none"> <li>✓ To make them aware about Indian Bioresources Information Network (IBIN) and its role in bioresources management.</li> <li>✓ To make them aware about the aims and objectives of convention on biological diversity and Ramsar convention.</li> <li>✓ To give them brief idea about environment protection act-1986 and environment impact assessment including stages of EIA</li> <li>✓ To acquaint them about bioresources conservation and public participation.</li> </ul>

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Semester: 2<sup>nd</sup>

Paper Title: Plant Resources

Core Course: Bioresources Paper-II

S. No.	Unit	Learning objectives
1.	<b>Unit-I (Plant Resources)</b>	<ul style="list-style-type: none"> <li>✓ To give them brief introduction about important plant resources from plant kingdom with special reference to cryptogams and phanerogams.</li> <li>✓ To give them an insight about the centres of origin of agriculture and domestication of cultivated plants as per Vavilov.</li> <li>✓ To give them a detailed introduction about the concept and role of bioprospection.</li> <li>✓ To give them a brief concept about biopiracy along with emphasis on case studies (Basmati, Neem and Turmeric) and traditional knowledge digital library (TKDL).</li> </ul>
2.	<b>Unit-II (Food and Fodder Crops)</b>	<ul style="list-style-type: none"> <li>✓ To give them a brief introduction about underutilized crops, and their significance as a future food crop.</li> <li>✓ To make them aware about the cultivation practices and limitations in two important underutilized crops-buckwheat and foxtail millet.</li> <li>✓ To give them an idea about the cultivation and utility of domesticated food crops like rice, maize, mustard, fodder crops and alfalfa.</li> </ul>
3.	<b>Unit-III (Fruits, Vegetables and Spices)</b>	<ul style="list-style-type: none"> <li>✓ To give them an insight about the cultivation practices adopted in case of apple, walnut and apricot at regional and global levels.</li> <li>✓ To acquaint them about storage and packaging of fruits and vegetables.</li> <li>✓ To give them a brief idea introduction about wild vegetables of Kashmir- <i>Taraxacum</i>, <i>Cichorium</i>, <i>Rumex</i> and <i>Malva</i>.</li> <li>✓ To give them a brief concept about spices and condiments-saffron, Cumin, Coriander and Fennel.</li> <li>✓ To make them aware about non-woody forest products and their applications- important sources of gums, resins, dyes and their economic importance.</li> </ul>
4.	<b>Unit-IV (Medicinal Plants of Kashmir)</b>	<ul style="list-style-type: none"> <li>✓ To give them brief idea about morphological, ethnobotanical and medicinal importance of valuable medicinal plants <i>Artemesia</i>, <i>Arnebia</i>, <i>Atropa</i>, <i>Saussurea</i> and <i>Rheum</i> at local and regional levels.</li> <li>✓ To provide them detailed information about essential oils and their extraction especially from lavender and rose plants, the cultivation practices followed.</li> </ul>

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Semester: 3rd

Paper Title: Animal Resources

Core Course: Bioresources Paper-III

S. No.	Unit	Learning objectives
1.	<b>Unit-I (Introduction to Animal Resources)</b>	<ul style="list-style-type: none"> <li>✓ To give them brief introduction about important animal resources.</li> <li>✓ To demonstrate understanding about the principles and practices for the production of high quality meat, milk and eggs</li> <li>✓ To give them a brief idea about the scope of meat, fish and poultry processing industry in J&amp;K.</li> </ul>
2.	<b>Unit-II (Livestock)</b>	<ul style="list-style-type: none"> <li>✓ To give them a brief idea about the history of domestication.</li> <li>✓ To gain insight about the important methods of selection and systems of breeding in farm animals and poultry birds.</li> <li>✓ To make them aware about the phenotypic and genotypic consequences of livestock.</li> <li>✓ To give them a brief idea about the inbreeding and outbreeding.</li> <li>✓ To gain insight about the genetic basis of heterosis.</li> </ul>
3.	<b>Unit-III (Fish resources)</b>	<ul style="list-style-type: none"> <li>✓ To give them a brief idea about the role of aquaculture in food supply.</li> <li>✓ To make them aware about the agencies involved in promoting academic, research and entrepreneurship in aquaculture.</li> <li>✓ To gain insight about the different types of farming system.</li> <li>✓ To give them a brief concept about the integrated fish farming with details of paddycum fish culture.</li> </ul>
4.	<b>Unit-IV (Insect resources)</b>	<ul style="list-style-type: none"> <li>✓ To give them a brief idea about the importance and scope of insect based industries.</li> <li>✓ To gain insight about the honey and silk industry.</li> <li>✓ To make them aware about advances in insect based industries of J&amp;K and their economic potential.</li> <li>✓ To acquaint them about use of insects in forensic science and biomedicine.</li> <li>✓ To give them a brief idea about the role of insects in pollination.</li> </ul>

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Semester: 4<sup>th</sup>

Paper Title: Microbial and Fungal Resources

Core Course: Bioresources Paper-IV

S. No.	Unit	Learning objectives
1.	<b>Unit-I (Microbial resources)</b>	<ul style="list-style-type: none"> <li>✓ To give them brief introduction about the historical perspective and different types of microbial resources.</li> <li>✓ To demonstrate understanding about the microorganisms in wastewater decontamination.</li> <li>✓ To give them a brief idea about the bioremediation through the use of microbial resources.</li> </ul>
2.	<b>Unit-II (Microbial resources and crop productivity)</b>	<ul style="list-style-type: none"> <li>✓ To gain insight about the biology and applications of mycorrhiza.</li> <li>✓ To make them aware about the role of trichoderma and biofilmed fertilizers</li> <li>✓ To give them a brief idea about the production and applications of rhizobium, azospirillum, azotobacter and plant growth promoting rhizobacteria</li> <li>✓ To gain insight about the types of mushrooms, their production and cultivation techniques.</li> </ul>
3.	<b>Unit-III (Microbiota and human health)</b>	<ul style="list-style-type: none"> <li>✓ To give them a brief idea about the bifidobacteria and role of probiotics in human health.</li> <li>✓ To make them aware about the potential anticancerous compounds from microbial resources.</li> <li>✓ To gain insight about the microbial cells as food (single cell proteins).</li> <li>✓ To give them a brief idea about the production of alcohol, cheese and beer.</li> <li>✓ To make them aware about the role of fungi in beverage and bread making industry.</li> </ul>
4.	<b>Unit-IV (Bioactive microbial agents)</b>	<ul style="list-style-type: none"> <li>✓ To give them a brief idea about biopolymer and biosurfactant production from microbial resources.</li> <li>✓ To gain insight about the industry- brewing, medicine- vaccines, hormones and environment bioleaching.</li> <li>✓ To gain insight about the antibiotics from fungi.</li> <li>✓ To give them a brief idea about the role of fungi as biocontrol agents.</li> <li>✓ To make them aware about the microbial production of poly unsaturated fatty acids.</li> </ul>

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Semester: 5<sup>th</sup>

Paper Title: Biomedicine and Biocosmetics

Core Course: Bioresources Paper-V

S. No.	Unit	Learning objectives
1.	<b>Unit-I (Biomedicine)</b>	<ul style="list-style-type: none"> <li>✓ To give them brief introduction about the sources of biomedicine (plant, animal and microorganisms).</li> <li>✓ To give them brief insight about the development of important traditional system of medicine.</li> <li>✓ To teach them about the principles of prevention and treatment of diseases and healthcare in traditional system of medicine.</li> </ul>
2.	<b>Unit-II (Herbal medicine)</b>	<ul style="list-style-type: none"> <li>✓ To give them brief idea about the classification, collection and processing of herbal crude drug.</li> <li>✓ To demonstrate understanding of the importance of plant drug standardization and quality control of herbal drugs.</li> <li>✓ To make them aware about the causes for the decline and the current revival of interest in indigenous system of medicine.</li> <li>✓ To give them the knowledge about the advantages and disadvantages of traditional system of medicine over modern system of medicine.</li> </ul>
3.	<b>Unit-III (Bio-Cosmetics)</b>	<ul style="list-style-type: none"> <li>✓ To give them a brief idea about the fundamentals and classification of biocosmetics.</li> <li>✓ To give them a brief study of raw materials used for the preparations of biocosmetics.</li> <li>✓ To demonstrate understanding about the stability of biocosmetics.</li> <li>✓ To give them a brief concept about the quality control, packaging and labeling of biocosmetics.</li> </ul>
4.	<b>Unit-IV (Types of cosmetics)</b>	<ul style="list-style-type: none"> <li>✓ To give them the knowledge about the advantages of biocosmetics over synthetics.</li> <li>✓ To give them brief knowledge about the personal hygiene products, hair care products, skin care products and perfumes.</li> <li>✓ To give them a brief insight about the aroma therapy.</li> </ul>

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Semester: 6<sup>th</sup>

Paper Title: Biostatistics and Biotechniques

Core Course: Bioresources Paper-VI

S. No.	Unit	Learning objectives
1.	<b>Unit-I (Data Collection and Types-Processing and Analysis of Data)</b>	<ul style="list-style-type: none"> <li>✓ To make them aware about types of data-continuous and discrete data. Primary and secondary data, their collection and limitations while using.</li> <li>✓ To give them a brief introduction about measures of central tendency-mean, median and mode.</li> <li>✓ To let them know about the measures of dispersion-mean deviation, standard deviation and coefficient of variation.</li> </ul>
2.	<b>Unit-II (Correlation and Regression- Graphical and Diagrammatic Representation of Data)</b>	<ul style="list-style-type: none"> <li>✓ To give them an introduction about simple correlation and regression, their coefficient calculation.</li> <li>✓ To give them brief description about the graphical and diagrammatic representation of data-Histogram, frequency polygon, frequency curve; Line diagram, bar diagram, pie diagram.</li> <li>✓ To make them aware about the significance and limitations of graphical and diagrammatic representation of data.</li> </ul>
3.	<b>Unit-III (Biotechniques)</b>	<ul style="list-style-type: none"> <li>✓ To give them a brief idea about the resolution and magnification power of a microscope; Principle &amp; working of compound light microscope.</li> <li>✓ To make them aware about the principle and applications of scanning electron microscopy and transmission electron microscopy.</li> <li>✓ To make them aware about the principle and working of spectrophotometer.</li> <li>✓ To give them a brief concept about the basic principles of chromatography, paper and thin layer chromatography.</li> </ul>
4.	<b>Unit-IV (Bioinformatics)</b>	<ul style="list-style-type: none"> <li>✓ To give them an introduction about the Bioinformatics-concept and applications. Bioinformatics databases— Concept of Genome, Nucleic acid and Protein databases (NCBI, GenBank and SwissProt).</li> <li>✓ To give them detailed concept about the Sequencing— Conventional and Next Generation Sequencing (NGS).</li> <li>✓ To teach them about basic Concept of sequence similarity, identity and homology. Sequence based database searches (Basic Local Alignment Search Tool (BLAST), Fast Algorithm (FASTA) — Concept and examples.</li> </ul>