

Programme Name	Ph.D.	Programme Code	
Course Code	DSE704	Credit	4
Year/Sem	1/1	L-T-P	4-0-0
Course Name	Bio-Analytical & Microbial Techniques		
Objectives of the Course:			
<ol style="list-style-type: none"> To provide scientific and computational knowledge related to various techniques associated with biotechnology. To impart laboratory skills for handling analytical tools in industry and research institution. To give the scientific knowledge regarding safety regulations for handling of instruments in the laboratory and industry. To demonstrate the operating procedures associated with upstream and downstream process like chromatography, electrophoresis, centrifugation, etc. 			
UNIT I CHROMATOGRAPHY & CENTRIFUGATION ((Total Topics -10 and Hrs-10)			
General principle and application chromatography, Gas chromatography, Paper chromatography, Thin layer chromatography, HPLC (High Performance/Pressure Liquid chromatography). Centrifugation: Principle and application. Common centrifuges used in laboratory Types of rotors (fixed angle, swing bucket), Types of Centrifugation: Preparative, differential & density gradient.			
UNIT-II SPECTROSCOPY & MICROSCOPY (Total Topics -9 and Hrs-10)			
Spectroscopic methods: principle and applications of UV-visible, FTIR. Principle & application of X-ray crystallography. Basic knowledge of the principles and applications of Microscopy: Light, phase contrast, Fluorescence and Transmission Electron microscopy			
UNIT- III MICROBIOLOGICAL TECHNIQUES (Total Topics -8 and Hrs-10)			
Media preparation (Selective and differential), Sterilization techniques, isolation and maintenance of bacterial and fungi cultures, staining techniques, biochemical characterization, antimicrobial assay along with determination of MIC.			
UNIT-IV MOLECULAR TECHNIQUES (Total Topics -8 and Hrs-10)			
Electrophoresis- General principle and application electrophoresis, Agarose gel electrophoresis, SDS- PAGE, Blotting techniques. Working & application of RT-PCR, Gel DOC.			
Course Outcomes (COs):			
CO1. Development of scientific, computational and analytical knowledge regarding principle and application of advanced analytical techniques in the field of biotechnology and microbiology.			
CO2. Comprehension of microbial techniques and processes for isolation and screening of microbes isolated from different environment and sources.			
CO3. Exhibit skills to pertaining to analytical characterization of biological samples.			
CO4. Apply modern techniques and their statistical knowledge for solving various scientific problems in industry and research institution.			
References Books :			
<ol style="list-style-type: none"> Sharma, V.K., <i>Techniques in Microscopy and Cell Biology</i>, Tata McGraw Hill, 1991. Alberts, B., <i>Molecular Biology of the cell</i>, Garland, 1989, 2nd edition. Robyt, J.F. and White B.J., <i>Biochemical Technique: Theory & Practical</i>, Waveland Press, Inc. Wilson, K. and Walker, J., <i>Practical Biochemistry</i>, University of Hertfordshire Cambridge University Press, 4th edition. 			

Programme Name	Pre-Ph.D. Course Work	Programme Code	23-
Course Code	DSE704	Credit	3
Year/Sem	1/1	L-T-P	3-0-0
Course Name	Medicinal & Aromatic Plants of Himalayan Region		

Objectives of the Course:

1. To identify medicinal and aromatic plants of Himalayan region.
2. To study different techniques utilized for phytochemical studies.
3. To skill the techniques of plant cell and tissue culture procedures.
4. To explore technological advancements for improvement of medicinal plants.

UNIT I Medicinal & aromatic plants of Himalayan region (Total Topics- 15 and Hrs- 10)

Himalayan region as biodiversity hot-spot; Study of morphology, habit, habitat and propagation of medicinal and aromatic plants; utilization of medicinal plants in traditional and modern system of medicine, Application of medicinal / aromatic plants in cosmetic, health care and food industry. Impact of climate, soil biology and abiotic factors on growth, propagation and reproduction of medicinal plants. Case study- *Withania somnifera*, *Piccirrhiza kurroa*, *Valerina wallichii*, *Raolvia serpentina*.

UNIT II Phytochemical and analytical studies (Total Topics-12 and Hrs-10)

Different secondary metabolites of medicinal and aromatic plants, alkaloids, terpenes, flavonoids. Plants as source of Antimicrobial compounds, anticancer, antioxidant, anti-inflammatory metabolites. Screening of plants for identification of phytochemicals, HPLC, GC-MS, FTIR, Quantitative and qualitative estimation.

UNIT- III Plant tissue culture (Total Topics- 12 and Hrs- 10)

Cell and tissue culture technique, explant selection, culture media, direct and indirect organogenesis, androgenesis, somatic hybridization, protoplast isolation and fusion, suspension culture, callus regeneration, role of plant growth regulators in micropropagation, applications of plant tissue culture, acclimatization and hardening of micropropagated plants.

UNIT-IV Technological advancement for improvement of plant varieties (Total Topics-10 and Hrs-10)

Biotechnological approach for improvement of plant varieties- gene transfer, vectors, transgenic plants, stress tolerance in plants, production of bio- active metabolites, plant growth promoting rhizobacteria- IAA Production, siderophore production, HCN activity. Application of nanotechnology to medicinal plants.

Course Outcomes (COs)

1. Exhibit understanding of habitat and cultivation of aromatic and medicinal plants..
2. Acquire skills for phytochemical analysis of medicinal plant and their respective application in healthcare and medicine
3. Application of plant tissue culture technique for conservation and mass propagation of endangered medicinal plants.
4. Inculcate scientific temperament to appraise technological application for improvement of medicinal plants.

References:

Books

1. Slater. Plant biotechnology: the genetic manipulation of plants. Oxford.
2. Ákos Máthé and Irfan Ali Khan. Medicinal and aromatic plants of India, Springer.