Programme: M.Sc. Botany
Course Code: BOO-121
Title of the Course: Techniques and instrumentation in Botany.
No. of Credits: 3
Effective from AY: 2020-21

Prerequisite for course	Knowledge of chemistry, biochemistry, instrumental techniques at UG level	
Objective	This paper teaches basic of various types of techniques and instrumentation such as spectrophotometry, chromatotgraphy, electrophoresis, scintillation and current molecular techniques to carry out routine and advance research in Botany/Life Science. The emphasis is on principle of the technique, instrumentation design, methodology of sample preparation and handling of equipment and application of the technique in the field of Botany.	
Content:	Laboratory practices and safety in laboratory: General safetymeasure, Chemical hazards, Physical hazards, Biologicalhazards, spillage and waste disposal, disposal of radioactivewaste, first aid, MSDS.	**2 hours**
	pH and buffer solutions: SI units; Molarity and moles; Acids andbase; Hydrogen ion concentration and pH, Dissociation of acidsand bases; Buffer solutions.	**3 hours**
	Centrifugation Techniques: Basic principles of sedimentation; RCF and g forces, Density gradient centrifugation; design and care of rotors, safety aspects in the use of centrifuges.	**2 hours**
	Spectroscopic Techniques: General principles; Radiation energyand atomic structure; Basic law of light absorption; Types ofspectra and their biological usefulness. Principle, application andinstrumentation of UV-VIS spectrophotometry; IR (infra-red)spectrophotometry; Spectrofluorometry, Atomic/flamespectrophotometry; Mass spectrometry.	**9 hours**
	Chromatography Techniques: General Principles and techniquesand application and material of column chromatography forAdsorption, partition, molecular sieving, ion exchange andaffinity chromatography.Factors influencing the resolution.Column development- isocratic, gradient solvent and thermaldevelopment. Chromatogram reading and qualitative andquantitative determination of peaks in a chromatogram	**8 hours**
	Electrophoresis Techniques: General principles, application of Isoelectric focusing, SDS–PAGE (sodium dodecyl sulphate), 2D electrophoresis, Blotting techniques; Detection, recovery and estimation.	**6 hours**
	Radiobiology: The nature of radioactivity; Atomic structure, stability and radiation; Isotopes; Types of radioactive decay; Detection and measurement of radioactivity; Applications of radioisotopes in biological sciences; Safety aspects of use of	**2 hours**

	radioisotopes.	
	Molecular techniques: Protein Crystallography, Microarray analysis, yeast hybrid assay, Immunoprecipitation assay, EMSA, DNAse footprinting, Surface Plasmon resonance, Proximity labeling.	6 hours
Pedagogy	Lecture through PPT/E-learning/Assignments/Seminars/LSMMoodle	
Reading/ Reference	1. **Bauman R.P.** Absorption Spectroscopy. John Wiley, New York 2. **Dixon R.N.** Spectroscopy and Structure. Mathuen, London 3. **Sacks R.D.** Emission Spectroscopy. John Wiley, New York 4. **Pesez M and Bartos J.** Colorimetric and Fluorometric Analysis of Organic Compounds and drugs, Dekker, New York. 5. **Becker R.S.** Theory and interpretation of fluorescence and phosphorescence, Wiley interscience, New York. 6. **Guilbault G.G.** Practical Fluorescence: Theory, methods and Techniques. Dekker, New York. 7. **Dean J. and Rains T.** Flame emission and atomic absorption. Dekker, New York. 8. **Brech F.** Analysis in instrumentation. Vol. 6. Plenum, New York. 9. **Bell R. J.** Introductory Fourier Transform spectroscopy. Academic Press, New York. 10. **Colthup N.B., Daly L.H. and Wiberley S.E.** Introduction to Infra-red and Raman Spectroscopy 2nd Ed. Academic Press. New York. 11. **Kolthoff I.M. and Elving P. J.** Treatise on analystical Chemistry, Wiley Interscience, New York. 12. **Williams D.A.R. and Mowthorpe D. J.** Nuclear Maganatic Resonance Spectroscopy. John Wiley, New York. 13. **Watson I.J.** Introduction to Mass spectroscopy, Raven, New York. 14. **Giddings J.C.** Principles and Theory, Dynamics of Chromatogtraphy Part I Dekker, New York. 15. **Grob R.L.** Modern Practices of Gas Chromatography. 2nd Ed. John Wiley, New York. 16. **Simpson C.F.** Techniques in liquid chromatography, Wiley-Heyden, New York. Horvath C. HPLC Vol.I Academic Orlando. F.L. Fritz J.S., GjerdeD.T. and Pohlandt C. Ion chromatography, A. Huthig, Heidelberg 17. **Yau W. W., Kirkland J.J. and Bly D.D.** Modern size exclusion chromatography, Wiley Interscience, New York. 18. **Bailey P.L.** Analysis and ion selective electrodes 2nd Ed. Heyden, London. 19. **Bates R.G.** Determination of pH: Theory and Practices, 2nd Ed. John Wiley, New York. 20. **Willard H.F., Merritt L.L., Dean, J.A. and Settle F.A.**	

	Instrumental Method of analysis. CBS Publishers and distribution, New Delhi 21. **Sharma, B.K.** Principal of analytical chemistry, Meerut Publication, Meerut. 22. **Hames B.D. and Rickwood D.** Gel electrophoresis of Proteins: A practical approach 2nd ed. IRL Press, Oxford. **23. Karp, G.** (2009). Cell and molecular biology: Concepts and experiments, 7th edition. John Wiley & Sons, USA. **24. Reece, R. J.** (2004). Analysis of genes and genomes.John Wiley & Sons Ltd. **25. Saraswathy, N. and Ramalingam, P.** (2011) Concepts and Techniques in Genomics and Proteomics. Biohealthcare Publishing (Oxford) Limited, New York. **26. Walker, J. M. and Rapley, R.** (2008). Molecular Biomethods Handbook, Hertfordshire, UK.	
Learning Outcome:	After completion of the paper, students should be able to independently work on various instruments and understand their principle. Also students should be able to prepare various types of solutions and calculate mole fraction, molality, molarity, *etc.*	