BTY 5313	**METHODS IN PLANT BIOLOGY** (Credits4;Theory4hrs;Practical3 hrs)
AIM	This course aims to make the learners understand the important methods and innovative research used in plant biology and rules in scientific writing. This will help the master students in carrying out their dissertation work and Preparing their thesis.
Objectives	• Tostudytheimportantmethodsappliedindifferentresearchareasandtheir technological advances. • To expose graduate students to scientific writing and make them understand how the research findings can be documented and communicated in a scientific way.
Learning outcome	On the completion, thestudents will be able, ➢ To applydifferent methods for identifying the microbes, plantsandtheirmolecules ➢ Tounderstandthestatisticaltoolsforanalyzingtheexperimentaldata. ➢ Tounderstandtheresearchtopic,researchproblem,reviewof literature,conductingexperiments,analyzingthedata,reachingvalidconclusionsandcommunicatingtheoutcometoscientificJournals.
	Theory
1.	**Microscopy**: Sectioning-Microtomy, Light microscope- Bright-field microscope,Dark-field,Phase-contrast,Differentialinterferencecontrast,Fluorescence, Laser dissection microscope, confocal microscopy
	Stereomicroscope,Transmissionandscanningelectronmicroscopy.
2	**Spectroscopy,** Principles and application: Beer and Lambert law, Colorimetryandspectrophotometry,FlamephotometryandAtomicabsorptionspectrophotometry; Infrared spectroscopy- FTIR, NIR; Raman Spectroscopy;NuclearMagneticResonance(NMR). Mass spectrometry**:** Basic principle and application; ESI-MS; MALDI-TOF;LC-MS;GC-MS; MS-MS
3	**Chromatography**, Principles and application: Paper chromatography, Thinlayerchromatography(TLC);Columnchromatography:gelfiltration,adsorption,partition,affinity,ionexchange;HPLC;HPTLC;Gas chromatography.
4	**Anatomicalandgeneralplantbiotechnologicalmethods:**Stainandstaining procedures, double staining, localization of pectin, suberin, phenolsetc.;Regenerationprotocolsemployingdirectandindirectorganogenesis/somaticembryogenesis;Centrifugation-Principlesand application:typesofcentrifuges;Tracertechniques;Bioreactors,Fermenter.
5	**FlowcytometryMethods:**PrinciplesofflowCytometry,NuclearDNAcontentmeasurement,FlowCytometryandPloidy:ApplicationsinPlantSystematics,EcologyandEvolutionaryBiology,GenomeSizeestimation, Analysisofendopolyploi**dy.**

6	**Structural biology and protein interactions:** Cryo electron microscopy, X-raycrystallography,ProteinNMR,andXrayscattering;yeasttwohybridassay,split proteinassays,co-immunoprecipitationandaffinitypurification. ProteinLocalization:Reportergenes,florescentproteintagging,immunostaining.
7	**Biostatistics:**Hypothesistesting(t-test,Chi-squaretest),Analysisofvariance(ANOVA)-Onewayandtwoway,correlation,regression.Introductionto variousstatisticalsoftwares.
8	**Scientificwriting:**Reviewofliterature;Contentwriting;preparingjournalmanuscripts;referencecitingandcopyrightissues;impactfactorandcitation index.
S.No	**Laboratory/Practicals**
1	Preparationofsamplesformicrotomesectioning
2	Preparationofsamplesformicrotomesectioning
3	Chromatographicseparationofbiomolecules(Proteins,oligosaccharides,neutralsugars etc.)
4	Chromatographicseparationofbiomolecules(Proteins,oligosaccharides,neutralsugars etc.)
5	Localizationoflignin/Phenols
6	Quantitativeestimationofproteinusingspectrophotometer
7	HPTLC:Separationofplantmetabolites/pigments
8	HPTLC:Separationofplantmetabolites/pigments
9	Autofluorescencedetectionofplantphenolics
10	Reviewwritingonselectedtopic

TextBooks:

1. StevenERuzin.1999.Plantmicrotechniqueandmicroscopy:OxfordUniversityPress
2. WalterF.1980.TheMicrotomeManualoftheTechniqueofPreparationand ofSectionCutting.Germany;Ernst LeitzWetzlar GMBH
3. BanwellCN,McGraw-Hill:1966,Fundamentalsofmolecularspectroscopy:Vol1,Science
4. Snyder LR, KirklandJJ, DolanJW.2009.IntroductiontoModer nLiquidChromatography:ThirdEdition
5. Kirakosyan A,.Kaufman PB. 2009 Recent Advances in Plant Biotechnology:Springer,Boston,MA
6. ChawlaHS. 2009,IntroductiontoPlantbiotechnology,thirdedition,Science Publishers
7. HarrisRK,RoderickE.Wasylishen,DuerMJ.2009NMRCrystallography ,Wiley,,firstedition,
8. DanielM.Bollag,MichaelD.RozyckiandStuartJ.Edelstein,ProteinMeth odsby2ed.WileyPublishers
9. BaileyNTJ.1969.StatisticalMethodsinBiologyPublishedbyTheEnglish Universitiespress L

10. DolezelJ,GreilhuberJandSudaJ.2005.FlowCytometrywithPlantCells: AnalysisofGenes,Chromosomes and Genomes.Wiley-VCH Publishers
11. Latestresearcharticles/reviewarticlesrelevanttotherespectivetopicswill beprovidedtothestudents by theconcerned faculty