GIS 504: RS AND GIS IN AGRICULTURE AND FORESTRY

Skills, employability and entrepreneurship: This course provides technical skills for implementing RS and GIS techniques in agricultural and forest monitoring and management operations and in identifying forest disasters. There are employment opportunities for students in department of Forestry and Agriculture, research institutes, agricultural universities and NGOs. Students can start their own business as a consultancy to help farmers.

GIS in Agriculture		
Unit 1	**Introduction to Agriculture**: Types of agriculture - Shifting, Subsistence, Extensive, Intensive agriculture, Plantation, Mixed Farming, Commercial Farming, Dry land farming, Wet land farming. Challenges posed to agriculture: Climate Change - Patterns of Temperature and Rainfall, Resource Constraint. Concepts of Agrometeorology: Agro-meteorological stations and automated weather stations.	6 hrs
Unit 2	**Spectral Characteristics of Crop**. Crop Inventory and assessment: Spectral characteristics of crops and Spectral Vegetation Indices; Crop yield modeling and condition assessment. Crop Management: Plant signatures and vitality indicators: Imaging spectroscopy, chlorophyll fluorescence. Cropping pattern & cropping indices analysis, Crop condition and stress assessment, Crop water management. **Crop Monitoring**: Crop area estimation, Crop growth monitoring and Condition Assessment, Crop yield prediction, crop stress detection, Disease identification, Phenological studies.	6 hrs
Unit 3	**Precision agriculture**: Definition, Importance, Components, prospects in Indian agriculture. GPS role in Precision Agriculture. Technologies used in Precision agriculture – Robots, Self-steering tractors, Drones and satellite imagery, Internet of things. Soil Resource Mapping: Soil Quality: Indicators, measurement and assessment, Soil pollution: Soil contamination by heavy metals andPesticides, Soil Nutrient Management for Precision Agriculture. Irrigation Systems in Agriculture.	6 hrs
Unit 4	**Concept of sustainable Agriculture:** Agricultural Land Use /Land Cover mapping – Visual analysis of satellite data. LULC Mapping and change detection using Remote Sensing Techniques. Impact of LULC change detection on biogeochemical and hydrological cycles. Site suitability for agricultural and horticulture crops. RS and GIS in damage assessment due to cyclone, drought and flood.	6 hrs
GIS in Forestry		
Unit5	Geographical distribution, types, extent and status of vegetation of the World, Asia-Pacific and India. Spectral properties of vegetation and factors affecting spectral reflectance. Spectral vegetation indices, phenology as discriminant for vegetation differentiation and growth.	6 hrs
Unit 6	Forest/Vegetation classification and mapping, Forest inventory and sampling techniques, Growing stock estimation, Biomass estimation, forest management, Fire risk zonation, Land evaluation of forestry, Landscape analysis, Wildlife habitat suitability analysis.	6 hrs
Unit 7	Forest hazards (Deforestation, Degradation and Forest fire), Land and soil degradation, desertification and Pollution (Water, air and soil).	6 hrs

Unit 8	**Remote sensing of forest ecosystem:** Forest change detection using time-series data. Hyperspectral Remote Sensing for species/community delineation, Microwave remote sensing in forestry, LiDAR remote sensing for tree height determination, Biophysical spectral response-based forest canopy density (FCD) mapping. Use of RS and GIS in Forest fire and wildlife habitat assessment. Mapping of forest density and type, issues in forest management. Forest Fire Modeling, Wild Life Habitat Assessment Modeling, Soil Erosion Modeling.	6 hrs

BIBLIOGRAPHY

1. Application of Remote Sensing in Forestry by A.G. Koppad and Anup Kumar Das.
2. Book of Remote Sensing and Geographical Information Systems by M Anji Reddy.
3. Forester's Perspective: Remote Sensing & Geographic Information System by Avichal Tripathi.
4. Land, T. G. 1999. ArcView-3D Analyst. ESRI press. 6-23.
5. Michael Zeiler 1999. The ESRI Guide to GIS Analysis, vol. I. ESRI press.4-16.
6. Michael Zeiler, Modeling Our World: The ESRI Guide to Geodatabase Design. ESRI press.3-7.
7. R.W. Tank: Focus on Environmental Geology (p. 256).
8. Remote sensing and Geographic Information System in Forestry by Girish B Shahapurmath, A. G. Koppad.
9. Remote Sensing For Sustainable Forest Management by Steven E. Franklin.
10. Remote Sensing With Special Reference to Agriculture and Forestry by National Academy of Sciences.

GIS 505: COMPUTER PROGRAMMING

Skills, employability and entrepreneurship: In this course, students learn about programming languages like C++, Java and Python, which are used in GIS software primarily for customization and automation. Python and Java are commonly used in GIS environments for scripting, spatial analysis, modeling, mapping applications and integrating GIS functions into web-based platforms. There are employment opportunities in MNCs, private companies. Students can start their own entrepreneurship.

Unit 1	**Basics of Computers:** An introduction to computers, development of computers, Hardware and Software. Fundamentals of Computers – operating systems, input devices, output devices, storage devices-primary, secondary, central processing unit, computer languages, translators.	8 hrs
Unit 2	**Information Super Highway:** Introduction to Internet. Scope of Internet. Equipment required for an Internet Connection. Electronic Mail. Concepts of Information Storehouse. Surfing the Net. Browsing the WWW. Search Engines and their applications. Application of internet to Geoinformatics. Introduction to networks, Local area network devices, topologies, protocols, wide area networks, servers, hubs, nodes, modems, internet.	8 hrs
Unit 3	**HTML (Web design):** Basic & advanced HTML, Types of tags, Document creations, Linking, Creating Link List, handling images, tables and, style sheets. Types of tags, Creating hyper text links. Formatting the text (example). Creating Image Links.	8 hrs