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Link to E-Learning Video/Textbooks

Geoinformatics in Forest Resource Management FRM 604

Autumn 2022

Course Teacher(s)

Dr. Akhlaq Amin Wani

Dr. Aasif Ali Gatoo

Dr. Shah Murtaza Mushtaq

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1. General Information

Course code	:	FRM 604
Course Title	:	Geoinformatics in Forest Resource Management
Number of credits	:	4
Course duration	:	18 weeks
Level	:	Doctoral
Course Teacher	:	Dr. Akhlaq Amin Wani Dr. Aasif Ali Gatoo Dr. Shah Murtaza Mushtaq
Pre-requisite	:	Prior knowledge of handling computers and basic knowledge in Forestry.

2. Course description

This course is aimed to develop and understanding among the students on basics of geoinformatics and its application for sustainable management of natural resources.

3. Course objectives

The course prepares students for careers as leaders in understanding Remote Sensing (RS) and Geographical Information System (GIS) and Applications of RS and GIS in monitoring and managing forest resources.

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4. Course outcome

On completion of this course, the students would:

Gain a wider understanding of basic principles of remote sensing and GIS It will enable the students to explore and handle different satellite datasets for specific applications in forests and vegetation landscapes. The students will enhance abilities and skills for mapping and monitoring of changes associated with forest and urban green spaces for effective policy making and management.

5. Course structure

	UNIT 1
Week1	Brief introduction to Remote sensing and GIS, Data structure, type and model: Raster and Vector data structure, vector data type, point, line and polygon.
Week2	Data hierarchical models and overlays.
Week3	**Practical:** Preparation maps; Visual interpretation of satellite imagery; Forest cover mapping and land use mapping.
Week4	Spatial analysis of vector based and raster based data in the software..
Week5	Digital elevation models, Global positioning system and differential GPS
Week6	**Practical:** Spectral characteristics of vegetation, water and soil; Study of Topo-sheets, Forest watershed delineation using GPS
Week7	**Mid Term Exam**
	UNIT 2
Week8	Optical, thermal and microwave remote sensing, LiDAR remote sensing
Week9	**Practical:** Satellite remote sensing; Study of satellite imageries; Digital image interpretation, Digital image processing in ERDAS software, image classification in ERDAS, preparation of thematic maps in Arc GIS
Week10	Satellite image interpretation and recognition elements: tone, color, texture, pattern, shape, size and associated features.

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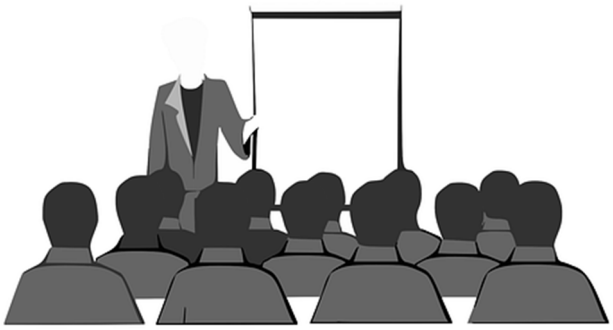
Week11	Introduction of ERDAS, Arc GIS and PolSar-Pro, ENVI softwares
Week12	Digital image processing, image rectification, geometric corrections, Image enhancement techniques
Week13	Digital image classification, supervised and unsupervised classification.
Week14	Vegetation Indices, Vegetation Index (VI), Normalized Differential Vegetation Index (NDVI), Soil Adjusted Vegetation Index (SAVI) etc.
Week15	**Practical:** Watershed delineation and clipping using ERDAS and Arc GIS. Mapping of forest with PolSarPro software, Biomass estimation using RS techniques.
	UNIT 3
Week16	Applications of Multispectral, Hyperspectral, thermal and microwave remote sensing.
Week17	Case studies on application of remote sensing and GIS in natural resource management.
Week18	**Practical Exam/Assignment submission/Presentation**
	End Tem Exam

5. Course structure



In Class Lectures

Students will be able to

1) Understand remote sensing, GIS and GPS.
2) Learn applications of RS and GIS in managing and monitoring forest resources.

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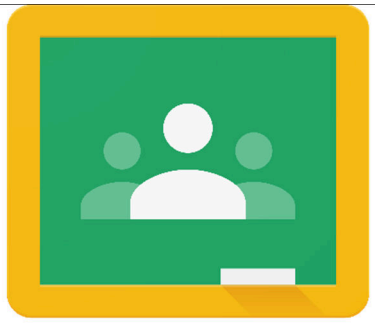
	Lab Exercises Students will be able to 1) Handle satellite data using different remote sensing and GIS software. 2) Learn different image processing techniques and its application in mapping and modeling.
 Google Classroom	**On line Tutorials** **Google Class Code:** cmlzgqh Students will explore and learn more about 1) Basic concepts of remote sensing, GIS and GPS and its applications through lectures notes and video lectures.
	Assignments/Presentation Students at individual level and in groups will explore and learn more about 1) Satellite data handling, Satellite data interpretation. 2) Land use land cover mapping and basics of modeling of geoinformatics. 3) Prepare and process geographical data and use in class activities. 4) Presentation.

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Topic	Link to the E-Course
Digital Image Formats	https://www.youtube.com/watch?v=E2xh8BT5Ur8&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=1
Digital Image Processing Part-1	https://www.youtube.com/watch?v=j0eqEZ4gpG0&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=2
Digital Image Processing Part-2	https://www.youtube.com/watch?v=5FdNXsyUP0s&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=3
Accuracy Assessment in Mapping	https://www.youtube.com/watch?v=7dX17bp8tlQ&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=4&t=8s
False Color Composite & True Color Composite	https://www.youtube.com/watch?v=bcMZHwH9pCU&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=5
Multiband Operations	https://www.youtube.com/watch?v=42QvKNRx2cY&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=7
Aerial Photography	https://www.youtube.com/watch?v=4eelhdVFTQo&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=8

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Introduction to Photogrammetry	https://www.youtube.com/watch?v=PTnL7ZI7yJs&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=9&t=68s
Scale, Focal Length and Height	https://www.youtube.com/watch?v=f1-kzkcpf9U&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=10&t=19s
Relief Displacement Formula	https://www.youtube.com/watch?v=HDg6oZuq52Y&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=11&t=17s
Database Management System (DBMS)	https://www.youtube.com/watch?v=6yEkm_UI7PA&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=12
Topology, Thematic and Raster Overlay	https://www.youtube.com/watch?v=WhAQpkAV8tM&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=13
Map Projection and Types	https://www.youtube.com/watch?v=tlDiHeHsLns&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=14
Microwave Remote Sensing	https://www.youtube.com/watch?v=dCt1BYLlm5k&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=15&t=101s
Raster data storage and compression	https://www.youtube.com/watch?v=2XvrOQmNnaI&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=16&t=10s
Global Positioning System	https://www.youtube.com/watch?v=_m0FZcZGKdk&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=18&t=30s
How GPS works?	https://www.youtube.com/watch?v=9ees6hLatrE&list=PLgQLxnNI9f_D7c1JYC8OiF3rFxkoEhj2m&index=17&t=515s

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6. References

Compulsory

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Lillesand, T.M. and Kiefer, W.R.(1994).Remote sensing and Image Interpretation, Fourth edition. John Wiley & Sons, Inc., USA

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Recommended

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Jackson, M.J. (1992). Integrated Geographical Information Systems. International Journal of Remote Sensing, 13(6-7): 1343-1351

Obi Reddy, G.P. and Sarkar, D. (2012). RS and GIS in Digital Terrain Analysis and Soil Landscape Modelling. NBSS & LUP, Nagpur.

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