Course Type	Course Code	Name of Course	L	T	P	Credit
DE2	**NMND507**	**UAV data Mapping & its applications**	3	0	0	3

Course Objective

The Proposed course provides basic understanding and implementation of UAV data with established best-practices for mapping and analysis. In addition, the students will understand fundamental concepts of strong 'applied' approach to mapping with UAVs data, data Quality & its Accuracy, Strategy for Selecting a UAS-based Geospatial Mapping System.

Learning Outcomes

Upon successful completion of this course, students will:

- be able to apply acquired knowledge and critical thinking skills to solve a real-world problem with appropriate UAV acquisition and data processing.
- be able to produce geospatial products such as digital elevation models, orthophotos, and photo-mosaics.
- be able to recognize and recommend potential applications of the UAV for GIS operations
- be able to assess available UAV system and data processing techniques and their suitability for the problem statement.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	Introduction to the Unmanned Aerial System: Introduction, History, components of UAV, Classification of UAV systems, overview of geospatial and mapping applications of UAV data.	4	Students will have knowledge on UAV current status, development and different applications in geospatial domain.
2.	Elements of Unmanned Aerial Vehicle: The air vehicle, communication data link, command and control element, pay load, launch and recovery, Risk and Human element, Drone regulations.	4	Students will learn different elements that form a UAV, payload section is very valuable to individuals with background in geospatial mapping and regulations of UAV.
3.	UAV Remote sensing and Photogrammetry: Remote Sensing with Drones, Modern mapping and Modern photogrammetry using drone imagery, geometric and radiometric errors while capturing images with drone	6	Students will have knowledge on remote sensing and photogrammetry as they relate to drones. Geometrically and radio metrically correcting the drone images.
4.	Mission Planning for capturing UAV imagery: study Topographical and aerial maps, imaging Sensor characteristics, computing Geometry of Vertical Image, planning aerial imagery collection, solution to design a flight plan and layout.	5	Students will learn Mission Planning and Control for capturing UAV imagery and design flight plan and layout.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
5.	Product Generation: The Image Processing with Structure from Motion (SfM) work flow, Imagery Geo-location, Ground Control Requirement, Data Products: Digital elevation model, terrain and surface models,	8	Students will learn about processing techniques for UAV data and prepare data products like Ortho images, DEM and surface models.
6.	Data Quality and Accuracy and Strategy for Selecting a UAV-based Geospatial Mapping System: Basic Considerations for Selecting UAS, Geospatial Data Accuracy and Quality and Mapping Standards, The New ASPRS Positional Accuracy Standards for Digital Geospatial Data, Horizontal and Accuracy Standards for Geospatial Data and number of check points.	6	Students will have knowledge on data quality and accuracy in terms of horizontal and vertical for digital geospatial data as per ASPRS.
7.	Applications using of UAV imagery and Data: UAV for Disaster response, Terrain & surface modelling of mining areas, vegetation and Environmental mapping, UAV derived data for hydrology and hazard modelling etc.	9	Students will have knowledge on various applications of the Unmanned Aerial vehicle in the domain of disaster, agricultural, environment, mining and civil engineering.
	Total	42	

Text Books

1. Fundamentals of Capturing and Processing Drone Imagery and Data by Amy E.Frazier and Kunwar K.Singh.
2. Unmanned Vehicle Systems for Geomatics by Coatas Armrnakis and Petros Patias.

Reference:

1. Proceedings of UASG 2021: Wings 4 Sustainability Unmanned Aerial System in Geomatics by Kamal Jain, Vishal Mishra and Biswajeet Pradhan
2. Lecture notes by faculty