



ADVANCED GEOMATICS ENGINEERING

PROF. PRADEEP KUMAR GARG

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IIT Roorkee

PRE-REQUISITES : Yes basic knowledge of Surveying is essential

INDUSTRY SUPPORT : National Remote Sensing, Centre, DRDO, Ministry of Water Resources, Ministry of Agriculture, Rural Department, Telecom companies, Power sectors, Road sectors etc.

COURSE OUTLINE :

Geomatics is one of the important tools that can help us to map and monitor the changes in the infrastructure, resources and environment on Earth. It is a multidisciplinary technology which involves the use of cartography, photogrammetry, Global Positioning System (GPS), remote sensing, Unmanned Aerial Vehicles (UAVs), Geographic Information System (GIS), geovisualization, spatial statistics, geostatistics, and other advanced tools & techniques. With the advancements in very high spatial resolution satellite images, GIS, LiDAR, UAV/Drones and other associated technologies in the recent years, applications of geospatial technology have increased in civil engg, natural resources management, disaster management, environment, geology, soil, forestry, agriculture, water management, urban, infrastructure development, smart city, 3D mapping, etc. The course contents will provide insight to understand the various tools for collection of geospatial data and emerging need of geospatial technology.

ABOUT INSTRUCTOR :

Prof. Pradeep Kumar Garg, is currently serving as Professor in Geomatics Engineering Group, Civil Engineering Department at Indian Institute of Technology (IIT) Roorkee, Uttarakhand, India. He completed B.Tech (Civil Engg.) in 1980 and M.Tech (Civil Engg) in 1982 both from the University of Roorkee (now IIT Roorkee). He is a recipient of Gold Medal at IIT Roorkee to stand first during M.Tech programme, Commonwealth Scholarship Award for doing Ph.D. from University of Bristol (UK), and Commonwealth Fellowship Award to carry out post-doctoral research work at University of Reading (UK). He joined the Department of Civil Engg at IIT Roorkee in 1982, and gradually advancing his career rose to the position of Head of the Civil Engg Department at IIT Roorkee in 2015, and then Vice Chancellor, Uttarakhand Technical University, Dehradun from 2015-2018. Prof. Garg has published more than 310 technical papers in national and international conferences and journals. He has undertaken 27 research projects and provided technical services to 94 consultancy projects on various aspects of Civil Engineering, generating funds for the Institute. He has authored text books on (i) Remote Sensing, (ii) Geoinformatics, (iii) Introduction to UAVs, and (iv) Digital mapping of soil, Edited three books and produced two technical films on Story of Mapping. Besides, supervising a large number of undergraduate projects, he has guided about 73 M.Tech and 28 Ph.D. Thesis. He is instrumental in prestigious MHRD funded projects on e-learning; Development of Virtual Labs, Pedagogy and courses under NPTEL. He has served as experts on various national committees, including Ministry of Environment & Forest, EAEC Committee, NBA (AICTE) and Project Evaluation Committee, DST, New Delhi. Prof. Garg has reviewed a large number of papers for national and international journals. Considering the need to train the human resource in the country, he has successfully organized 40 programmes in advanced areas of Surveying, Photogrammetry, Remote Sensing, GIS and GPS. He has successfully organized more than 10 conferences and workshops. He is a life member of 24 professional societies, out of which he is a Fellow member of 9 societies. For academic work, Prof. Garg has travelled widely, nationally and internationally.

COURSE PLAN :

1. Introduction: Introduction of Geomatics Engineering and its various applications
2. Photogrammetry: aerial and terrestrial, types and geometry of aerial photograph, scale and flying height, relief (elevation) displacement, parallax, stereo-pair and stereovision, stereoscopes, 3D mapping, DEM, DSM & DTM, height determination, digital photogrammetry, photogrammetric mapping, applications of photogrammetry.
3. Remote Sensing: Basic/ Ideal remote sensing, interaction mechanism with atmospheric and earth surface, atmospheric windows, multi concept of remote sensing, spectral signatures, various platforms and sensors, various remote sensing data products, optical, thermal, microwave and hyperspectral images, visual data interpretation
4. GPS surveying: Principles and methods, applications, DGPS, error in observations and corrections.
5. UAV: Introduction, components, data collection, data types, data analysis software, applications in civil engineering
6. LiDAR: Basic principles, terrestrial and airborne LiDAR, data collection techniques, point cloud generation, analysis of data, 3D mapping.
7. Digital Image Processing: Digital image, introduction to digital image processing, preprocessing, enhancement, transformation, indies, image classification for mapping, accuracy assessment.
8. GIS: Introduction of geographic information system, vector and raster data, database creation, parameterization from DEM, buffering and overlay analysis, spatial analysis in GIS, applications.
9. Applications: Applications of Geomatics Engineering tools in various engineering projects.