M.A./ M.Sc. (Two Years Degree Program)	
IV Semester	
Subject-Geography	
Code of the Course	GEG9108P
Title of the Course	ADVANCED GIS FOR GEOGRAPHICAL APPLICATIONS
Qualification Level of the Course	NHEQF Level 6.5
Credit of the course	4
Type of the course	Discipline Specific Elective Practical Course in Geography
Delivery type of the Course	Practical (80+40). The 80 hours for content delivery include hands-on exercises, and 40 hours of diagnostic assessment, formative assessment, and subject/class activity, problem solving.
Pre-requisites	Fundamental understanding of geographical concepts and geospatial technology
Co-requisites	Basic working knowledge of computer and geospatial softwares.
Objectives of the course	• To learn the various steps of image processing and information extraction workflow from satellite imageries. • To learn the various advanced techniques of GIS based analysis for applied research, decision making and planning. • To develop working skills in various open source and proprietary image processing and GIS softwares - ArcGIS, Erdas Imagine, ENVI, ILWIS, QGIS, SAGA, etc. • To produce professionals with an edge as researchers trained in state-of-the-art technology with sound theoretical base; planners and decision makers with thorough understanding of the capabilities and tools of geospatial technology; and avenues for self-employment as technical/geo-spatial consultants.
Learning outcomes	• Students will be trained in state-of-the-art geospatial technology. • Students will be introduced to the fundamental concepts of GIS, methods of geospatial data generation and visualization and the vast repository of data available on web-geoportals.

	• Students will develop working skills in open source and proprietary GIS softwares. • Students will have awareness regarding the potential of GIS in decision making and planning. • Students will foster technical skills for employment opportunities as GIS consultant/analyst/project associates/entrepreneurs across private and public sector.
Syllabus **पाठ्यक्रम**
UNIT - I	**Introduction to Google Earth Pro application** Creating point. line, polygon features. Analysis of Historical (Temporal) Imagery. Profile generation. Measuring distances. **गूगल अर्थ प्रो एप्लिकेशन का परिचय** बिंदु, रेखा और बहुभुज तत्वों का निर्माण। ऐतिहासिक (कलिक) चित्रण का विश्लेषण। परिच्छेदिका निर्माण। दूरियाँ मापन।
UNIT - II	**Spatial Analysis** Types of spatial analytical functions in GIS. Buffer, clip, update, union, intersection. Map overlay. Remote sensing and GIS data integration; sources of error. **स्थानिक विश्लेषण** जी.आई.एस. में स्थानिक विश्लेषणात्मक कार्यों के प्रकार। बफर, क्लिप, अपडेट, यूनियन, इंटरसेक्शन। मानचित्र अधिचित्र। सुदूर संवेदन और जी.आई.एस. आँकड़ों का एकीकरण। त्रुटियों के स्रोत।
UNIT - III	Attribute data query, Spatial data query and Raster data query. Data generalization, Data classification. Map composition. लाक्षणिक आँकड़ा जाँच, स्थानिक आँकड़ा जाँच और रास्टर आँकड़ा जाँच। आँकड़ा सामान्यीकरण, आँकड़ा वर्गीकरण। मानचित्र रचना।
UNIT - IV	**Statistical Surfaces** Generation of statistical surfaces. Methods of spatial interpolation: linear, nonlinear- IDW. DEM, TIN and their derivatives. Terrain analysis. Extraction of topographic attributes, watershed and landscape features using DEM. **सांख्यिकीय सतहें** सांख्यिकीय सतहों का निर्माण। स्थानिक अंतर्वेषण की विधियाँ: रैखिक, अरैखिक- IDW। डी.ई.एम., टिन और उनके व्युत्पन्न। स्थलाकृतिक विश्लेषण। डी.ई.एम. का उपयोग करके स्थलाकृतिक विशेषताओं, जल विभाजक और परिदृश्य तत्वों का निष्कर्षण।

UNIT - V	**Spatial Pattern Analysis** Point pattern analysis: Nearest Neighbour analysis. Spatial auto-correlation. Global indices (Geary's *c,* Global Moran's I & Getis-Ord General G Index). Local indices (Local Moran's I & Getis- Ord Gi * index) **स्थानिक प्रतिरूप विश्लेषण** बिंदु प्रतिरूप विश्लेषण: निकटतम पड़ोसी विश्लेषण। स्थानिक स्वतः-सहसंबंध। वैश्विक सूचकांक (गीरी का सी, ग्लोबल मोरन का आई और गेटिस-ऑर्ड जनरल जी इंडेक्स)। स्थानीय सूचकांक (स्थानीय मोरन का आई और गेटिस- ऑर्ड जीआई * सूचकांक)
Practical Exercises	1. Generation of point. line, polygon features using Google Earth Pro software. (1 exercise) 2. Profile generation using Google Earth Pro software. (1 exercise) 3. Buffering, clipping, union and intersection of vector data. (4 exercises) 4. Spatial Interpolation – IDW, DEM, TIN. (3 exercises) 5. Terrain analysis. (1 exercise) 6. Extraction of topographic attributes, watershed and landscape features using DEM. (3 exercises) 7. Settlement pattern analysis - Nearest Neighbor technique. (1 exercise) 8. Computation of Geary's c, Global Moran's I & Getis-Ord General G Index and interpretation of results - population data. (3 exercises) 9. Computation of Local Moran's I & Getis- Ord Gi * index and interpretation of results - population data. (2 exercises) Exercises will be implemented in QGIS, ArcGIS or any other GIS Software as per availability.
	Suggested Readings **सहायक ग्रन्थ / सामग्री**
Text Books	• Chang, Kang-tsung, 2003. *Introduction to Geographical Information Systems*. Tata McGraw Hill Publ. Co., New Delhi. • Chauniyal, D.D., 2004. *Remote Sensing and Geographical Information Systems* (**in Hindi)**, Sharda Pustak Bhawan, Allahabad.
Reference Books	• Lo, C.P. and Yeung, Albert K. W., 2002. *Concepts and Techniques of Geographic Information Systems*. Prentice Hall of India, New Delhi.

	• Longley, P., Goodchild, M.F., Maguire, D. and Rhind, D., 1999. *Geographic Information Systems. Principles, Techniques, Management, Applications*. John Wiley, New York. • Reddy, M. Anji, 2001. *Textbook of Remote Sensing and Geographic Information Systems*. B. S. Publs., Hyderabad. • Vyas P.R., 2014. *Remote Sensing and Geographical Information System: Basics and Applications*, Rawat Publications, Jaipur.
Suggested E-resources	• www.qgistutorials.com • http://www.pasda.psu.edu/tutorials/gisbasics.asp • https://earth.google.com • bhuvan.nrsc.gov.in • india-wris.nrsc.gov.in • https://openstreetmap.org