Course title: Geoinformatics for urban development			
Course code: MEU 179	**No. of credits:** 3	**L-T-P:** 22-12-22	**Learning hours:** 56
Pre-requisite course code and title (if any): None			
Department: Sustainable Engineering			
Course coordinator(s): Dr. Deepty Jain	**Course instructor(s):** Dr. Deepty Jain		
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Course type: Programme Core	**Course offered in:** Semester 1		

Course description

In today's time, spatial data analysis helps support decision making in urban domain. It is prudent that the students of MTech Urban Development Management learn the techniques of spatial data analysis that includes data collection, management, interpretation and analysis. The course is designed to introduce the concepts and develop understanding of Geoinformation Systems (GIS) and remote sensing imageries application in urban domain to the students joining the program and holding graduation from varied disciplines. The course structure will help them build knowledge base and develop skills that they can use in various courses and in practice.

Course objectives

1. To provide understanding of remote sensing / GIS techniques.
2. To develop acumen of remote sensing/ GIS tool application for urban development and management.
3. To enable handling of raster data including image classification and hyperspectral analysis.
4. To develop technical skills in GIS application and software for spatial analysis.

Course content

Module	Topic	L	T	P
1	Introduction to Remote sensing: Electromagnetic spectrum and earth observation, Types of sensors and applications, Image correction, Spatial referencing, Image interpretation	6	4	4
2	Applied Remote sensing for UDM: Supervised and unsupervised classification for mapping land use land cover, Thermal remote sensing for land surface temperature mapping, Hyperspectral remote sensing for vegetation index and built-up index mapping, Spatial statistics – neighbourhood and zonal statistics, Case examples	6		6
3	Introduction to Geoinformation systems: Spatial and non-spatial database management systems, Spatial data types, Vector representations, Topology and spatial relationships, Sequential query language (Spatial), Map Coordinate Systems (Data Reprojection GCS to UTM)	6	4	4
4	Applied Geoinformation system for UDM: Digitizing urban features, Data Collection (Mobile survey, Geotagging photos, geocoding, Data quality/data gaps checks and repairs, Data interpolation, Spatial data analysis (overlay functions, proximity analysis, multicriteria analysis), Data visualization (symbology, map layout and for alternate platforms), Case examples	4	4	8
	Total	**22**	**12**	**22**

Details of the labs				
1	Acquiring remote sensing imagery and spatial referencing of imageries			2
2	Image correction technique			2
3	Supervised and unsupervised image classification and validation through site visits			2
4	Land surface temperature mapping			2
5	Normalized Difference Vegetation Index, Normalized Difference Built-up Index mapping and spatial statistics			2
6	Spatial database management and attribute management			2
7	Map projection and datum			2
8	Vector data acquisition using open-source platforms, digitization and editing			2
9	Spatial and non-spatial SQL, Join and Relate with vector data			2
10	Spatial data analysis			2
11	Map visualization, data classification and map composition			2

Evaluation criteria:
Lab assignments / tutorial

Minor test 1: 15%, Assessment based on module 1

Minor test 2: 15%, Assessment based on module 3

Lab Assignments/Tutorials: 20%, submission of regular assignments in correspondence to practical lab components, showcase learning of tools and methods based on lab component module 1 - 4

Project: 20%, a project on integrated application of the tools and methods taught throughout the semester.

Major test: 30%, overall syllabus and course

Learning outcomes:
Students will be able to

1. Use remote sensing imageries in various applications of urban development and management.
2. Gather and manage spatial data.
3. Conduct analysis using spatial data on GIS platforms.
4. Generate maps ready for visual interpretation and inclusion in reports and presentations.

Pedagogical approach:
The course is designed in a way that remains independent of a particular software. The knowledge gathered can be applied on any platform. For practical exercises in the class like QGIS, ILWIS, ERDAS IMAGINE and ArcGIS will be used.

The course will be delivered through class lectures, lab exercise and tutorials and appropriate case studies will be introduced to strengthen the understanding of application of tools and techniques in practice.

Course Reading Materials:

1. Jensen J., Remote Sensing of the Environment: An Earth Resource Perspective, Pearsons, 2009.
2. Lillesand T., Kiefer R. W. and Chipman J., Remote Sensing and Image Interpretation, Wiley & Sons, 2009.
3. Lo, C.P. and Yeung, A.K.W., Concepts and Techniques of Geographic Information Systems, PHI Leaning Private Limited 2011.
4. Longley P. A., Barnsley M. J., Donnay Jean-Paul, Remote Sensing and Urban Analysis, Taylor & Francis, 2001.
5. Yang, X., Urban Remote Sensing Monitoring, Synthesis and Modeling in the urban Environment, Wiley Blackwell, 2011.

Journals for reference:
Computers, Environment and Urban Systems
International Journal of Geographic Information Systems
Urban Planning and Development

Student responsibilities:
Timely submission of weekly lab assignments, Initiative for conducting project, regularity in class, thorough reading of provided material, practice, etc.

Course reviewers:

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Ms. Eleza Boban, Senior GIS Specialist, Stantec, Qatar