GIH 403: GEOGRAPHICAL INFORMATION SYSTEM

Skills, employability and entrepreneurship: This course paper is an advanced type in terms of not only studying the entire earth science in general, but also all aspects of spatio-temporal data of any discipline in specific. With the help of advanced software's and computer programs, massive data collected over time can be analyzed to determine the complex future trends. There is a good scope of this course for students who can work as Geoinformatician in various organizations related to human resource development and private organizations and MNCs. Students can also open up their own start-up company.

Unit 1	**Basics of Geographic Information System**: Definition, components, packages, capabilities and purpose of GIS. History of Geographic Information System, Development of GIS as information and decision-making system, Overview of GIS Architecture.	06 hrs
Unit 2	**Definition**: Maps and spatial information, Components of GIS, maps and spatial data. Thematic characteristics of spatial data, other sources of spatial data-sensors, survey data, air photos, satellite images and field data.	06 hrs
Unit 3	Functions and Advantages of GIS: Introduction, Functions of GIS, application areas of GIS, Advantages of GIS, Uses and limitations of GIS.	06 hrs
Unit 4	GIS Data Models: Introduction, Spatial, Thematic, and Temporal Dimensions of Geographic Data. Spatial entity Spatial data Models: Introduction and types, Spatial Resolution. Raster Data Models: Raster Data Formats – netCDF4, HDF, Geo TIFF, ESRI grid, IMG. Raster data structure - Cell-by-cell raster encoding, Run-length raster encoding, Quad-tree raster encoding. Advantages/Disadvantages of the Raster data Model.	06 hrs
Unit 5	Vector Data Models: Definition, basic types of vector data model – Point, Line and Polygon. Vector Data Models Structures: Spaghetti Data Model, topological data model. Spatial Analysis: Types of analysis- point data, line data and polygon data. Data Extract – Clip, Select, Split and Table select. Overlay analysis – Erase, Identify, Intersect, Spatial join, Union etc. Proximity analysis – Buffer, Multiple Buffers, Thiessen Polygon, point distance. Conversion from vector to raster data. Advantages / Disadvantages of the Vector Model. Vector Data Formats – shape file, AutoCAD DXF, Geo Media, GML and DLG.	06 hrs
Unit 6	**Concepts of 3D models:** Digital Elevation and Terrain Models (DEM & DTM), Generation and structure of DEM/DTM and their applications. Geospatial Triangulated Irregular Network (TIN) model, slope, aspect, hill shade. **Digitization:** Editing and Structuring of Map Data. Mode of digitization, editing, topology creation and structuring map data. Data Quality and Sources of Errors. Nature of geographic data, sources of errors in GIS data base, data quality parameters, handling errors in GIS.	06 hrs
Unit 7	**Fundamentals of GPS:** Introduction, space segments, user segments and control segments. Observation principle and signal structure, accuracy of GPS measurements, point position in gang relative positioning, methods of surveying with GPS, Static and Kinematic positioning, navigation with GPS, differential GPS, navigational receivers.	06 hrs
Unit 8	**Applications of GIS in India:** Outlines of Applications in Facility and Utility Management, Natural Resource Management, Natural Disaster Management, Coastal Zone Management, Hydrology, Atmosphere, Health and energy. Application of Open source GIS, Bhuvan, Google Earth, Geo-server and Map-server.	06 hrs

BIBLIOGRAPHY

1. An Introduction to Geographic Info. System by Heywood, Carnelin and Carven, Prentice Hall, 1998.
2. Bonham – Carter G.F., Geographic Information System for Geoscientists, Pergamon Press, Tarrytown, New York, 1994.
3. Burough, P.A., and Rachael A, Mec Donnell. Principles of Geographic Information System, Oxford Unversity Press-1998 (Indian Print).
4. Demers, Michael; Fundamental of Geographic Information System, John Wiley, 1999 (Indian Print)
5. Fraser Taylor., P.A., Geographic Information System – The Microcomputer and Modern Cartography, Pergamon Press, 1991.
6. Keaies, J.S. Cartographic design and Production London, Longman group, 1973.
7. Les Worell, (Ed) 1990. Geographic Info. System, Development and Applications, Belbaven Press.
8. Longley, P. A., Maguire, D. J., Goodchild, M. F and Rhind, D. W; GIS Principles Techniques, Applications and Managements, Longman Scientific and Technical, 2001 (very Expensive Book).
9. Maguire, D. J. Goodchild, M. F. and Rhind, D. W. GIS-Principles and application, Longman Scientific and Technical, 1991.

GIS 404: FUNDAMENTALS OF EARTHSCIENCES

Skills, employability and entrepreneurship: Students admitted from deferent disciplines are provided bride type of basics/fundamental of Earth Sciences. Students learn about the formation and properties of minerals and rocks. Therefore, tis course will help students to identify better quality materials for the constructions dimensional and decorative stones for major civil engineering structures. Students exit out of this course have skills to work in industries related to earth resources, agricultural and soil survey and public works. They will be exposed to start their own entrepreneurship. This course may also be helpful in various government exams, including NET, SET, GATE, and other similar tests.

Unit 1	Introduction**:** Formation of the earth, composition of earth crust, mantle and core. Plate tectonics, Major and Minor plates, continental drift and ocean floor spreading.	08 hrs
Unit 2	Mineralogy: Introduction to important Rock forming Minerals.	08 hrs
Unit 3	Outlines of Igneous Rocks: Intrusive and Extrusive igneous rocks, Granite, diorite, gabbro, pegmatite, peridotite, dolerite, basalt, andesite, dacite, obsidian, pumice, rhyolite, scoria and tuff etc.	08 hrs
Unit 4	Outlines of Metamorphic Rocks: Contact and regional matamorphism, Important metamorphic rocks: Gneiss, Schist, Quartzite, Granulites, Marble, Slate, etc.	08 hrs
Unit 5	Outlines of Sedimentary Rocks: Origin of sediments. Breccia, Conglom-erate, Sandstone, Limestone, Shale, Morphology & Origin of Laterites.	08 hrs
Unit 6	Structural Geology: Primary and Secondary Structures. Folds, Faults, Joints & Unconformities.	08 hrs

BIBLIOGRAPHY

1. Mukerjee, P.K. 1997, A Text book of Geology. The World Press Pvt. Ltd, 1-638.
2. Allen, J. R. L, 1969. Physical Processes of Sedimentation; New York, American Elsevier, 3-36.