**Birla Institute of Technology & Science, Pilani**

**Instruction Division**

**First Semester 2015-2016**

**Course Handout (Part-II)**

Date: 03/08/2015

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

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| **Course No.** | **:** | **CE F431** |
| **Course Title** | **:** | **Principles of Geographical System** |
| **Instructor-in-Charge** | **:** | **Rajiv Gupta** |

**Course Description:** This 3-credit hour course is an Introduction to Geographical Information Systems, theory and application of GIS, data sensing and collection, fundamental database concepts, fundamental spatial concepts, models of spatial information, representation and algorithms, structures and access methods, architectures and interfaces, data output and display techniques, next generations systems.

**Scope and Objectives of the Course:** The course introduces GIS and its related fields within a strong framework of their applicability. The objective to the course is to promote a good foundation in GIS and working knowledge of fields strongly related to GIS in the computing perspective. The course will also guide the students, through projects and study of next generations systems, to apply concepts and ideas to various application areas and to establish a motivation towards research in thrust areas related to GIS.

**Text Books:**

**Text Book:** T1: Computing Aspects of Geographical Information Systems; Rajiv Gupta and Mukesh Kumar Rohil; Notes EDD, 2001.

**Reference Books:**

R1: Thomas M Lillesand, and Rralph W Kiefer; "Remote sensing and Image Interpretation", 3rd ed., John Wiley & Sons, 1994.

R2: Michael F. Worboys, "GIS: A Computing Perspective", Taylor & Francis Ltd; First Ed., 1995.

**Course Plan:**

(Schedule of each lecture may change depending on the time required for each topic)

| Lecture No. | Learning Objectives | Topics to be covered | Reference |
|---|---|---|---|
| 1 | Overview of GIS | Application of GIS | T1 (1), R1, R2 |
| 2 | Overview of GIS | Introduction to GIS | T1 (1), R1, R2 |
| 3 | Overview of GIS | Projects and Implementation | T1 (1), R1, R2 |
| 4 | Introduction of GIS modules | GIS Functionality: Interface | T1 (2) |
| 5 | Data required for GIS | GIS Functionality: Data | T1 (2) |
| 6 | Capabilities of GIS | GIS Functionality: Application | T1 (2) |
| 7 | Data acquisition for GIS | Remote sensing Fundamentals | T1 (8), R1(1) |
| 8 | Data acquisition for GIS | Basics of Electromagnetism radiation | T1 (8), R1(1) |
| 9 | Data acquisition for GIS | EMR properties of water, soil, vegetation, etc. | T1 (8), R1(3) |
| 10 | Means of data acquisition | Photographic cameras | T1 (9), R1(2) |
| 11 | Means of data acquisition | Photographic films, processing, and application | T1 (9), R1(2) |
| 12 | Means of data acquisition | Digital cameras | T1 (9), R1(2) |
| 13 | Types of data | Basics of Thermal sensing | T1 (9), R1(7) |
| 14 | Types of data | TM and Multispectral sensing | T1 (9), R1(7) |
| 15 | Types of data | Radar: basics and application | T1 (9), R1(7) |
| 16 | Types of data | Passive remote sensing | T1 (9), R1(7) |
| 17 | Enhancement of visualization | Image rectification and restoration | T1 (10), |

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| | and accuracy of data | | R1(10) |
| 18 | Enhancement of visualization and accuracy of data | Image rectification and restoration | T1 (10), R1(10) |
| 19 | Enhancement of visualization and accuracy of data | Image enhancement | T1 (10), R1(10) |
| 20 | Enhancement of visualization and accuracy of data | Image classification | T1 (10), R1(10) |
| 21 | Enhancement of visualization and accuracy of data | Image classification | T1 (10), R1(10) |
| 22 | Making data compatible for GIS | Coordinate systems | T1 (4) |
| 23 | Making data compatible for GIS | Coordinate transformation | T1 (4) |
| 24 | Making data compatible for GIS | Map projections | T1 (4) |
| 25 | Making data compatible for GIS | Digitization, Encoding, and Structuring of data | T1 (3) |
| 26 | Conversion of data | Vectorization | T1 (5) |
| 27 | Conversion of data | Rasterization | T1 (5) |
| 28 | Compatibility of DBMS with GIS | Basics of DBMS | T1 (6) |
| 29 | Compatibility of DBMS with GIS | ER & EER | T1 (6) |
| 30 | Compatibility of DBMS with GIS | Database design | T1 (6) |
| 31 | Compatibility of DBMS with GIS | Spatial databases | T1 (6) |
| 32 | Compatibility of DBMS with | Spatial databases | T1 (6) |

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| | GIS | | |
| 33 | Applications and computations | Geometric algorithms | T1 (12) |
| 34 | Applications and computations | Triangulation | T1 (12) |
| 35 | Applications and computations | Triangulation | T1 (12) |
| 36 | Applications and computations | Network representation and algorithms | T1 (12) |
| 37 | Applications and computations | Set based algorithms | T1 (12) |
| 38 | Memory and access optimization | Spatial Data structures | T1 (13) |
| 39 | Memory and access optimization | Spatial Data structures | T1 (13) |
| 40 | Memory and access optimization | Access methods | T1 (13) |
| 41 | GIS with other software | Architectures and Interfaces | R2 |
| 42 | Fundamentals of Data output and display techniques | Data output and display techniques | R2 |
| 43 | Future of GIS | Next generation GIS | R2 |

**Note:** Additional lecture notes (LN) would be given in class for few topics

**Evaluation Scheme**

| EC No. | Evaluation Component | Duration (min) | Marks | Date & Time | Remarks |
|---|---|---|---|---|---|
| 1 | Mid-semester test | 90 | 100 | 5/10 2:00 - 3:30 PM | OB |

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| 2 | Laboratory | Cont. | 40 | | - |
| 3 | *Project | Cont. | 40 | 2/12 FN | - |
| 4 | Comp. Exam. | 180 | 120 | | CB |

* ***Final Project Marks will be awarded only if the student completes project as per the course requirement.***

**Make-up Policy:** Take prior permission.

**Notices:** Civil Engineering Notice Board.

**Chamber Consultation Hour:** To be announced in the class

**Instructor-In-Charge**