

SPATIAL DATA INFRASTRUCTURE

ENGE 412

Lecture : 4
Tutorial : 0
Practical : 3/2

Year : IV
Part : I

Course Objectives:

The objective of this course is to describe the key principles, components, and technologies of Spatial data infrastructure (SDI) necessary for effective design and implementation, including both technical and institutional arrangements. It also aims to analyze, model and assess SDI development approaches and spatial enablement systems in local, national, regional and global contexts.

1 Introduction (6 hours)

- 1.1 Definition and components
- 1.2 Importance and benefits
- 1.3 History and evolution
- 1.4 SDI frameworks and models (Global, regional, national, local)
- 1.5 Geospatial data formats
- 1.6 Distributed geospatial databases

2 Data Quality and Standards (8 hours)

- 2.1 Data quality and standards
- 2.2 International organization of standardization (ISO TC 211, TC 204, JTC-1)
- 2.3 World wide web consortium (W3C), Open geospatial consortium (OGC)
- 2.4 Data exchange formats and interoperability
- 2.5 National standards organizations, distributed computing with web services
- 2.6 OGC web service, architecture
- 2.7 SDI architectures based on open source software

3 Meta-data Principles (8 hours)

- 3.1 Levels of metadata
- 3.2 Linkage between geospatial data and metadata
- 3.3 Metadata standards
- 3.4 Implementation approach
- 3.5 Implementation issues
- 3.6 Gazetteers and thesauri

4 Geospatial Data Catalogue (6 hours)

- 4.1 Catalogue server, service development design

- 4.2 Software implementations
- 4.3 Catalogue gateway and access interface development

5 SDI Guiding Principles (6 hours)

- 5.1 Data stewardship, data security
- 5.2 Data accessibility, data interoperability
- 5.3 Data reusability, data synchronization
- 5.4 Data usability

6 Open GIS and Web Mapping (8 hours)

- 6.1 Map servers and software
- 6.2 Geoportals overview
- 6.3 Geoportal service requirement: Portrayal services, data services
- 6.4 Catalogue services data access and delivery: Open access to data

7 Policy and Organizational Structure (8 hours)

- 7.1 Organizational approach, implementation approach
- 7.2 Institutional arrangements (Policies, standards) and organizational changes
- 7.3 Global SDI: GSDI association, UN/GGIM
- 7.4 Regional SDI: INSPIRE, ASEANSDI
- 7.5 National SDI: Present situation and challenges

8 Applications and Future Trends (10 hours)

- 8.1 Applications: Environmental monitoring and management; Urban planning and land administration; Disaster management and emergency response; Transportation and infrastructure management; Natural resource management
- 8.2 Emerging technologies: IoT, AI, and machine learning in geospatial context
- 8.3 Trends in data sharing and open data initiatives
- 8.4 Advances in real-time data integration and processing
- 8.5 The role of SDI in smart cities and sustainable development

Practical (22.5 hours)

- 1. Setting up geospatial web services
- 2. Configuring and deploying services: Web map service (WMS), web feature service (WFS)
- 3. Creating and managing metadata
- 4. Visualizing and analyzing spatial data
- 5. Registering catalogue server demonstration of geo-network
- 6. Implementing a real-world SDI project
- 7. Developing a mini SDI project or case study

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Hours	Mark distribution*
1	6	6
2	8	8
3	8	8
4	6	6
5	6	6
6	8	8
7	8	8
8	10	10
Total	60	60

* There may be minor deviation in marks distribution.

References

1. Longley, P. A., Goodchild, M. F., Maguire, D. J., Rhind, D. W. (2015). Geographic information systems and science. Wiley.
2. Williamson, I. P., Rajabifard, A., Feeney, M.-E. F. (2003). Developing spatial data infrastructures: From concept to reality. CRC Press.
3. Masser, I. (2005). GIS worlds: Creating spatial data infrastructures. ESRI Press.
4. van Oort, P. A. J. (2006). Spatial data quality: From process to decisions. CRC Press.
5. Chang, K.T. (2019). Introduction to geographic information systems. McGraw-Hill Education.