

# CARTOGRAPHY AND GEOVIZUALIZATION

ENGE 251

**Lecture** : 3  
**Tutorial** : 0  
**Practical** : 3/2

**Year : II**  
**Part : II**

## **Course Objectives:**

The objective of this course is to equip students with the skills and knowledge to create professional and aesthetically pleasing maps by applying cartographic conventions. Students will learn to effectively select and combine visual variables to represent geospatial data, classify and generalize data, and make informed decisions regarding color, contrast, projections, and scales. The course also aims to familiarize students with current trends in cartographic science and technology, including virtual reality, open-source web tools, and geovisual analytics.

### **1 Fundamentals of Cartography (3 hours)**

- 1.1 History of cartography
- 1.2 Scope of cartography
- 1.3 Principle of cartography
- 1.4 Cartographic information system

### **2 Maps (3 hours)**

- 2.1 Maps and their types
- 2.2 Components of map
- 2.3 Map as an interface to data
- 2.4 The map design process
- 2.5 Basic steps for communicating map information

### **3 Generalization (5 hours)**

- 3.1 Principles and objective of generalization
- 3.2 Techniques and methods of generalization
- 3.3 Algorithms and tools for generalization
- 3.4 Generalization in different types of maps
- 3.5 Challenges and solutions in generalization

### **4 Colour Theory and Graphic Variable (5 hours)**

- 4.1 Nature of light
- 4.2 Additive and subtractive colours

- 4.3 Colour triangle
- 4.4 Choice of colours (Colour charts)
- 4.5 Importance of graphic variables
- 4.6 Concept of visual perception
- 4.7 Types of graphic variables

**5 Typography (4 hours)**

- 5.1 Characteristics and types typography
- 5.2 General typographic guidelines
- 5.3 Specific typographic guidelines
- 5.4 Automated type placement

**6 Elements of Map Projections (5 hours)**

- 6.1 Concepts of map projection
- 6.2 The reference globe and developable surfaces
- 6.3 The mathematics of map projections
- 6.4 Map projection characteristics (Class, case aspect)
- 6.5 Distortion on map projections
- 6.6 Projection properties

**7 Data Classification (5 hours)**

- 7.1 Data measurement level
- 7.2 Different classification methods
- 7.3 Criteria for selecting a classification method considering the spatial distribution of the data

**8 Mapping Techniques (6 hours)**

- 8.1 Aesthetic and design
- 8.2 Relief representation
- 8.3 Topographic data representation
- 8.4 Geographical names
- 8.5 Common thematic maps (Cartograms, chorochromatic maps, dot maps, proportional point symbol maps, flowline maps, isoline maps, cartograms, prism maps, choropleth map)

**9 Map Reproduction Techniques (5 hours)**

- 9.1 Planning, map editing, and raster image processing for print production
- 9.2 Screening for point reproduction
- 9.3 Halftone and stochastic screening

- 9.4 Aspects of color, printing-process color, spot color, high-fidelity process color, continuous tone color printing
- 9.5 Color management system, high volume prints reproduction-pre-phase, file formats, proofing methods
- 9.6 Offset lithographic printing, computer-to-plate, direct-to-plate

**10 Geo-visual Exploration and User Usability (4 hours)**

- 10.1 Visualization and maps, geo-visualization
- 10.2 Brushing-attribute, geographical, temporal, exploratory tools, visual analytics
- 10.3 User centered design of geo data dissemination systems
- 10.4 Use contexts, user data collection and analysis methods

**Practical (22.5 hours)**

- 1. Map reading and interpretation techniques
- 2. Cartographic design and layout principles
- 3. Map projections and coordinate systems
- 4. Color theory in cartography: Enhancing map readability
- 5. Typography in cartography: Labeling techniques and best practices
- 6. Generalization techniques for simplifying spatial data
- 7. Symbolization and map symbols: Effective use in cartography
- 8. Designing choropleth maps for demographic data
- 9. Proportional symbol mapping: Visualizing quantitative data
- 10. Creating and analyzing thematic maps
- 11. Multivariate mapping and data visualization
- 12. Creating story maps and narrative cartography

**Final Exam**

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

Chapters	Hours	Marks distribution*
1 and 2	6	8
3	5	4
4 and 5	9	10
6	5	8
7	5	8
8	6	10
9	5	8
10	4	4
<b>Total</b>	<b>45</b>	<b>60</b>

\* There may be minor deviation in marks distribution.

## References

1. Slocum, T. A., McMaster, R. B., Kessler, F. C., Howard, H. H. (2022). *Thematic Cartography and Geovisualization*. United Kingdom: CRC Press.
2. Kraak, M., Ormeling, F. (2013). *Cartography: Visualization of Spatial Data*. United Kingdom: CRC Press.
3. Slocum, T. A., McMaster, R. B., Kessler, F. C., Howard, H. (2022). *Thematic Cartography and Geovisualization*. United Kingdom: CRC Press.
4. Robinson, A. H. (1995). *Elements of cartography*. John Wiley and Sons Ltd.
5. Slocum, T. A., McMaster, R. B., Kessler, F. C., Howard, H. (2022). *Thematic Cartography and Geovisualization*. United Kingdom: CRC Press.
6. Longley, P. A., Goodchild, M. F., Maguire, D. J., Rhind, D. W. (2005). *Geographic Information Systems and Science*. United Kingdom: Wiley.
7. Online resources and tutorials (Esri training, Qgis documentation, CartoDB guides)