



National University of Engineering (UNI)
School of Civil Engineering
Syllabus 2027-I

1. COURSE

CE3T2. General Cartography and Cartographic Design (Mandatory)

2. GENERAL INFORMATION

2.1 Course	: CE3T2. General Cartography and Cartographic Design
2.2 Semester	: 8 th Semester.
2.3 Credits	: 4
2.4 Hours	: 3 HT; 2 HP;
2.5 Duration of the period	: 16 weeks
2.6 Type of course	: Mandatory
2.7 Learning modality	: Face to face
2.8 Prerequisites	: CE2T3. Geodesy. (7 th Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

General Cartography and Cartographic Design is the cartography course of the Vialidad, Geomática y Transporte (DAVG) track, building on the geodetic reference frameworks established in Geodesy — and specifically in satellite geodesy — to address how the curved surface of the Earth is projected, modeled, and communicated as a map. The course first develops map projection theory, the UTM system and local grid conventions, and the distortion properties and selection criteria that govern which projection is appropriate for a given mapping purpose and extent. It then covers the vector and raster data models, national mapping standards and spatial data infrastructure, and the web mapping and tile services that underlie modern digital cartographic products, together with the data interoperability and quality control practices that support them. The course continues with the principles of cartographic design — map composition, symbolization, generalization across scales, and the use of color and visual hierarchy — used to communicate spatial information effectively. It closes with the production of topographic map series and thematic maps applied to civil engineering practice, and the evaluation of the quality and fitness for use of a finished cartographic product through positional accuracy testing and metadata documentation.

5. GOALS

- Explain map projection theory and apply the UTM system and local grid conventions, selecting a projection appropriate to a given mapping purpose and geographic extent.
- Apply national mapping standards and spatial data infrastructure specifications, distinguish vector from raster data models, and publish cartographic data as a web map or tile service while verifying data interoperability.
- Compose a map layout and design symbolization, color, and visual hierarchy for point, line, and area features, generalizing map content appropriately for a target scale.
- Produce topographic map series and thematic maps applied to civil engineering practice, following a defined digital cartographic production workflow.
- Test a cartographic product against an applicable positional accuracy standard and document its metadata to evaluate its quality and fitness for use.

6. COMPETENCES

ABET-1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (Usage)

ABET-2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. (Usage)

ABET-6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (Usage)

7. TOPICS

Unit 1: Map Projections and Coordinate Reference Systems (30 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
• Map projection theory: developable surfaces and projection families • The Universal Transverse Mercator (UTM) system and zone conventions • Projection distortion: conformality, equal-area, and equidistant properties • Local and national grid systems derived from a base projection • Criteria for selecting a map projection for a given mapping purpose and extent	• Explain map projection theory and the trade-offs among projection families [Familiarity] • Apply the UTM system's zone conventions to a mapping project [Usage] • Evaluate the distortion characteristics of a given projection for a mapping task [Assessment] • Derive a local grid system from a national base projection [Usage] • Select a map projection appropriate to a given purpose and geographic extent [Assessment]
Readings : [Snyder1987], [Iliffe2008]	

Unit 2: Cartographic Data Models and Standards (12 hours)	
Competences Expected: ABET-2	
Topics	Learning Outcomes
• Vector and raster data models for cartographic products • National mapping standards and spatial data infrastructure (e.g. Peru's IDEP) • Web mapping services and tile-based map delivery standards • Data interoperability standards for exchanging cartographic data • Quality control procedures for cartographic data production	• Distinguish vector from raster data models and identify when each is appropriate for a cartographic product [Familiarity] • Apply a national mapping standard or spatial data infrastructure specification to a mapping project [Usage] • Publish a cartographic product as a web map or tile service [Usage] • Verify data interoperability when exchanging cartographic data between systems [Assessment] • Perform quality control on a cartographic data production workflow [Assessment]
Readings : [Longley2015]	

Unit 3: Cartographic Design and Generalization (12 hours)	
Competences Expected: ABET-2	
Topics	Learning Outcomes
• Map composition elements: title, legend, scale, north arrow, and layout • Symbolization of point, line, and area features • Cartographic generalization: simplification, selection, and exaggeration across scales • Map scale selection and its relationship to feature detail and generalization • Color theory and visual hierarchy in map design	• Compose a map layout with appropriate title, legend, scale, and north arrow elements [Usage] • Design symbolization for point, line, and area features on a map [Assessment] • Generalize map content appropriately for a target scale [Assessment] • Select an appropriate map scale for a given purpose and level of detail [Familiarity] • Apply color theory and visual hierarchy principles to improve map readability [Usage]
Readings : [Robinson1995]	

Unit 4: Topographic and Thematic Cartography (30 hours)	
Competences Expected: ABET-6	
Topics	Learning Outcomes
• Topographic map series conventions and national mapping grids (e.g. Peru's Carta Nacional) • Thematic map types: choropleth, isoline, dot-density, and proportional symbol maps • Digital cartographic production workflows • Map accuracy standards and positional accuracy testing • Cartographic metadata documentation	• Explain topographic map series conventions and national mapping grid systems [Familiarity] • Select an appropriate thematic map type for a given dataset and message [Usage] • Produce a digital cartographic product following a defined production workflow [Usage] • Test a map product against an applicable positional accuracy standard [Assessment] • Document the metadata of a cartographic product [Familiarity]
Readings : [Slocum2022]	

8. WORKPLAN

8.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

***** EVALUATION MISSING *****

10. BASIC BIBLIOGRAPHY