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Personería Jurídica No. 192 de 1946 de Mingobierno  
Nit.: 860.013.798-5



## FREE UNIVERSITY PEREIRA SECTION

### UNDERGRADUATE PROGRAM IN ENVIRONMENTAL ENGINEERING



**SUBJECT:** **GEOGRAPHIC INFORMATION SYSTEMS**

**CODE:** -----

**SEMESTER:** **TENTH**

**HOURS** **WEEKLY: 4**

**THEORETICAL: 2**

**PRACTICES: 2**

**REQUIREMENTS:** **PHOTOGRAMMETRY AND REMOTE SENSING**

#### **GOALS.**

That the student becomes familiar with the principles and trends of the systems of geographic information and be able to apply its conceptual bases in the field of Environmental Engineering

#### **METHODOLOGY.**

The course will be developed with a presentation by the professor on the basic content of the subject;

Later, the students will be responsible for carrying out the practices and exercises





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leading to strengthening the knowledge of the topics learned, elaborating with said

elements throughout the course a project that will be presented at the end of the course.



## WORK PROGRAM.

### 1. GENERAL CONCEPTS

- What is a GIS
- Components and subsystems
- Cartography and GIS
- Sciences and technologies related to GIS
- Technical resources: Hardware, Software, Human Resources

### 2. GEOGRAPHIC INFORMATION

- Graphic and alphanumeric components
- Points, lines, polygons, volumes, figures, toponymy
- Elements of spatial reasoning: Georeferenced, continuity, connectivity
- Spatial and temporal resolution of the data
- Traditional methods of representation





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- Photogrammetry and Digital Cartography
- Cartographic process in modern systems



### 3. DATA COLLECTION SOURCES

- Data acquisition, management and entry
- Sources of information
- Global positioning systems (GPS)

### 4. PROJECTIONS AND COORDINATES

- Development and evolution of geography
- Interpretation of photogrammetric plans
- Projections
- Coordinate systems
- Coordinate transformation

### 5. DATA CAPTURE AND MANIPULATION

- Digitization methods
- Most common mistakes

Evaluation, preparation and standardization of information





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Attribute encoding



## 6. DATA STORAGE STRUCTURES

- Topology
- Raster Structure
- Vector structure

## 7. DATABASE

- Definition
- Database management systems
- Models: Relational, Network, Hierarchical, Object-Directed

Models: Relational:

Tables

Data duplication

Data redundancy

Repetition of groups

Identifier

Table Normalization

Entities and relationships





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## Properties

### Skeletons of boards

### Attributes

- Data quality



## 8. ANALYSIS IN GIS

- Steps for an analysis in GIS
- Functions used in a GIS
- Map overlay (Intersection, union, clipping, updating, deletion)
- Classification, generalization, integration, breakdown
- Applications of Relational Algebra
- Dimensioning: lengths, areas, dimensions
- Neighborhood: location, contiguity, belonging
- Transformations: Projections and scales
- Digital terrain models
- Networks

## 9. MODELS

- Model classes.
- Model creation





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## 10. GENERAL CONCEPTS FOR THE DESIGN AND IMPLEMENTATION OF A GIS

- Project scope
- Identification of GIS users
- Data model design
- Data sources and collection methods
- Classification of elements
- Descriptions
- Current information flows and operations
- Functional requirements of the project
- Alternatives and cost-benefit analysis



## 11. APPLICATIONS AND PRODUCTION OF RESULTS

- Project scope
- Final exits

Production of maps, lists, tables

Graphic display or alphanumeric display

## 12. GIS APPLICATIONS





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• General:

Territorial planning

Planning and development

Natural resources

Mapping

Security

Rural and urban cadastre

• Specific:

Public services

Infrastructure

Disaster prevention

• Databases



**LITERATURE.**

CEPIS 13 Theory, Design and Control of Water Clarification Processes.



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