



Department of Geomatics
UNIVERSITY of ALASKA ANCHORAGE

GIS at UAA

**Towards Teaching and Learning
Geospatial Science and Engineering**

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Department of Geomatics today

- Full time faculty
 - Don Davis, Chair
 - John Bean
 - Gennady Gienko
 - Bill Hazelton
- Adjunct faculty
 - Steven Callaghan
 - June Finkbiner
 - Norman Harris
 - Jonathan Lang
 - Ian Miller
 - Angela Parsons

GIS courses at UAA

GIS courses at UAA: lower division

- GIS A123 Introduction to Geographic Information Systems (GIS) 1 CR
- GIS A124 Introduction to GIS and Remote Sensing 1 CR
- GIS A125 GPS for GIS 1 CR
- GIS A127 Introduction to Metadata for GIS 1 CR
- **GIS A268 Elements of Geographic Information Systems (GIS) 4 CR**
- GIS A295 Internship in Geographic Information Systems I 3 CR

GIS courses at UAA: upper division

- **GIS A366 Spatial Information Analysis and Modeling 3 CR**
- **GIS A367 GIS and Remote Sensing 3 CR**
- **GIS A369 Land Information Systems 3 CR**
- **GIS A370 GIS and Remote Sensing for Natural Resources 3 CR**
- GIS A375 GIS and Public Health 3 CR
- GIS A433 GIS and the Marine Environment 3 CR
- **GIS A458 Design and Management of Spatial Data 3 CR**
- GIS A460 GIS Senior Project 3 CR
- **GIS A468 Integration of Geomatic Technologies 3 CR**
- GIS A470 GIS for Facility Management and Transportation Systems 3 CR
- GIS A490 Selected Advanced Topics in GIS 1-6 CR
- GIS A495 Internship in Geographic Information Systems II 3 CR

GIS and geospatial education

... to start a discussion

What do we expect from GIS (geospatial) professionals?

- Ability to analyze **project requirements** and **alternative technological approaches**
- Accomplish the task with **reasonable and justified results**
 - Quality of geospatial data
 - Limitations of technologies
 - Methodological restrictions
 - Financial and operational restrictions

Underlying principles and concepts

- GIS is a platform for **emerging geospatial technologies**
- Appreciation of **geographical and social phenomena** as the main object in GIS projects
- Appreciation of **quality of spatial data** as the measure of reliability of applied GIS project
- There are **alternative geospatial solutions**

GIS as a platform for geospatial technologies

- ArcGIS extensions
 - Survey analyst
 - Trimble GPS analyst
 - DAT/EM Summit Evolution
 - SOCET SET photogrammetry analyst
 - ERDAS Stereo analyst
 - ERDAS Image analysis
 - LIDAR Image analysis
 - RADAR Image analysis
 - ... analysts

Quality of geospatial data

- **Understanding and managing uncertainties** is essential to evaluate and manage quality of spatial data and information
 - Uncertainty of geographical phenomena
 - Uncertainty in measurements and observations
 - Ambiguity in spatial and non-spatial data
 - Ambiguity in results
 - Ambiguity in decisions

Alternative geospatial solutions

- Example: Terrain mapping solutions
 - Photogrammetry
 - Lidar
 - Radar
 - Topographic surveying
 - Terrestrial Laser Scanning
 - Cartography (contour line maps)

GIS curriculum: Considerations

Professional requirements for GIS:

- No licensure for professional practicing in GIS
- Professional certification (GISP)

GIS curriculum: Considerations

- Areas of knowledge
 - GIS&T Body of Knowledge
- Levels of knowledge
 - Professional certification requirements
- Sequence of knowledge acquisition
 - Course delivery, time flow

Levels of knowledge and education

Level of expertise

Educational options

- GIS users
 - “Ologies” and “ologists”
 - Engineering
 - Surveying
 - Management

- Emphasis
- Undergrad certificate
- Minor
- Post-baccalaureate certificate

- GIS professionals
 - Technicians
 - Technologists
 - Analysts
 - Scientists

- GIS professional certificate
- BSc & BEng
- MSc & MEng
- PhD

GIS educational options at UAA

Option	Credits	Target group	Years to complete	Demand
Emphasis	12	Enrolled in BSc/BA	1-1.5	?
Undergrad certificate	15	Enrolled in AAS	1-1.5	?
Minor	18-21	Enrolled in BSc/BA	1.5-2.5	+
Post-baccalaureate certificate	18-21	BSc/BA graduates	1.5-2	+
GIS professional certificate	32	open	2.5-3	?
BSc & BEng	60+	Enrolled in BSc/BA	4	?

Outlining GIS curriculum

Some perspectives to think about

Full time faculty and Adjunct faculty

Full time faculty

Goal:

- Ensure **sustainability of the program** by teaching of the core subjects.
- Initiate and supervise undergrad and grad research.

Teaching preferences:

1. Fundamental geospatial knwl
2. Geospatial technologies
3. Applications

Adjunct faculty

Goal:

- Provide local expertise,
- Practical applications,
- Specialized technologies.

Teaching preferences:

1. Applications
2. Geospatial technologies
3. Fundamental geospatial knwl

Some curriculum issues to address

- Introductory course in **general geospatial methods and technologies** for non-geomatics students (100-level)
- **Programming** for geospatial applications (300-level)
- **Geospatial databases** (400-level)
- **Project management** (400-level)

Course delivery: blocks and shared teaching

- Course Blocks
 - Semester long courses can be divided into blocks
 - Different blocks can be taught by different faculty
 - Blocks can be taught as short courses (1 credit hour)
- Advantages
 - Applicable **for upper division courses**
 - Flexible, adjustable contents
 - Convenient and appealing for adjuncts
- Disadvantages
 - Extra load on full time faculty for course administration

	Block 1	Block 2	Block 3
Credits	1	1	1
Weeks	5	5	5
Faculty	Full time faculty	Adjunct A	Adjunct B

Remote Sensing? Photogrammetry? - GEOSPATIAL IMAGE ANALYSIS

- Digital image characteristics
 - image formation: physics and principles
 - image geometry: frames, scanning
 - image data compression and storage
- Image corrections
 - geometry
 - radiometry
- Information retrieval
 - geometric measurements
 - object identification
 - image interpretation
- Digital image processing
 - image enhancement
 - filtering, convolution, etc.
- Digital geospatial image analysis
 - automated feature extraction
 - terrain surface generation
- Geospatial data fusion
 - imagery and vectors
 - imagery and tessellations

Knowledge areas:

- Physics
- Math
- Mapping
- Surveying
- Photogrammetry
- GIS
- Cartography
- Programming
- Computer science

Course offerings and faculty workload

Option	Credits	Credits offering per semester	Faculty FTE
Emphasis	12	6-9	1.5-2.0
Undergrad certificate	15	9	1.5-2.0
Minor	18-21	9-12	1.5-2.0
Post-baccalaureate certificate	18-21	9-12	1.5-2.0
GIS professional certificate	32	12-15	2.5-3.0
BSc & BEng	60-80	24	3.0-4.0

Perspectives vs. Reality

- Geospatial Engineering: education vs. training
 - Teaching Geospatial Science is not teaching GIS software packages
- Learning vs. Teaching
 - Provide basement for life-long learning
- Quality teaching vs. Crisis management
 - Ensure sustainability of the program