

UC Santa Barbara

Core Curriculum-Geographic Information Science (1997-2000)

Title

Outline of the Core Curriculum in GIScience

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The NCGIA Core Curriculum in GIScience Outline

Legend

- Numbers in brackets indicate each unit's unique key number.
 - *Italicized names* indicate unit authors.
 - *GC notes* links to related materials in the Geographer's Craft.
 - *old CC* links to the on-line version of the original Core Curriculum.
 - *CCTP* refers to the Core Curriculum for Technical Programs
 - Bulleted items in Arial font are additional, suggested unit topics.
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0. What is GIS? (002), *Michael Goodchild*

1. Fundamental Geographic Concepts for GIScience (004)

1.1. The World in Spatial Terms (005), ed. *Reg Golledge*

1.1.1. Human Cognition of the Spatial World (006), *Dan Montello*

1.1.2. Asking Geographic Questions (007), *Tim Nyerges and Reg Golledge*

1.2. Representing the earth digitally (008)

- features, pictures, variables; points, lines, areas, fields, 3D; processes and time

1.3. Position on the earth (012), ed. *Ken Foote*

1.3.1. Coordinate Systems Overview (013), *Peter Dana*

1.3.2. Latitude and Longitude (014), *Anthony Kirvan*

1.3.3. The Shape of the Earth (015), *Peter Dana*

1.3.4. Discrete Georeferencing (016), *David Cowen*

1.3.5. Global Positioning Systems Overview (017), *Peter Dana*

1.4. Mapping the earth (018)

1.4.1. Projections and transformations (019), ***from the old CC, see also GC notes*

1.4.2. Maps as Representations of the World (020), *Judy Olson*

1.5. Spatial relationships (021)

- connections and topology; networks; distance and direction; flow and diffusion; spatial hierarchies; boundaries; spatial patterns; attributes of relationships

1.6. Abstraction and incompleteness (030)

- 1.6.1. [Sampling the World](#) (031), **from the *old CC*
- 1.6.2. [Line Generalization](#) (034), **from the *old CC*
- scale and geographic detail; uncertainty; generalization

2. Implementing Geographic Concepts in GISystems (035)**2.1. Defining characteristics of computing technology (036)**

- 2.1.1. [Fundamentals of Data Storage](#) - *Carol Jacobson* (037)
- 2.1.2. Algorithms (040)
 - 2.1.2.1. [Simple Algorithms for GIS I: Intersection of Lines](#) (184), **from the *old CC*
 - 2.1.2.2. [Simple Algorithms for GIS II: Operations on Polygons](#), (185) **from the *old CC*
 - 2.1.2.3. [The Polygon Overlay Operation](#) (186), **from the *old CC*
- data versus processes; history; object orientation

2.2. Fundamentals of computing systems (042)

- operating systems; programming languages and software engineering; developing algorithms; user interfaces; computer networks; hardware for GISystems

2.3. Fundamentals of information science (050)

- 2.3.1. [Information Organization and Data Structure](#) (051), *Albert Yeung*
- 2.3.2. [Non-spatial Database Models](#) (045), *Thomas Meyer*

- data modeling

2.4. Representing fields (054), *Michael Goodchild*

- 2.4.1. [Rasters](#) (055), *Michael Goodchild*
- 2.4.2. [TINs](#) (056), **from the *old CC*
- 2.4.3. [Quadtrees and Scan Orders](#) (057), *Michael Goodchild*

- polygon coverages

2.5. Representing discrete objects (059)

- storing relationships; computing relationships; topology for geodata; object hierarchies

2.6. Representing networks (064), *Benjamin Zhan***2.7. Representing time and storing temporal data (065)****2.8. Populating the GISystem (066) - see the *GC notes and the CCTP***

- creating digital data - sampling the world; remote sensing; GPS as a data source; digitizing and scanning; editing
- accessing existing data - data exchange; open GIS; finding data; data conversion; transfer standards; distributed networked databases; generating data from existing data
- metadata

2.9. Kinds of geospatial data (082)

- 2.9.1. [Transportation Networks](#) (183), *Val Noronha*
- 2.9.2. [Natural Resources Data](#) (090), *Peter Schut*
 - 2.9.2.1. Soil Data for GIS (091), *Peter Schut*
 - hydrography; land cover and vegetation; geology; climate; terrain
- 2.9.3. Land Records - see [Unit 164](#)
- administrative boundary data; demographic and health data; global data

- 2.10. Handling uncertainty** (096), ed. *Gary Hunter* (see also *GC notes*)
- 2.10.1. [Managing Uncertainty in GIS](#) (187), *Gary Hunter*
 - 2.10.2. [Uncertainty Propagation in GIS](#) (098), *Gerard Heuvelink*
 - 2.10.3. [Detecting and Evaluating Errors by Graphical Methods](#) (099), *Kate Beard*
 - 2.10.4. [Data Quality Measurement and Assessment](#) (100), *Howard Veregin*
- storing uncertainty information
- 2.11. Visualization and cartography** (101)
- 2.11.1. Cartographic fundamentals (102) - *GC notes*
- principles of graphic design; digital output options; scientific visualization; animation and virtual worlds; cognitive basis of visualization
- 2.12. User interaction** (107)
- user interfaces; forms of user interaction with GIS
- 2.13. Spatial analysis** (110)
- combining data; map algebra; terrain modeling; finding and quantifying relationships; generalization; spatial statistics; geostatistics; spatial econometrics; spatial interpolation; spatial search; location/allocation; districting; spatial interaction modeling; cellular automata; distance modeling; neighborhood filtering; pattern recognition; genetic algorithms
- 2.14. Implementation paradigms** (126)
- 2.14.1. [Spatial Decision Support Systems](#) (127), *Jacek Malczewski - GC notes*
 - 2.14.2. [Exploratory Spatial Data Analysis](#) (128), *Robert Haining and Stephen Wise*
 - 2.14.3. [Process Modeling and Simulation](#) (130), *Lubos Mitas and Helena Mitsova*
 - 2.14.4. [Multimedia and Virtual Reality](#) (131), *George Taylor*
 - 2.14.5. [WebGIS](#) (133), *Kenneth Foote and Anthony Kirvan*
 - 2.14.6. [Artificial Neural Networks for Spatial Data Analysis](#) (188), *Suchi Gopal*
- interoperability; object oriented GIS; knowledge based and expert systems; collaborative spatial decision making

3. [Geographic Information Technology in Society](#) (135), *Robert Maher*

- 3.1. Making it work** (136)
- needs assessment; conceptual design of the GIS; survey of available data; evaluating hardware and software; database planning and design; database construction; pilot studies and benchmark tests; acquisition of GIS hardware and software; GIS system integration; GIS application development; GIS use and maintenance
- 3.2. Supplying the data** (143)
- 3.2.1. [Public access to geographic information](#) (190), *Albert Yeung*
 - 3.2.2. [WWW Basics](#) (148), *Albert Yeung*
 - 3.2.3. [Digital Libraries](#) (191), *Albert Yeung*
 - 3.2.4. Legal Issues (147) - *GC notes and old CC*
- transfer standards; national and international data infrastructures; marketing data
- 3.3. The social context** (149)
- digital democracy; geographic information in decision making; human resources and education; ethics of GIS use

3.4. The industry (154)

- history and trends; current products and services; careers in GIS

3.5. Teaching GIS (158), *David Unwin*

3.5.1. Curriculum Design for GIS (159), *David Unwin*

3.5.2. Teaching and Learning GIS in Laboratories (160),
David Unwin

4. Application areas and case studies (161)

4.1. Land Information Systems and Cadastral Applications (164), *Steve Ventura*

4.2. Precision Agriculture (194), links to material by *PrecisionAg.org*

- also: facilities management; network applications; emergency response and E911; recreation, resource management (agriculture, forestry), urban planning and management, environmental health, environmental modeling, emergency management, studying and learning geography, business and marketing (real estate)
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