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**Introduction to Geographic Information Systems**

**BSC 3931**

**INSTRUCTOR**

Name:  Dr. Theodore (Ted) Switzer Contact Phone Number: TBD

Email: switzer.theodore@spcollege.edu Office Location: SS-172

Office Hours: MW 4:50 – 5:20 or by appointment

Link to Instructor page: http://it.spcollege.edu/course\_info/inquiry.cfm?number=741

**ACADEMIC DEPARTMENT**

Dean: John Chapin Department Chair Name: Dr. Linda Gingerich

Office Location: Seminole Office Location: Clearwater

Office Number: UP 337 Office Number: SS 177A

**COURSE DESCRIPTION**

This course is designed to provide a basic introduction to the use of geographic information systems in visualizing and analyzing spatial data. Early topics cover a brief introduction to the components of geographic information systems as well as various uses. Subsequent lectures will focus on collecting and incorporating various types of geospatial data into a geographic information system. Various qualitative and quantitative analytical methods will be discussed, culminating in a discussion of effective ways of graphically presenting results. Lectures are designed to provide a fundamental understanding of geographic information system theory; these theories will be put into practice in the corresponding demonstrations. At the completion of the course students will have sufficient understanding of basic geographic information system techniques to analyze and present spatial data from their own undergraduate research studies.

**COURSE GOALS**

1. The student will understand the fundamental of geographic information systems (GIS).

2. The student will demonstrate an understanding of obtaining and incorporating data into a GIS.

 3. The student will demonstrate an understanding of qualitative analyses of spatial data.

 4. The student will demonstrate an understanding of quantitative analyses of spatial data.

 5. The student will demonstrate an understanding of the importance of combining data from several features.

 6. The student will demonstrate an understanding of cartography.

**COURSE OBJECTIVES**

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| 1. The student will understand the fundamental of geographic information systems (GIS) by:
 |
| 1. defining what a GIS is.
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| 1. describing possible uses of a GIS in analyzing various types of biological data
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| 1. illustrating the effect of scale on our perception of real-world phenomenon.
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| 1. describing the fundamental geographic coordinate system as well as several types of survey designs to collect spatial data.
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| 1. explaining the relationships among nominal, ordinal, interval, and ratio data and how the various data types translate into point, line, area, and surface features.
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| 1. describing similarities and differences among various types of map projections and problems associated with representing data from a spherical world in two dimensions.
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| 1. illustrating differences among various GIS database structures.
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| 1. The student will demonstrate an understanding of obtaining and incorporating data into a GIS by:
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| 1. describing the advantages and limitations of raster data models.
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| 1. describing the advantages and limitations of vector data models.
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| 1. identifying various methods of obtaining spatial data and inputting data into a GIS.
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| 1. defining the importance of including appropriate metadata for GIS data sources.
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| 1. describing various types of data errors and how these errors are identified and corrected.
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| 1. The student will demonstrate an understanding of qualitative analyses of spatial data by:
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| 1. defining various queries of attributes of point, line, and polygon features
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| 1. identifying various approaches for calculating the centroids of geospatial features
 |
| 1. describing various approaches of calculating length, perimeter, and area of vector and raster features.
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| 1. defining various methods of calculating shape and sinuosity of vector and raster data.
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| 1. describing how to calculate distance between features and along the path of a given feature.
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| 1. The student will demonstrate an understanding of quantitative analyses of spatial data by:
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| 1. defining the importance of data reclassification and comparing methods of aggregating vector and raster data to achieve new classification systems.
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| 1. describing various approaches for defining buffers when reclassifying data.
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| 1. describing fundamental differences between discrete and continuous statistical surfaces
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| 1. comparing various approaches of interpolating spatial data as well as identifying problems that may arise when conducting interpolation analyses.
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| 1. describing the details of terrain analysis, including details of how slope and aspect are calculated.
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| 1. describing the details of nearest neighbor analyses to examine the spatial distribution of point and line features.
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| 1. defining how networks can be used in determining efficient routing pathways.
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| 1. The student will demonstrate an understanding of the importance of combining data from several features by:
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| 1. identifying problems that are best addressed by combining data from various GIS features.
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| 1. defining various approaches for overlaying raster data, including difficulties associated with combining data representing different spatial scales.
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| 1. discussing advantages and disadvantages of various graphical approaches of overlaying vector data.
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| 1. illustrating how various GIS components are integrated into a cartographic model, and how produced models can be verified.
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| 1. The student will demonstrate an understanding of cartography by:
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| 1. explaining the fundamental importance of good map design in displaying GIS data.
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| 1. describing various approaches for defining symbolically different categories of geospatial data.
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| 1. discussing advantages and disadvantages of presenting data using multiple single-theme displays and a single multivariate map display.
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**PREREQUISITES (COURSE & SKILL SET)**

Basic familiarity with personal computers.

**COREQUISITES (COURSE & SKILL SET)**

None.

**REQUIRED TEXTBOOK & OTHER RESOURCE INFORMATION**

Demers: *Fundamentals of Geographic Information Systems*, Fourth Edition. John Wiley and Sons, Inc. ISBN: 978-0-470-12906-7.

Ormsby, Napoleon, Burke, Groessl and Bowden: *Getting to Know ArcGIS Desktop for ArcGIS 10*. Esri Press, Inc. ISBN: 978-1-58948-260-9.

**MEETING INFORMATION**

Course location: Clearwater, SS-101

Meeting Days/Times: MW 5:20 – 7:30

**IMPORTANT DATES**

Course Dates: 1/11 – 5/6

Drop/Add: 1/15

Withdrawal Date: 3/23

Financial Aid: <http://www.spcollege.edu/central/SSFA/HomePage/calendar.htm>

 **DISCIPLINE SPECIFIC INFORMATION**
<http://www.spcollege.edu/bachelors/biology/>
<http://www.spjc.edu/clw/math_science/>

**ASSIGNMENTS**

Full descriptions of written assignments can be found on MyCourses. Assignments, including all work, are to be submitted in hard copy.

**ATTENDANCE**

**The college-wide attendance policy is included in the Syllabus Addendum at**

<http://www.spcollege.edu/webcentral/policies.htm>

Regular class attendance is expected of all students. Successful completion of this course requires regular class attendance. If you miss a class, you are responsible for making up the material. Students who miss the first two weeks of class will be automatically withdrawn from the class. If you decide to no longer attend class or must withdraw for any reason, you are responsible for ALL paperwork to be completed and turned in by TBD.

**ACTIVE CLASS PARTICIPATION:**

Students who are not actively participating in class will be reported to administration on TBD. Administration will automatically withdraw (WF) students for non-participation. Active class participation will be judged based on timely submission of at least 70% of assigned work. A student who has submitted 70% or more of the assigned work (in a timely manner) and/or has NO MORE THAN 4 absences by that deadline will be considered to be actively participating; A student with less than 70% timely submission of material and/or more than 4 absences will be deemed “not actively participating” and assigned a grade of “WF” by Administration.

**GRADING**

Final grades will be based on two lecture exams (20% each), biweekly lecture homework assignments (20%), four special project reports (20%), and weekly software demonstrations (20%). Exams will consist of various types of questions, including multiple choice, matching, calculations, and short answer/essay.

**Missed lecture exams will NOT be made up.**

Overall final grades will be assigned according to the following scale and are **NOT negotiable**:

 **GRADE** **PERCENTAGE**

 A 90-100

 B 80-89

 C 70-79

 D 60-69

 F <=59

**TENTATIVE COURSE SCHEDULE**

***Class Week Topic Chapter***

**Jan 11** *Lecture:* Course Intro, Intro to Digital Geography 0, 1

 *Demo:* Getting to Know ArcGIS

**Jan 18** *Lecture:* **No Class - MLK**

 *Demo:* Exploring ArcMap (Exercises 3a, 3b, 3c)

**Jan 25** *Lecture:* Basic Geographic Concepts and Maps 2, 3

 *Demo:* Exploring ArcCatalog (Exercises 4a, 4b, 4c)

**Feb 1** *Lecture:* GIS Computer Structure and GIS Data Models; **HW 1** 4, 5

 *Demo:* Symbolizing Features and Rasters (Exercises 5a, 5b, 5c, 5d)

**Feb 8** *Lecture:* GIS Data Input; **HW 2** 6

 *Demo:* Classifying Features and Rasters (Exercises 6a, 6b, 6c, 6d)

**Feb 15** *Lecture:* Data Storage and Editing; **Report 1** 7

 *Demo:* Labeling Features (Exercises 7a, 7b, 7c)

**Feb 22** *Lecture:* Data Query and Description; **HW 3** 8

 *Demo:* Querying Data (Exercises 8a, 8b, 8c)

**Feb 29** *Lecture:* Measurement 9

**Mar 7** *Lecture:* **No Class – Spring Break**

**Mar 14** *Lecture:* **EXAM 1; Report 2**

 *Demo:* Joining and Relating Tables (Exercises 9a, 9b)

 Selecting Features by Location (Exercises 10a, 10b)

**Mar 21** *Lecture:* Classification and Statistical Surfaces; **HW 4** 10, 11

 *Demo:* Preparing Data for Analysis (Exercise 11a, 11b, 11c, 11d)

**Mar 28** *Lecture:* Terrain Analysis; **HW 5**  12

 *Demo:* Analyzing Spatial Data (Exercise 12a, 12b, 12c)

**Apr 4** *Lecture:* Spatial Arrangement; **Report 3** 13

 *Demo:* Projecting Data in ArcMap (Exercise 13a, 13b)

**Apr 11** *Lecture:* Map Overlay and Cartographic Modeling; **HW 6** 14, 15

 *Demo:* Creating and Editing Data (Exercise 15a, 16a, 16b)

**Apr 18** *Lecture:* Cartography and Visualisation 16

 *Demo:* Making Maps for Presentation (Exercise 19a, 19b, 19c, 19d)

**Apr 25** *Lecture:* Wrap up and Review; **HW 7; Report 4**

**May 2** *Lecture:* **EXAM 2**

**SIGNATURE PAGE**

I have read, understand, and agree to abide by the parameters set in this syllabus.

I understand that I must have continuous access to, and fluency with a computer and related software throughout the course.

I understand that it is my responsibility to complete all assignments in a timely manner and that my grade will suffer should my assignments not be completed by the deadlines. I will not expect time extensions for late assignments.

I promise that all work performed and submitted in this class will be my own. I understand that if any submitted assignment is determined not to be of my own work or if I am suspected of using prohibited resources while completing an assignment, then I will be subject to disciplinary measures as stated in the syllabus and the college catalog, including failing the class.

I understand that rudeness has no place in this course. I will communicate with others in a respectful, appropriate and polite manner. I also realize that failure to do so can result in my being withdrawn from the course.

I understand that excessive, unexcused absences will result in a withdrawal from the course.

Student signature:                                                       Date: