

## **Term Information**

Effective Term Spring 2020

## **General Information**

Course Bulletin Listing/Subject Area Geography  
Fiscal Unit/Academic Org Geography - D0733  
College/Academic Group Arts and Sciences  
Level/Career Graduate, Undergraduate  
Course Number/Catalog 5803  
Course Title Sustainable Energy Geographies  
Transcript Abbreviation Sustainable Energy  
Course Description Sustainable development; Energy systems; Energy production, consumption, and conservation; Environmental and societal impacts.  
Semester Credit Hours/Units Fixed: 3

## **Offering Information**

Length Of Course 14 Week, 12 Week  
Flexibly Scheduled Course Never  
Does any section of this course have a distance education component? No  
Grading Basis Letter Grade  
Repeatable No  
Course Components Lecture  
Grade Roster Component Lecture  
Credit Available by Exam No  
Admission Condition Course No  
Off Campus Never  
Campus of Offering Columbus

## **Prerequisites and Exclusions**

Prerequisites/Corequisites  
Exclusions  
Electronically Enforced No

## **Cross-Listings**

Cross-Listings

## **Subject/CIP Code**

Subject/CIP Code 30.3301  
Subsidy Level Doctoral Course  
Intended Rank Junior, Senior, Masters, Doctoral

## Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

## Course Details

### **Course goals or learning objectives/outcomes**

- Understand spatial and temporal patterns of different energy systems in complex social and environmental systems  
Appraise social and environmental changes associated with global and regional energy industries  
Apply academic knowledge in society

### **Content Topic List**

- Part I: Primary and Secondary Energy (1 week)  
Part II: Global and National Coal System (2 weeks)  
Part III: Global and National Natural Gas System (2 weeks)  
Part IV: Global Oil (1 week)  
Part V: Nuclear Energy (1 week)  
Part VI: Hydroelectricity (1 week)
- Part V: Nuclear Energy (1 week)  
Part VI: Hydroelectricity (1 weeks)  
Part VII: Wind Energy (1 week)  
Part VIII: Solar Energy (1 week)
- Part IX: Other Renewables (1 week)  
Part X: Carbon Capture and Storage (1 week)  
Part XI: Energy Efficiency (1 week)  
Part XII: Electricity and Grids (1 week)

### **Sought Concurrence**

No

## Attachments

- GEOG 5803 Syllabus 2020Spring Energy Geography-Yue.docx: GEOG 5803 Syllabus  
*(Syllabus. Owner: Coscia, Nancy Beth)*
- Geography Enviro and Society Major Curriculum 1-2020 - pending 5803.pdf: GEOG Environment & Society Major Curriculum  
*(Other Supporting Documentation. Owner: Coscia, Nancy Beth)*
- GIS Major Curriculum 3-2019.pdf: GIS Major Curriculum  
*(Other Supporting Documentation. Owner: Coscia, Nancy Beth)*
- Spatial Analysis Major Curriculum 3-2019.pdf: Spatial Analysis Major Curriculum  
*(Other Supporting Documentation. Owner: Coscia, Nancy Beth)*

## Comments

- If approved, GEOG 5803 will offered as a human geography major elective for the Environment & Society major, as a 5000-level topical course major elective for the GIS major, and a major elective course for the Spatial Analysis major as noted in the attached major curriculum sheets. *(by Coscia, Nancy Beth on 11/18/2019 10:21 AM)*

**COURSE REQUEST**  
5803 - Status: PENDING

Last Updated: Haddad,Deborah Moore  
11/18/2019

**Workflow Information**

Status	User(s)	Date/Time	Step
Submitted	Coscia,Nancy Beth	11/18/2019 10:29 AM	Submitted for Approval
Approved	Munroe,Darla Karin	11/18/2019 10:34 AM	Unit Approval
Approved	Haddad,Deborah Moore	11/18/2019 12:03 PM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Oldroyd,Shelby Quinn Vankeerbergen,Bernadette Chantal	11/18/2019 12:03 PM	ASCCAO Approval

## **GEOG 5803: Sustainable Energy Geographies**

### **The Ohio State University Spring 2020**

Instructor: Dr. Yue QIN

Office: 1123 Derby Hall

E-mail: [qin.548@osu.edu](mailto:qin.548@osu.edu)

Phone: 609-865-5698

Office Hour: TBD

Lecture Time: TBD

Lecture Location: TBD

Course URL: <http://carmen.osu.edu>

#### **Course Description:**

Energy consumption is a fundamental driver of societal development. Meanwhile, it is one of the primary reasons for social and environmental problems. The geospatial mismatch of energy production and consumption, the temporal evolution of energy systems, and energy technologies development will directly affect the ultimate goal of sustainable development. This course will introduce students to the geography of global and regional energy systems. In this course, we will cover various energy resources, including both fossil fuels (coal, natural gas, oil) and non-fossil energy (nuclear, hydro, wind, solar and et al.). We will introduce the geographic distribution of different energy sources (e.g., where they are produced and consumed, and the fundamental geographic mismatch). We'll explain the changing patterns in each energy system and the major drivers for different changes. For each energy system, we'll introduce its life stages, from production, processing, transmission, distribution, and end-use consumption, domestic and international trades, as well as the development of different energy technologies, energy policies, and the resulting social and environmental impacts. Case studies will be used to better understand different energy systems.

#### **Learning Objectives:**

- 1) Understand the spatial and temporal patterns of different energy systems in complex social and environmental systems
- 2) Learn to appraise social and environmental changes associated with global and regional energy industries
- 3) Learn the application of academic knowledge in society and the resulting impacts
- 4) Be able to effectively share and receive knowledge by engaging with the whole class
- 5) Recognize the value and culture differences across different countries towards different energy systems

## **Text Books and Other Materials:**

### ***Textbook:***

'[Our energy future: resources, alternatives, and the environment](#)', Christian Ngô, Joseph B. Natowitz, Hoboken, New Jersey: John Wiley & Sons, Inc., [2016]

### ***Recommended readings:***

- 1) The great transition: shifting from fossil fuels to solar and wind energy / Lester R. Brown with Janet Larsen, J. Matthew Roney, and Emily E. Adams, Earth Policy Institute
- 2) Energy and global climate change: bridging the sustainable development divide / Anilla Cherian
- 3) IEA, World Energy Outlook.
- 4) Additional literatures

## **Evaluation**

Standard OSU grading scale will be used for evaluation. Grading will be based on four elements

- **Participation (15%)**

Your attendance and in-class participation. You have to show up for at least one of the lectures in the first week to stay enrolled in this course. For each class found missing, you lose 0.4 points for the final grade. Exceptions may be granted in cases such as serious illness, family emergency, or career opportunities, if requests were made before class starts with solid proofs.

- **Assignments (15%)**

3 assignments during the semester. Please refer to the policy on **Late papers** below.

- **Quiz (20%)**

We will have 1 in-class quiz (80 minutes) during the semester to evaluate your understanding of this course.

- **Mid-term individual presentation (20%):**

Individual presentation in the energy field. Select an energy topic and conduct an independent literature review (~10 classical/impactful/latest publications). You have to demonstrate your understanding of a field, such as its most important and emerging questions, methodologies, and major findings in the field. Each student will have ~10 minutes (TBD), including Q&A.

- **Final group project (30%):**

Students must form their group and submit a proposal about the final project by the end of the 10<sup>th</sup> week. Students will choose an energy topic to conduct an independent project. You should conduct a literature review to understand the emerging questions in the subfield, based on which to design a project, collect data, analyze the data, to present the results (e.g., mapping the spatial and temporal patterns, revealing the driving factors for changing trends, and characterizing the societal and environmental implications). A final group presentation should be done by each of the students in the group, and a final group paper is expected (should be in the format of a peer-reviewed paper, including major components such as: abstract, introduction, methodology, results and discussion, and figures & tables; word limits: 3000-5000 words).

## Important Issues

**Disability Services:** The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; [slds.osu.edu](http://slds.osu.edu); 098 Baker Hall, 113 W. 12th Avenue.

**Late papers.** Each exercise or project item has a specific deadline. Late submissions will be penalized 10% for each day late. Exceptions may be granted in cases such as serious illness, family emergency, or career opportunities, if requests were made before class starts with solid proofs. All submissions must be made on carmen (no email submissions please).

**Academic Misconduct:** It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

**Mental Health Statement:** As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student’s ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life’s Counseling and Consultation Service (CCS) by visiting [ccs.osu.edu](http://ccs.osu.edu) or calling 614- 292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower.

You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273- TALK or at [suicidepreventionlifeline.org](http://suicidepreventionlifeline.org).

**Diversity:** The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Below is a tentative syllabus. (All readings below are required)

Week	Date	Topics	Notes
1	1/6	Introduction about Energy Geography	<b><u>Chapter #1</u></b> ; Assignment #1- geographic self-introduction (due before the first class next week)
	1/8	Primary and Secondary Energy	
2	1/13	Global Coal System	<b><u>Chapter #4</u></b> ; Spatial and temporal distribution of coal resources, its production, consumption, prices, and international trades  Upstream, midstream, and end-use coal industries; <b><i>Recommended Readings:</i></b> lifecycle of coal-fired power generation (NREL, Chapter 5)
	1/15	Coal Industries	
3	1/20	Coal System in major producing and consuming countries	Importance of coal in major producing and consuming countries, advancement of coal technologies, its societal and environmental impacts; <b><i>Required Readings:</i></b> China's Coal: Demand, Constraints, and Externalities; The true cost of Coal (Chapter 2, 5, 6, 7)
	1/22		
4	1/27	Global Natural Gas Systems	<b><u>Chapter #2</u> and <u>Chapter #3</u></b> ; Spatial and temporal distribution of gas resources, production, consumption, prices, and international trades  Lifecycle stages of natural gas industries; <b><i>Required Readings:</i></b> Life-cycle analysis of shale gas and natural gas;
	1/29	Natural Gas Industries	
5	2/3	Natural Gas systems in major producing and consuming countries	Development of conventional and unconventional natural gas; the shale gas boom in U.S., and the economic, political, and technical barriers for unconventional gas development outside U.S., major natural gas
	2/5		



			technologies, its societal and environmental impacts; <b>Required Readings:</b> US Shale Gas Development What Led to the Boom? Life cycle greenhouse gas emissions of Marcellus shale gas; Are we entering a golden age of gas? (Section 1 and 2)
6	2/10	Global Oil Systems	<b><u>Chapter #2 and Chapter #3;</u></b> Spatial and temporal distribution of oil resources, production, consumption, prices, and international trades (OPEC)
	2/12	Oil Industries	Lifecycle stages of oil industries and their societal and environmental impacts; <b>Recommended Readings:</b> <i>Life-Cycle Analyses of Energy Consumption and GHG Emissions of Natural Gas-Based Alternative Vehicle Fuels in China;</i> <i>Just Oil? The Distribution of Environmental and Social Impacts of Oil Production and Consumption;</i> Assignment #2: Write a one-page memo of your own thoughts about the fossil industry to get prepared for next class discussions.
7	2/17	Discussions on “Pros and Cons of the Fossil industry”: societal, environmental, economic, political impacts for different regions, population groups, shareholders and et al.	
	2/19	Nuclear Energy	<b><u>Chapter #11;</u></b> Fundamentals of nuclear energy, its global and regional development (existing status and prediction); major technologies, societal and environmental impacts.
8	2/24	Midterm- individual presentation	

	2/26	(5-10 minutes for each student)	Individual presentation of a chosen topic in the energy field. Select an energy topic and conduct an independent literature review. (Refer to 'Evaluation' for details)
9	3/2	Hydroelectricity	<u><a href="#">Chapter #6</a></u> ; Fundamentals about hydroelectricity, and its spatial and temporal development <b>Recommended Readings:</b> Hydroelectricity power
	3/4	Implications of Hydroelectricity	Multiple uses for reservoirs, major technologies, societal and environmental concerns of hydroelectricity  <b>Recommended Readings:</b> Intensification of hydrological drought in California by human water management; Human-water interface in hydrological modelling: current status and future directions
10	3/9	Wind Energy	<u><a href="#">Chapter #10</a></u> ; Fundamentals about wind energy, and its spatial and temporal development
	3/11	Implications of Wind Energy	Technology, policies, societal and environmental impacts
11	3/16	Solar Energy	<u><a href="#">Chapter #8</a></u> ; Fundamentals about solar, and its spatial and temporal development
	3/18	Implications of Solar	Technology, policies, societal and environmental impacts Assignment #3- write a one-page memo for next class discussions. Writing on behalf of either the solar industry, wind industry, coal industry, oil & gas industry, local residents, NGO to local government for support
12	3/23	Other renewables	<u><a href="#">Chapter #7</a></u> and <u><a href="#">Chapter #9</a></u> ;

			Introduction of other renewable energy, their spatial and temporal pattern, societal and environmental impacts (e.g., biofuels, geothermal, and waste heat)
	3/25	Debates on government support	Students will represent different stakeholders and convince the 'local government' for financial/policy support (convince the government why your industry needs support, e.g., your importance to local economy, energy security, social equity, environment...)
13	3/30	Quiz	
	4/1	Carbon Capture and Storage	Introduction of CCS, current development status, technologies, costs, geographical and economic barriers
14	4/6	Energy Efficiency	Importance, major technologies, and the economic and environmental implications of energy efficiency
	4/8	Electricity and Grids	<a href="#"><u>Chapter #12</u></a> ; Fundamentals of electricity and their environmental and societal implications
15	4/13	20 minutes group presentations + 5 minutes questions	
	4/15		
16	4/20		

# Geography: Environment and Society (Bachelor of Arts)

## Geography: Environment and Society Major

Requires 121 Total Credit Hours; 33-34 Major Credit Hours

### GENERAL EDUCATION

College of Arts & Sciences Bachelor of Arts general education requirements apply.

Please visit <https://artsandsciences.osu.edu/academics/current-students/advising/ge>

### MAJOR REQUIREMENTS

NOTE: Several major courses are offered only one term per year. Careful schedule planning is required to complete course sequences in a timely manner.

#### Required Courses (3 courses/9 hours)

Course	Title	Hours	Required Prerequisite
GEOG 3800 *	Geographical Perspectives on Environment & Society	3	None
GEOG 4101 *	Undergraduate Research & Professionalization Seminar	3	12 credit hours in Geography
GEOG 4100 *	Geographic Inquiry ( <i>capstone course</i> )	3	<i>taken in last year of study</i>
OR	OR		
GEOG 4103	Introductory Spatial Data Analysis ( <i>previously GEOG 5100</i> )	3	Math 1116 or higher

\* Indicates course is only offered one term per year.

#### Physical Geography Courses (3 courses/9-10 hours)

Course	Title	Hours
GEOG 2800 *	Our Global Environment	3
OR	OR	
GEOG 2960 *	Introduction to Physical Geography	4
GEOG 3980 *	Biogeography: An Introduction to Life on Earth	3
GEOG 3900	Global Climate Change: Causes & Consequences	3
OR	OR	
GEOG 3901H *	Global Climate & Environmental Change	3

\* Indicates course is only offered one term per year.

#### Elective Courses (5 courses/15 hours)

(2 methods courses and 3 human geography courses)

#### Methods Courses (select 2 courses/6 hours)

Course	Title	Hours	Required Prerequisite
GEOG 4103	Introductory Spatial Data Analysis ( <i>if not taken as required course</i> ) ( <i>previously GEOG 5100</i> )	3	Math 1116 or above
GEOG 5103	Intermediate Spatial Data Analysis	3	GEOG 4103 <i>Not open to students w/GEOG 5100</i>
GEOG 5200	Cartography & Map Design	3	None
GEOG 5201	GeoVisualization	3	GEOG 5200
GEOG 5210	Fundamentals of Geographic Information Systems	3	None
GEOG 5212	Geospatial Databases for GIS	3	GEOG 5210 and CSE 1114
GEOG 5225 *	Geographic Applications of Remote Sensing	3	None
GEOG 5226 *	Spatial Simulation & Modeling in GIS	3	None

\* Indicates course is only offered one term per year.

## Human Geography Courses (select 3 courses/9 hours)

Course	Title	Hours
GEOG 3597.03 *	Environmental Citizenship	3
GEOG 3702 **	Life & Death Geographies: Global Population Dynamics	3
GEOG 5402 *	Land Use Geography	3
GEOG 5700 *	Geography of Development	3
GEOG 5751 **	New Worlds of Latin America	3
GEOG 5801 *	Environmental Conservation	3
GEOG 5802 *	Globalization & Environment	3
GEOG 5803 *	Sustainable Energy Systems	3

\* Indicates course is only offered one term per year.

\*\* Indicates course is only offered alternate years or less often.

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## Major Requirements

The following requirements for the major apply to all Arts and Sciences degrees.

**Major requirements comprise at least 30 semester hours and can be substantially higher.** Major courses must be at the 2000 level or above. At least 20 hours of the major must be in courses offered by the department of the major. Note: Some interdisciplinary majors are excluded from the 20-hour rule.

**Students must earn at least a C- in a course for the course to be applied to the major.** However, students must receive a 2.0 cumulative grade point average (GPA) for all major course work. If a D+, D, or an E is earned in a course needed for the major, the course cannot be counted on the major. The major advisor will decide if the course should be repeated or if another course should be substituted. Courses taken on a pass/non-pass basis cannot be used on the major.

**The department must approve all courses in the major.** Some departments require a “major program form,” a document that must be signed by the academic advisor and submitted with the graduation application. Some departments do not require such a form because the academic advisors use an automated version on the degree audit report. Some departments require both. In any case, students should meet with the academic advisor early to plan the major; during your meeting, it can be determined whether the department requires a paper major program form. Any changes or adjustments to the major should be made in consultation with the academic advisor.

**If a student transferred from another institution, no more than half of the credit hours on the major program may consist of transfer credit.** The academic advisor, the chairperson of the department, and the appropriate assistant dean must approve any request for a variation in this policy.

**For Honors students, the GE curriculum and major must be approved by the assigned Honors advisor.** Information about the honors curriculum and requirements and how to schedule an appointment with an honors advisor is available on the College of Arts and Sciences Honors Program website: <http://aschonors.osu.edu/advising>. Students will also be assigned a faculty advisor in the department of study to help the student choose courses and co-curricular opportunities that align with academic and professional goals.

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**For more information about internship and career opportunities, visit the College of Arts and Sciences Career Services Office.** Their website is <http://asccareerservices.osu.edu/>.

# Geographic Information Science (Bachelor of Science)

## Geographic Information Science Major

Requires 121 Total Credit Hours; 33 Major Credit Hours

### GENERAL EDUCATION

College of Arts & Sciences Bachelor of Science general education requirements apply.

Please visit <https://artsandsciences.osu.edu/academics/current-students/advising/ge>

### MAJOR REQUIREMENTS

NOTE: Several major courses are offered only one term per year. Careful schedule planning is required to complete course sequences in a timely manner.

#### Required Prerequisites to Courses in the Major (should be completed as soon as possible)

Course	Title	Hours
CSE 1114	Intro to Databases Using MS Access	1.5
STAT 1450 <b>OR</b> STAT 2450	Intro to the Practice of Statistics <b>OR</b> Introduction to Statistical Analysis I	3

*Prerequisites are course specific. There are no prerequisites that must be completed before declaring to the major.*

#### Required Courses (8 courses/24 hours)

Course	Title	Hours	Required Prerequisite
GEOG 4103 *	Introductory Spatial Data Analysis ( <i>previously GEOG 5100</i> )	3	Math 1116 or above
GEOG 5200(S)	Cartography and Map Design	3	None
GEOG 5201 **	GeoVisualization	3	GEOG 5200(S)
GEOG 5210	Fundamentals of Geographic Information Systems	3	None
GEOG 5212 * **	Geospatial Databases for GIS	3	GEOG 5210 & CSE 1114
GEOG 5222 **	GIS Algorithms and Programming	3	GEOG 5212
GEOG 5223 **	Design and Implementation of GIS	3	GEOG 5222
GEOG 5225	Geographic Applications of Remote Sensing	3	None

\* Prerequisite course required to enroll.

\*\* Part of major course sequence. Major course(s) must be completed with a "C-" or better as prerequisite to enroll.

NOTE: Major course sequences require a minimum of 4-5 semesters to complete depending upon term of first course and ability to enroll concurrently in CSE 1114 and GEOG 5210 in first term.

### Elective Courses

Choose three of the following courses (9 hours).

Course	Title	Hours	Required Prerequisite
GEOG 5103 *	Intermediate Spatial Data Analysis	3	GEOG 4103 <i>Not open to students w/GEOG 5100</i>
GEOG 5226	Spatial Simulation and Modeling in GIS	3	None
GEOG 5229 *	Emerging Topics in GIS	3	GEOG 5210
GEOG 5XXX	One 5000-level topical course in Geography in addition to the courses above	3	Varies
CSE 2122 *	Data Structures Using C++	3	CSE 1222
CSE 2123 *	Data Structures Using Java	3	CSE 1223
CSE 3241 *	Introduction to Database Systems	3	CSE 2133 or 2231 & 2321
CSE 5242 *	Advanced Database Management Systems	3	CSE 3241 or 5241 & 2421 or 5042

\* Prerequisite course required to enroll.

## Major Requirements

The following requirements for the major apply to all Arts and Sciences degrees.

**Major requirements comprise at least 30 semester hours and can be substantially higher.** Major courses must be at the 2000 level or above. At least 20 hours of the major must be in courses offered by the department of the major. Note: Some interdisciplinary majors are excluded from the 20-hour rule.

**Students must earn at least a C- in a course for the course to be applied to the major.** However, students must receive a 2.0 cumulative grade point average (GPA) for all major course work. If a D+, D, or an E is earned in a course needed for the major, the course cannot be counted on the major. The major advisor will decide if the course should be repeated or if another course should be substituted. Courses taken on a pass/non-pass basis cannot be used on the major.

**The department must approve all courses in the major.** Some departments require a “major program form,” a document that must be signed by the academic advisor and submitted with the graduation application. Some departments do not require such a form because the academic advisors use an automated version on the degree audit report. Some departments require both. In any case, students should meet with the academic advisor early to plan the major; during your meeting, it can be determined whether the department requires a paper major program form. Any changes or adjustments to the major should be made in consultation with the academic advisor.

**If a student transferred from another institution, no more than half of the credit hours on the major program may consist of transfer credit.** The academic advisor, the chairperson of the department, and the appropriate assistant dean must approve any request for a variation in this policy.

**For Honors students, the GE curriculum and major must be approved by the assigned Honors advisor.** Information about the honors curriculum and requirements and how to schedule an appointment with an honors advisor is available on the College of Arts and Sciences Honors Program website: <http://aschonors.osu.edu/advising>. Students will also be assigned a faculty advisor in the department of study to help the student choose courses and co-curricular opportunities that align with academic and professional goals.

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# Geography: Spatial Analysis (Bachelor of Science)

## Spatial Analysis Major

Requires 121 Total Credit Hours; 33 Major Credit Hours

## GENERAL EDUCATION

College of Arts & Sciences Bachelor of Science general education requirements apply.

Please visit <https://artsandsciences.osu.edu/academics/current-students/advising/ge>

## MAJOR REQUIREMENTS

NOTE: Several major courses are offered only one term per year. Careful schedule planning is required to complete course sequences in a timely manner.

### Required Prerequisites to Courses in the Major (should be completed as soon as possible)

Course	Title	Hours
CSE 1114	Intro to Databases Using MS Access	1.5
STAT 1450 <b>OR</b> STAT 2450	Intro to the Practice of Statistics <b>OR</b> Introduction to Statistical Analysis I	3

*Prerequisites are course specific. There are no prerequisites that must be completed before declaring to the major.*

### Required Courses (6 courses/18 hours)

Course	Title	Hours	Required Prerequisite
GEOG 4103 *	Introductory Spatial Data Analysis ( <i>previously GEOG 5100</i> )	3	Math 1116 or above
GEOG 5200(S)	Cartography and Map Design	3	None
GEOG 5201 **	GeoVisualization	3	GEOG 5200
GEOG 5210	Fundamentals of Geographic Information Systems	3	None
GEOG 5212 * **	Geospatial Databases for GIS	3	GEOG 5210 & CSE 1114
GEOG 4101	Undergraduate Research & Professionalization Seminar	3	12 hours in major

\* Prerequisite course required to enroll.

\*\* Part of major course sequence. Major course(s) must be completed with a "C-" or better as prerequisite to enroll.

## Elective Courses

Choose five of the following courses (15 hours).

One must be a physical or human geography course (denoted with \*\*\*)

Course	Title	Hours	Required Prerequisite
GEOG 5103 *	Intermediate Spatial Data Analysis	3	GEOG 4103 <i>Not open to students w/GEOG 5100</i>
GEOG 5222 * **	GIS Algorithms and Programming	3	GEOG 5212
GEOG 5223 * **	Design and Implementation of GIS	3	GEOG 5222
GEOG 5225	Geographic Applications of Remote Sensing	3	None
GEOG 5226	Spatial Simulation and Modeling in GIS	3	None
GEOG 5229 * **	Emerging Topics in GIS	3	GEOG 5210
GEOG 5300	Geography of Transportation ***	3	None
GEOG 5402	Land Use Geography	3	None
Choice	Any 3000 to 5000-level human geography course ***	3	None
Choice	Any 3000 to 5000-level physical geography course ***	3	None
CSE 2122 * <b>OR</b> CSE 2123 *	Data Structures Using C++ <b>OR</b> Data Structures Using Java	3	CSE 1222 <b>OR</b> CSE 1223

\* Prerequisite course required to enroll.



## Major Requirements

The following requirements for the major apply to all Arts and Sciences degrees.

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**Students must earn at least a C- in a course for the course to be applied to the major.** However, students must receive a 2.0 cumulative grade point average (GPA) for all major course work. If a D+, D, or an E is earned in a course needed for the major, the course cannot be counted on the major. The major advisor will decide if the course should be repeated or if another course should be substituted. Courses taken on a pass/non-pass basis cannot be used on the major.

**The department must approve all courses in the major.** Some departments require a “major program form,” a document that must be signed by the academic advisor and submitted with the graduation application. Some departments do not require such a form because the academic advisors use an automated version on the degree audit report. Some departments require both. In any case, students should meet with the academic advisor early to plan the major; during your meeting, it can be determined whether the department requires a paper major program form. Any changes or adjustments to the major should be made in consultation with the academic advisor.

**If a student transferred from another institution, no more than half of the credit hours on the major program may consist of transfer credit.** The academic advisor, the chairperson of the department, and the appropriate assistant dean must approve any request for a variation in this policy.

**For Honors students, the GE curriculum and major must be approved by the assigned Honors advisor.** Information about the honors curriculum and requirements and how to schedule an appointment with an honors advisor is available on the College of Arts and Sciences Honors Program website: <http://aschonors.osu.edu/advising>. Students will also be assigned a faculty advisor in the department of study to help the student choose courses and co-curricular opportunities that align with academic and professional goals.

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**For more information about internship and career opportunities, visit the College of Arts and Sciences Career Services Office.** Their website is <http://asccareerservices.osu.edu/>.