Course title: GIS and Mapping our Changing World
Course code: (GI) ENVI 3003 BRGE
Programs offering course: Global Architecture and Design, Berlin Open Campus Block
Open Campus Track: STEM and Society
Language of instruction: English
U.S. semester credits: 3.00
Contact hours: 45.00
Term: Fall Block III 2020

Course Description
This is an introduction to the field of spatial analysis and Geographic Information Systems (GIS). GIS is a vital analytical tool used to examine many local and global problems, such as deforestation, urbanization, human health, resources and conservation, and climate change. In this course, principles of spatial analysis and GIS are coupled with hands-on experience in one GIS software package. Emphasis will be placed on spatial concepts and reasoning as well as acquiring basic mapping and analytic skills using GIS software ESRI ArcGIS. By the end, students will have a complex comprehension of spatial reasoning, GIS functionality, and GIS application in mapping environmental changes on multiple scales.

Learning Objectives
By completing this course, students will:

- Demonstrate important concepts and principles of spatial analysis
- Exhibit literacy using spatial data models and formats
- Show competency using applications of geospatial analysis for local and global environmental issues
- Use basic ESRI ArcGIS
- Apply methods of spatial analysis
- Demonstrate ability to apply knowledge to a research project

Course Prerequisites
None.

Methods of Instruction
This course includes reading-based discussions, lectures and demonstrations, student-led presentations, a group mini project, and computer laboratory working sessions. In-class and out-of-class computer exercises will be completed on a weekly basis. These exercises are designed to provide hands-on experience with GIS technology and a methodology for implementing a GIS project. In most computer laboratory sessions, students will be given time to work on exercises including time for question and answer, and problem solving. In addition, discussions will include relevant and contemporary uses of GIS to map and help solve local, regional and global environmental changes.

Assessment and Final Grade
1. Mapping Task and Individual Reflection 20%
2. Computer Laboratory Work (6) 20%
3. Presentation 15%
4. Software Demonstration and Short-Answer Responses 25%
5. Participation 20%
TOTAL 100%

Course Requirements
Mapping Task and Individual Reflection

The assessment task relies upon the data gathered on the walking tour of the city of study in Week 1. In small groups of three, students are to determine the GPS coordinates of ten tourist sites in the central business area of the city they are studying.
Computer Laboratory Work (6)

Computer laboratory work consists of practical, hands-on exercises working with GIS software on case studies using local data. The computer laboratory work will be graded on the basis of active participation in the exercises, attention to detail on lab methodology, and critical analysis of experiment results.

Presentation

In groups of four, students are to present one example of an application of GIS in the area of wildlife conservation, social justice, or resource management. The presentation must be created through multimedia software or an application including: Canva, Prezi, SlideDog or PowerPoint. The presentation must include an overview of background information of phenomena profiled; the data collection methodology used; the data classification key; and a verbal description of trends evident in the visual map data.

Presentations are to run for a maximum of 10 minutes. Following the presentation, a few minutes will be allocated to a question and answer forum.

Software Demonstration and Short-Answer Responses

The final assessment will take place during class time. Students will use data and software to demonstrate GIS capabilities, and provide written answers to three essay questions on environmental change, GIS and remote sensing. The assessment will be graded according to: the appropriate choice of GIS tools, the quality of the GIS output, and the depth of knowledge and application of theory to practice evident in the essay responses.

Participation

Participation is valued as meaningful contribution in the digital and tangible classroom, utilizing the resources and materials presented to students as part of the course. Meaningful contribution requires students to be prepared in advance of each class session and to have regular attendance. Students must clearly demonstrate they have engaged with the materials as directed, for example, through classroom discussions, online discussion boards, peer-to-peer feedback (after presentations), interaction with guest speakers, and attentiveness on co-curricular and outside-of-classroom activities.

Attendance

Regular class attendance is required throughout the program, and all absences will result in a lower participation grade for any affected CIEE course. Due to the intensive schedules for Open Campus and Short Term programs, absences that constitute more than 10% of the total course will result in a written warning.

Students who transfer from one CIEE class to another during the add/drop period will not be considered absent from the first session(s) of their new class, provided they were marked present for the first session(s) of their original class. Otherwise, the absence(s) from the original class carry over to the new class and count against the grade in that class.

For CIEE classes, excessively tardy (over 15 minutes late) students must be marked absent.

Attendance policies also apply to any required co-curricular class excursion or event, as well as to any required field placement. Students may not miss placement/work hours at an internship or service learning site unless approved in advance by the Academic Director and placement supervisor. All students must complete all of the requisite 100 minimum work hours on site at the internship or service learning placement to be eligible for academic credit.

Students who miss class for personal travel, including unforeseen delays that arise as a result of personal travel, will be marked as absent. No make-up or re-sit opportunity will be provided.

Attendance policies also apply to any required class excursion, with the exception that some class excursions cannot accommodate any tardiness, and students risk being marked as absent if they fail to be present at the appointed time.

Absences for classes will lead to the following penalties:
N.B. Course schedule is subject to change due to study tours, excursions, and local holidays. Final schedules will be included in the final syllabus provided to students on site.

**Weekly Schedule**

**Week 1**

**Class: 1.1 Introductory Concepts**

This opening lecture will introduce the students to GIS and map analysis. Students will be given the opportunity to explore the key features and functionality of selected GIS databases, with the guidance of the lecturer.

Reading:


**Class: 1.2 Spatial Referencing Systems, ArcGIS and GIS data**

In the morning lecture, students will gain knowledge of concepts and principles of spatial referencing systems. This theoretical knowledge will be built on in the afternoon computer laboratory session. Here they will additionally be introduced to ArcGIS (Vector GIS) and GIS Data Structures during the lab session.

In the afternoon session, students will undertake date collection on a walking tour of the host city’s central business district and surrounds. Working in small groups of three, they will apply what they have learned by gathering GPS coordinates for major tourist sites and mapping them. This activity will contribute to the Mapping Task and Individual Reflection due at the end of Week 3.

Reading:


**Week 2**

**Class: 2.1 GIS Basics**

In this lecture, students will learn about the Vector or Object GIS and its capabilities. They will also be introduced to uncertainty in Spatial Data and Analysis.

Reading:


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<thead>
<tr>
<th>Percentage of Total Course Hours Missed</th>
<th>Minimum Penalty</th>
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<tbody>
<tr>
<td>Up to 10%</td>
<td>Participation graded as per class requirements</td>
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<tr>
<td>10 – 20%</td>
<td>Participation graded as per class requirements, 3% grade penalty &amp; written warning</td>
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<tr>
<td>More than 20%</td>
<td>Automatic course failure, and possible expulsion</td>
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</table>
Class: 2.2  Computer Laboratory Work

During the lab session, students will learn about topology and linear addressing. In collaborative
groups, students will map green spaces and analyze land use and land cover change in the city of study .

Reading:

Hunter, J.T., & Lechner, A.M. (2017). A multiscale, hierarchical, ecoregional and floristic
classification of arid and semi-arid ephemeral wetlands in New South Wales, Australia. Marine and
Freshwater Research, 69(3), 418-431 doi.org/10/1071/MF17006


Week 3

Class: 3.1  GIS Applications 1

In this class, students will explore cartography and map creation as well as raster data sets and
their capabilities. Finally, they will learn more about the application of GIS to the analysis of land
use, land cover and change detection. This theoretical framework will be supported by the analysis
of a case study of the changes to land cover as a result of mining operations.

Reading:

patterns of land cover due to mining activities in the Darling Range Western Australia: A Visual
Analytics Approach. Ore Geology Reviews doi.org.10.1016/j.oregeorev.2018.07.001

Class: 3.2  Creating Vegetation, Environmental Indices (Ndvi), GIS Environmental Application

Students will learn about creating vegetation and environmental indices (NDVI). They will use online
GIS and Remote Sensing platforms, such as Earth Engine (i.e. GlobCover: Global Land Cover Map),
and Global Forest Watch, for the analysis of an environmentally degraded area in the host country

Reading:

wetland ecosystems to environmental changes: Comerong Island, southeastern Australia. Journal of
Coastal Research: Special Issue 75 – Proceedings of the 14th International Coastal Symposium,
Sydney, 6-11 March 2016: 33-37. doi.org/10.2112/SI75-007.1

On-line resources:

WWF Global (2018). Access at
http://wwf.panda.org/our_work/forests/deforestation_fronts/deforestation_in_eastern_australia/

Due Date for Submission of Mapping Task and Individual Reflection

Week 4

Class: 4.1  GIS Applications 2

In the morning session, students will see how GIS can be used in resource management and
conservation. Students will also learn how to prepare data bases and 3D data. In addition,
students will discover the exciting applications of Story Maps. Key concepts will be developed with
application in the afternoon computer laboratory session.

Reading:

conservation and natural resource management. Annals of the New York Academy of Sciences,
Class:  4.2  Field Trip

Students will be introduced to the platform Open Street Map. This is a citizen-generated map utilizing GPS input for the personal knowledge of place, images and data sets.

Students will also partake in a walking tour of an urban centre that has undergone significant planning, architectural and cultural change in the last five years. Students will update information on Open Street Map to provide an accurate record.

Reading:

On-line resources:
Open Street Maps Accessed at: https://www.openstreetmap.org/
https://wiki.openstreetmap.org/wiki/OpenStreetBrowser/Category_list

Week 5

Class:  5.1  GIS, Environment and Society

Students will be introduced to global footprint mapping and to the developing area of environmental justice mapping. They will be introduced to the database EJSCREEN: Environmental Justice and Mapping Tool maintained by the United States Environmental Protection Agency. Students will collaboratively explore its functionality in the depiction of environmental and demographic indicators, which dictate exposure to harm, or access to healthy environmental conditions.

Reading:

Online resources:
Environmental Protection Authority (2018). https://www.epa.gov/ejscreen

Class:  5.2  Merging Human Demographics and Environmental Data

Building upon content of the previous lecture, students will learn how to merge human demographics and environmental data. During the computer laboratory session, they will be introduced to concepts such as spatial queries; attribute (field) calculations, location and distance calculations. They will practice the use of GIS to manage and extract environmental and social data, how to use existing datasets to create new layers, such as indices, and how to use GIS to sample layers and obtain data for statistical analyses.

Reading:
Week 6

Class: 6.1 GIS and the Future

Students will learn how to use GIS to predict and cope with global environmental change through the application of remote sensing and environmental monitoring. The second part of the session will be dedicated to students’ in-class presentations.

Reading:


Due Date for Submission of the In-class Presentations

Class: 6.2 Computer Laboratory Work

Students will practice how to use remote sensing data in GIS for Global Environmental Enforcement. As an activity, they will map the future of our global environment. This final session will allow for troubleshooting in preparation for the final assessment task.

Due Date for submission of Software Demonstration and Short-Answer Responses

Course Materials

Readings


Online Resources

https://acsqhc.maps.arcgis.com/home/index.html