The Minor Program in Geographic Information Sciences is designed to give students the technical skills needed to acquire, manage and analyze geographic data. Almost everything we do involves geographic information: deciding where to live and travel, environmental monitoring, and urban planning. Influenced by computer technology, the academic disciplines of geographic information science such as remote sensing, Geographic Information Sciences (GIS) and computer cartography have evolved dramatically in the past few decades. The fields of remote sensing, the science of obtaining geographic information from aircraft and satellites, and GIS, a computer technology that manages and analyzes different forms of digital geographic data, have been growing at an extraordinary rate. Computer cartography has revolutionized traditional cartography to vastly improve map making and visualization of geographic information in a multimedia environment. Students in the minor program will receive extensive training in digital processing of remote sensing observations and cartographic vector data, spatial analysis, and the display of information products. These skills are in great demand locally, nationally and globally.

The Curriculum: 15/16 credit hours
Choose one (3 or 4 cr.):
- Non Geography Major
  - GEOG 201/211(4) Geography of Environmental Systems. A systematic introduction to the processes and associated forms of the atmosphere and earth’s surfaces emphasizing the interaction between climatology, hydrology, and geomorphology.
  - GEOG 202 (3) The World in Cultural Perspective
Examines the imprint of cultural traits on the earth’s landscape. The transformation of the earth’s surface as a result of cultural diversity, settlement patterns, political organizations, cultural evolutions, and population growth.

Required Courses: (12 cr.)
- GEOG 372 (3) Remote Sensing. Principles of remote sensing in relation to photographic, thermal infra-red and radar imaging. Methods of obtaining quantitative information from remotely sensed images emphasizing the study of spatial and environmental relationships.
- GEOG 373 (3) Geographic Information Systems. Characteristics and organization of Geographic data; creation and use of geospatial databases; metadata; spatial data models for thematic mapping and map analysis; use of geographic information systems in society, government, and business. Practical training with use of advanced software and geographic databases.
- GEOG 306 (3) Quantitative Methods for Geographic and Environmental Sciences. Essentials in the quantitative analysis of spatial and other data, with a particular emphasis on statistics and programming. Topics include data display, data description and summary, statistical inference and significance tests, analysis of variance, correlation, regression, and some advanced concepts, such as matrix methods, principal component analysis, and spatial statistics. Students will develop expertise in data analysis using advanced statistical software.

Additional Courses for Geography and Non-Geography Majors
- GEOG 416 (3) Conceptualizing and Modeling Human-Environmental Interactions. Develops skills to carry out research that integrates environmental and economic aspects of sustainability by introducing extensively used quantitative tools for analyzing human-environmental interactions in the field of ecological economics. These include, e.g., index number calculations and decomposition analysis, Environmental Kuznets Curve (EKC), environmental input-output analysis and lifecycle analysis, and multi-criteria decisions aid (MCDA).
- GEOG 418 (3) Field and Laboratory Techniques in Environmental Science.
- GEOG 472 (3) Object-Oriented Computer Programming for GIS. Expands on conceptual and practical aspects of programming for geographic applications. The main focus of this course is to provide students more advanced programming in object oriented programming languages (i.e. Python). In addition, students will develop a proficiency in applying these advanced programming principles to manipulating spatial data sources within the Geographic Information Systems (GIS).
- GEOG 473 (3) Geographic Information Systems and Spatial Analysis. Analytical uses of geographic information systems; data models for building geographic data bases; types of geographic data and spatial problems; practical experience using advanced software for thematic domains such as terrain analysis, land suitability modeling, demographic analysis, and transportation studies.
- GEOG 475 (3) Computer Cartography. Advanced skills of computer mapping using more sophisticated software packages. Map projection evaluation and selection, coordinate system conversion, techniques of quantitative thematic mapping, map design and generalization, hypermedia and animated cartography. Emphasis on designing and making cartographically sound sophisticated thematic maps.
- GEOG 476 (3) Object-Oriented Computer Programming for GIS. Expands on conceptual and practical aspects of programming for geographic applications. The main focus of this course is to provide students more advanced programming in object oriented programming languages (i.e. Python). In addition, students will develop a proficiency in applying these advanced programming principles to manipulating spatial data sources within the Geographic Information Systems (GIS).
- GEOG 498N (3) Topical Investigations: Conceptualizing and Modeling Human-Environmental Interactions. This course aims to develop skills to enable students to carry out research projects, which integrate environmental and economic aspects of sustainability. Through lectures, group work, and hands-on computer sessions, the class will familiarize students with some extensively used quantitative tools for analyzing human-environment interactions. By the end of the semester you should have some understanding of a number of currently used approaches, software packages and tools for analysis within the fast-growing field of Ecological Economics.

Admission to the Program: There are no special requirements for the Geographic Information Science Minor Program. Geographic science methods are applicable to many diverse fields, such as agriculture, marketing and archaeology. The Department of Geographical Sciences welcomes students from every area of study.

Requirements:
- All credits for the minor must be taken in the Department of Geographical Sciences at the University of Maryland, College Park.
- All courses must be completed with a grade of 2.0 or better.
- No more than six credits are to be included in the Minor and student's major, supporting courses, and college requirements.
- GEOG306; credit only granted for: BIOM301, BMGT230, CCJS200, ECON321, EDM5451, GEOG306, GVPT422, PSYC200, or SOCY201

Application form attached, return to Advising Office, Lefrak 2181M.
Email: geog-advising@umd.edu
Phone: 301-405-4073
# Advising Worksheet
**Minor in Geographic Information Science (GIS)**

**NAME OF STUDENT________________________**
**UNIVERSITY I.D. NUMBER____________________**
**MAJOR________________________ SEMESTER DECLARED: ____________**
**TELEPHONE WHERE YOU CAN BE REACHED DURING THE DAY________________________**
**E-MAIL________________________**
**EXPECTED DATE OF GRADUATION________________________**

**REASON WHY DECLARING GIS YOUR MINOR (EXPAND ON YOUR SELECTION)**
**FRIENDS__________ CLASS__________ INSTRUCTOR__________ WEBSITE__________**
**JOB POTENTIAL__________ CURRICULUM STRUCTURE__________**
**OTHER________________________**

<table>
<thead>
<tr>
<th>COURSES COMPLETED TOWARD MINOR</th>
<th>DATE</th>
<th>GRADE</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NON-GEOGRAHICAL SCIENCES MAJOR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. GEOG 201/GEOG211</td>
<td>_______</td>
<td>____</td>
<td>4 HOURS</td>
</tr>
<tr>
<td>OR GEOG 202</td>
<td>_______</td>
<td>____</td>
<td>3 HOURS</td>
</tr>
<tr>
<td>2. GEOG 372</td>
<td>_______</td>
<td>____</td>
<td>3 HOURS</td>
</tr>
<tr>
<td>3. GEOG 373</td>
<td>_______</td>
<td>____</td>
<td>3 HOURS</td>
</tr>
<tr>
<td>4. GEOG 416, 418, 472, 473, 475, 498N</td>
<td>_______</td>
<td>____</td>
<td>3 HOURS</td>
</tr>
<tr>
<td>5. GEOG 306*</td>
<td>_______</td>
<td>____</td>
<td>3 HOURS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GEOGRAPHICAL SCIENCES MAJOR (INCLUDES ENSP-LA, GLOBAL, AND COASTAL)</th>
<th>DATE</th>
<th>GRADE</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. GEOG 372</td>
<td>_______</td>
<td>____</td>
<td>3 HOURS</td>
</tr>
<tr>
<td>2. GEOG 373</td>
<td>_______</td>
<td>____</td>
<td>3 HOURS</td>
</tr>
<tr>
<td>3. GEOG 416, 418, 472, 473, 475, 476, 498N</td>
<td>_______</td>
<td>____</td>
<td>6 HOURS</td>
</tr>
<tr>
<td>4. GEOG 306*</td>
<td>_______</td>
<td>____</td>
<td>3 HOURS</td>
</tr>
</tbody>
</table>

**REMINDR: STUDENT MUST ACHIEVE A “C” OR BETTER IN EACH COURSE APPLIED TO THE GIS MINOR.**

**THIS STUDENT HAS COMPLETED ALL THE REQUIREMENTS FOR A MINOR IN**
**Geographic Information Sciences (GIS).**

**SIGNATURE OF GEOGRAPHICAL SCIENCES ADVISOR ________________________**
**DATE ________________________**