

## B.S. in Environmental Geographic Information Science Program Overview

Learn more at <https://machias.edu/environment/>

Environmental Geographic Information Science is, by nature, an interdisciplinary field, so the proposed program core incorporates coursework in geospatial technology, data acquisition, environmental studies, geographic inquiry, computer and data science, programming, and design. Each course in the program is included to address skills, knowledge and competencies outlined in the [US Department of Labor Geospatial Technology Competency Model](#) and emerging workforce needs as identified by the US Department of Labor and workforce research. Courses incorporate hands-on, applied projects that not only reinforce course skills and competencies, they also teach soft skills required for career success such as critical thinking, project management, oral and written professional communication, ethics, initiative, etc.

The program concentrations prepare students for specific sectors of the geospatial workforce, providing both specialized knowledge and advanced technical skills:

- Ecological Applications concentration (18 to 20 cr) includes a thorough foundation in biological and ecological sciences and the GIS tools and practices used in natural science fields. Because this pathway includes multiple field courses, it is not available in an online-only format.
- Community Applications concentration (18 cr) combines coursework in community studies and related social sciences with tools and practices used in community and regional planning, government, and land records management. This pathway is available in both on-campus and online formats.
- Spatial Data Science concentration (17 to 18 cr) incorporates quantitative analysis and programming skills necessary for work in application development and research or conservation analytics. This pathway is available in both on-campus and online formats.

### Outline of required and/or elective courses

#### Program Core (55 - 57 cr)

*Note: Program includes 19 to 20 credits in gen ed core.*

#### First Year Seminar

1 – 2

(Select one; waived for transfers with 15 or more credits)

FYS 101 - Science Bridge (1)

ENV 102S - Atlantic Salmon Conservation Projects (2)

BIO 114 - Careers in Fisheries & Wildlife Biology (2)

GIS 1XX - Intro to Geospatial Careers (online) (1)

#### Environment & GIS

27

ENV 112 – Environmental Issues (3)\*

ENV 213 – Environmental Ethics and Values (3)\*

Scientific Inquiry (4)\*

(Select one)

BIO 117 – This is Life!

ELA 113 – Natural Environments

GIS 1XX – Our Digital Earth

GIS 204 - Intro to GPS (change to Intro to Satellite Positioning & Navigation Systems) (2)

GIS 300 - Geographic Information Systems I (4)

GIS 400 - Geographic Information Systems II (4)

GIS 420 - Remote Sensing and Image Analysis (4)

GIS 428 - Web-Based Maps, Applications & Services (3)

Geography

6

GEO 101 - Introduction to Geography (3)\*

GEO Elective (choose one GEO course 200 level or above) 3

Note: These can be taken through UMM, USM, UMF, or UM. USM and UMF frequently offer geography field courses that make heavy use of GIS & GPS and would make attractive electives. Also, this requirement may be met by UM graduate courses in [Spatial Information Engineering, Spatial Informatics, and \(proposed\) Data Science Engineering 4+1 programs](#)

Computer & Data Science

9

CIS 150 - Introduction to Data Science (UMA) 3

CIS 255 - Database Design (UMA) 3

GIS 2XX - Python Scripting for GIS (UMA) 3

Design & Communication

8 (or 9)

ART 101 – 2D Fundamentals of Art (3)\*

Or

ART 106 – Art Fundamentals (3)\*

ART 213 - Graphic Design I (3)

ENV 224 - Scientific Writing and Presentation (2 or 3)

GIS Capstone

4

GIS 424 - Advanced Projects in GIS (4)

OR

GIS 426 - Community Applications in GIS (4)

**CONCENTRATIONS (choose one)**

Ecological Applications Concentration

18 to 20cr

(NO ONLINE PATHWAY)

BIO 118 - Animal Life (BIO 117 is a prereq) 2

BIO 119 - Plant Life (BIO 117 is a prereq) 2

BIO 245 - General Ecology 4

MAT 215 - Applied Statistics 4\*

OR

GIS 431 - Introduction to Geostatistics 4

Choose one:

BIO 227 - Invertebrate Zoology 4

ENV 103 - Oceanography 4  
BIO 212 - Ornithology 4  
BIO 216 - Mammalogy 4  
BIO 223 - Marine Mammals & Pelagic Birds 4  
BIO 229 – Plant Systematics 4  
BIO 313 - Ichthyology 4  
BIO 333 – Plant Ecology 4  
BIO 235 - Introduction to Fisheries & Wildlife Management 3  
REM 412 - Interpretation of Natural & Cultural Resources (Jr standing) 3

Choose one:

GIS 312 - Municipal Applications of GIS (UMM) 3  
CIS 449 - R (UMA) 3  
CIS 355 - Sensors (UMA)  
GEO 340 - Digital Mapping (USM) 4  
GEO 445 - Drone Mapping (USM) 3  
Other GEO or GIS course, as approved by division 3 or 4

Options, including field courses, available through UM, UMF & USM. Also, this requirement may be met by UM graduate courses in [Spatial Information Engineering, Spatial Informatics, and \(proposed\) Data Science Engineering 4+1 programs](#)

### Community Applications Concentration

18 cr

(ON-CAMPUS & ONLINE PATHWAYS)

CMY 101 - Introduction to Community Studies 3  
GIS 312 - Municipal Applications of GIS (UMM) 3  
MAT 113 - Introduction to Statistics 3\*  
OR  
MAT 124 - Statistics for Social Sciences 3\*  
GEO 343 Community Planning (UMF) 3  
OR  
GEO 340 Sustainable Land Use (UMF) 3

Choose one:

GIS 429 - Geographic Information Systems Internship (UMM) 3  
CIS 352 - Data Visualization (UMA) 3  
GEO 445 - Drone Mapping (USM) 3  
Other GEO or GIS course, as approved by division 3 or 4

Options, including field courses, available through UM, UMF & USM. Also, this requirement may be met by UM graduate courses in [Spatial Information Engineering, Spatial Informatics, and \(proposed\) Data Science Engineering 4+1 programs](#)

Choose one:

SOC 101 – Introduction to Sociology\*  
SOC 301 - Rural Sociology 3

ANT 212 - Environmental Anthropology 3  
BUS 111 - Introduction to Business & Entrepreneurship 3  
ECO 223 - Environmental Economics 3  
MAN 301 - Management 3  
POS 305 - Environmental Policy 3  
REM 412 - Interpretation of Natural & Cultural Resources (Jr standing) 3

Spatial Data Science Concentration

17 to 18 cr

(ON-CAMPUS & ONLINE PATHWAYS)

CIS 218 - Introduction to SQL (UMA) 3  
MAT 126 - Calculus I 4\*  
GIS 431 - Introduction to Geostatistics (UMM) 4  
CIS 353 - Human Computer Interaction/User Design (UMA) 3

Choose one:

CIS 352 - Data Visualization (UMA) 3  
MAT 127 - Calculus II 4  
CIS 461 - Spatio-Temporal Information Science (UMA) 3  
CIS 355 - Sensors (UMA) 3  
CIS 449 - R (UMA) 3

Other CIS, GEO or GIS course, as approved by division 3 or 4. Also, this requirement may be met by UM graduate courses in [Spatial Information Engineering, Spatial Informatics, and \(proposed\) Data Science Engineering 4+1 programs](#)

NOTES ON RELATIONSHIP BETWEEN THIS PROGRAM AND THE GENERAL EDUCATION REQUIREMENTS

This curriculum includes a number of courses that also meet general education requirements. These are denoted by an \* in the course list. As a result, the number of credits required by the program are reduced by 19-20 credits depending on the math course selected. The Community Applications also requires SOC 101 Introduction to Sociology as a prerequisite to SOC 301 Rural Sociology. SOC 101 also meets a gen ed requirement in Social Contexts & Institutions.

To meet the Quantitative Literacy requirement of the UMM Gen Ed:

Select one:

- MAT 103M Algebraic Models in Our World (Community Applications concentration) 3 or 4
- MAT 111M College Algebra (Ecological Applications or Data Sci concentration) 3 or 4
- Or establish equivalence by:
  - Score at least 530 on SAT MSS exam or at least 21 on ACT math exam. (no credit is awarded, but the requirement is satisfied)
  - Score 50 or better on CLEP College Mathematics or College Algebra exam taken after 7/1/2001 or 500 or better on the same exam taken before that date

The Gen Ed requirement for a second math course is met within each concentration