GEOSPATIAL ENGINEERING

The Geospatial Engineering program is designed to equip students with advanced knowledge and practical skills in the rapidly evolving field of geospatial science and technology. This interdisciplinary program focuses on the acquisition, processing, analysis, and visualization of geospatial data, preparing graduates for leadership roles in industry, government, and research. The program is designed to provide you with an understanding of the fundamentals of Geographic Information Systems (GIS), positioning, timing, and navigation technologies such as the Global Positioning System (GPS), and includes several emphasis areas. A project-based capstone course promotes industry collaborations and real-world application of learned principles.

The graduate programs available in this multiple-industry field include:

- Master of Science

This can be completed wholly or partially through online work. GRE scores are not required. Other campus-wide rules for graduate degrees are repeated here only if modified; check the graduate studies section of this catalog for the latest updates. The catalog version in force during the semester of initial enrollment is the baseline for evaluation of graduation readiness. Details about required and elective courses can be found at the department webpage and in the graduate catalog.

The program addresses the growing demand for professionals who can leverage cutting-edge technologies such as Global Navigation Satellite Systems (GNSS), GIS, remote sensing, robotics, artificial intelligence/machine learning (AI/ML), and unmanned aerial vehicles (drones) to solve complex real-world problems. Students will gain a deep understanding of geodetic principles and their application in diverse fields. Laboratories and research sites are located in Missouri S&T's McNutt Hall, Rock Mechanics facility, Audubon Nature Center, and Experimental Mine.
Students can choose to specialize in one of the following areas of interest:

- **Remote Sensing and Earth Observation:** This emphasis focuses on the acquisition, processing, and interpretation of data from various remote sensing platforms, including satellite imagery, aerial photography, and Light Detection and Ranging (LiDAR), for environmental monitoring, resource management, and urban planning.
- **Navigation and Autonomous Systems:** This area explores the integration of geospatial technologies with robotics and autonomous systems, including topics such as autonomous navigation, sensor fusion, and robotic mapping for applications in surveying, construction, and precision agriculture.
- **Geodetic Systems:** This emphasis provides a deep dive into the theoretical and practical aspects of geodesy, including geodetic reference frames, gravity field modeling, and precise positioning techniques for applications in crustal deformation studies, infrastructure monitoring, and national mapping.

Master of Science
Geospatial Engineering

The Geospatial Engineering Master's program is designed for students with undergraduate degrees from a wide range of technical backgrounds, including disciplines such as geological, civil, and environmental engineering, geological and environmental sciences, and computer science. Students with these STEM degrees should have the baseline computational and mathematic requirements necessary for the required coursework. The program provides an advanced education in geospatial technologies, preparing graduates to address complex problems across multiple sectors.

The MS program in Geospatial Engineering offers an in-depth curriculum that covers essential geospatial technologies, including:

1. Global Navigation Satellite Systems (GNSS) and geodesy: Understanding satellite-based systems for positioning, timing, and navigation, as well as non-satellite-based positioning methods.

2. Remote Sensing and Synthetic Aperture Radar (SAR): Learning to interpret and analyze data from various imaging technologies.

3. Geographic Information Systems (GIS): Managing, analyzing, and visualizing spatial data.

4. Geomatics: Developing precision in mapping, surveying, and spatial data applications.

These core academic components are supplemented by hands-on training in industry-standard software and data analysis, allowing students to apply their skills in real-world scenarios. Through interdisciplinary courses, students gain collaborative experience, equipping them to work effectively with professionals from diverse fields.

Program Requirements:

The Master of Geospatial Engineering degree requires a minimum of thirty hours of graduate credit. The plan of study must include a minimum of twenty-four credit hours of 4000-. 5000-, and 6000-level lecture courses (1000/2000-level courses cannot be included). A minimum of nine credit hours of the required coursework must come from the group of 6000-level lecture courses. Additionally, no credit hours of graduate research may be applied toward the plan of study. Furthermore, to align with the listed program outcomes, the curriculum is organized into three major parts: (i) program core courses (15 credit hours), (ii) specialty elective courses (6 credit hours), and (iii) discipline-specific elective courses (9 credit hours).

Curriculum Structure and Course Requirements

Core Geospatial Engineering Courses

Take all 5 (15 credit hours).

GEO ENG 5144	Remote Sensing Technology	3
GEO ENG 5146	Applications Of Geographic Information Systems	3
GEO ENG 6150	Capstone Project in Geospatial Engineering	3
GEOPHYS 6401	Introduction to Positioning, Navigation, and Timing	3
GEOPHYS 6403	Advanced Positioning, Navigation, and Timing	3

Specialty Elective Courses: In consultation with their advisor(s), students take 6 credit hours (choose two courses out of three) for their specialty area of interest.

Area of Interest: Navigation and Autonomous Systems

ELEC ENG 5680	Introduction to Radar Systems	3
COMP ENG 5880	Introduction to Robotics	3
GEO ENG 6321	Advanced Mapping with Drones	3

Area of Interest: Remote Sensing and Earth Observation

GEO ENG 6146	Advanced Remote Sensing And Image Processing	3
GEOPHYS 6232	Introduction to Satellite Geodesy	3
GEO ENG 6321	Advanced Mapping with Drones	3

Area of Interest: Geodetic Systems

GEOLOGY 6211	Geodynamics	3
GEOPHYS 6232	Introduction to Satellite Geodesy	3
GEOPHYS 5432	Potential Field Theory	3