

# MichiganTech

## SCHOOL OF TECHNOLOGY ACADEMIC PROGRAM INFORMATION

### Bachelor of Science in Surveying Engineering

Surveying Engineering graduates are the major geospatial workforce for many industries and federal agencies. They fill a critical need in business and industry as supervisors and managers who possess a combination of engineering and managerial backgrounds. The ability of Tech graduates to contribute on the job from day one increases their value while providing them professionally rewarding careers with significant potential for advancement.

**Undergraduate enrollment:** 56

**Faculty:** 3

**Average class size:** \*21

**Average lab size:** \*12

**Courses with labs:** 10 of 21

**Credit hours required:** 130

\*Average class size and lab size statistics include all degree programs within the School of Technology.

**Advisor:** James C. Loman

**Phone:** (906) 487-2259

**Fax:** (906) 487-2583

**Email:** [jcroman@mtu.edu](mailto:jcroman@mtu.edu)

**Website:** <http://www.tech.mtu.edu/TLS>

#### Student/professional organizations:

- Douglass Houghton Student Chapter of the American Congress on Surveying and Mapping
- Lambda Sigma Honor Society
- Epsilon Pi Tau Honor Society

**Accreditation agency:** Accredited by the Applied Science Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone: (410) 347-7700. *A change in accreditation (EAC rather than ASAC) is being sought for all students admitted after August of 2005 due to the program change from Surveying to Surveying Engineering.*

#### Why get a degree in Surveying Engineering?

The Surveying Engineering curriculum provides a unique blend of theoretical and practical knowledge that prepares students to create the future. Excellent support from the surveying profession ensures that our students gain exposure to state-of-the-art equipment and software as well as making numerous scholarships available. There are abundant opportunities for summer jobs in the public and private sectors throughout Michigan and the nation with many students securing their first job offer prior to their senior year. Students have numerous opportunities to increase their professional awareness and supplement their leadership skills through active participation in the Student Chapter of the American Congress on Surveying and Mapping. Students may also get involved with faculty sponsored research or volunteer to help an upper-class person conduct his or her senior project. The Surveying Engineering degree is not terminal and has great potential for further advanced and research-oriented graduate degrees in multiple geospatial disciplines including geodesy, photogrammetry, cartography and geospatial information sciences.

#### What will I learn?

Students will learn geospatial systems and spatial data obtaining technologies by means of high-precision optical and electromechanical instruments, satellite and aerial remote earth observation systems, aerial and terrestrial laser scanners, and global positioning systems. They will understand how to compare various geospatial data obtaining technologies and formulate conclusions on optimal ways of earth mapping projects for specific purposes and required accuracy. The curriculum includes the use of Global Positioning System (GPS) techniques for high precision control surveys as well as other surveys wherever it is appropriate. Geographic Information Systems (GIS) technology is taught as part of the curriculum to collect, analyze, and interpret data for surveying and engineering applications. A sampling of course topics from the Surveying Engineering program follows:

- Communication, both oral and written
- Physics (lab based)
- Calculus, Statistics, Linear Algebra
- Cartography
- Computer Applications and Programming
- Engineering Problem Solving
- Accounting Principles and Business Law
- Remote Sensing
- Geomorphology
- Data Collection Systems
- Professional Practice
- Land Subdivision Design
- Surveying Fundamentals and Practice
- Survey Computations
- Survey Measurements and Adjustments
- Legal Aspects of Surveying
- Boundary Surveying Principles
- Route and Construction Surveying
- Geodesy
- Geodetic Adjustments Theory
- Geodetic Positioning
- Photogrammetry
- Geospatial Information Technology
- Surveying Field Practice

## **What is Surveying Engineering?**

Geospatial means linking information to location. Sustainable development of a society depends greatly on the availability and reliability of geospatial data. Terabytes of multi-dimensional geospatial data and metadata are acquired using various sophisticated instruments such as global navigational satellite systems, aerial and satellite panchromatic hyper-spectral remote sensors, high-precision optical/electronic surveying instruments, laser scanning systems, radars, sonars, etc. The roots of geospatial technology are geodetic science, photogrammetry, cartography, surveying, topographic mapping, and thematic mapping. In this context, surveying is the geospatial science of measuring the physical features of the earth using specialized equipment and procedures to obtain highly accurate results. Surveyors as professionals perform boundary and engineering-related surveys to prepare maps, plots, and plans depicting topography. They also verify the location of existing or planned surface or subsurface features in relation to the existing survey control.

## **Who will I work for?**

There is a large and growing need for engineers and scientists with advanced training in the geospatial technologies. In particular, there is a recognized need in different disciplines to gather, analyze and interpret geographically referenced spatial information and data. Specifically, opportunities for Surveying Engineering graduates have been excellent in positions across the U.S. Students are immediately valuable to prospective employers thus ensuring that you will obtain a professional, career-focused job upon graduation. Surveying Engineering program graduates are highly sought by both public and private sector organizations. This trend will only strengthen in coming years since a lot of the baby boomer generation of surveyors will soon be approaching retirement age. While many Surveying Engineering graduates have found work in the public sector or with utilities, most graduates find exciting careers in the private sector with small, medium or large engineering or surveying firms. Job opportunities for interns and graduates are available in surveying, cartography, photogrammetry, and as field engineers. Most states require professional licensure of surveyors. The requirements vary, but generally the completion of a rigorous examination and a three to eight year apprenticeship with a registered surveyor is necessary.

## **How much will I make?**

New graduates can expect excellent starting salaries with almost 100% placement. Graduates report excellent earnings growth and careers that continually lead to more responsible leadership roles. The U.S. Bureau of Labor Statistics reported mean salary of surveyors at \$55,980 in May 2008. Median annual earnings in the middle 50 percent were \$52,980. The lowest ten percent earned \$29,600 and the highest ten percent earned \$85,620. Median earnings of surveyors employed in architectural, engineering, and related services were \$55,110 in May 2008.

## **What preparation do I need in high school?**

In preparation for a degree in engineering, the high school student should take chemistry, physics, at least three years of math, and as much English and communications as possible. In addition, practical, hands-on courses and at least one year of hands-on computer experience is strongly recommended.

**Average ACT:** Composite 25.1; English 23.7; Math 26.2

**Average high school GPA:** 3.5

## **Department of Labor Job Outlook**

As technologies become more complex, opportunities will be best for surveyors who have a bachelor's degree and strong technical skills. Upgraded licensing requirements will continue to limit professional advancement opportunities for those without a bachelor's degree. Increasing demand for geographic data, as opposed to traditional surveying services, will mean better opportunities for cartographers and photogrammetrists who are involved in the development and use of geographic and land information systems. New technologies, such as GPS and GIS, will also enhance employment opportunities for surveyors who have the educational background and technical skills that enable them to work with the new systems.

Overall employment of surveyors is expected to grow about as fast as average for all occupations through the year 2014. The widespread availability and use of advanced technologies, such as GPS, GIS, and remote sensing, will continue to increase both the accuracy and productivity of these workers, limiting job growth to some extent. However, job openings will continue to arise from the need to replace workers who transfer to other occupations or who leave the labor force altogether.

Opportunities for surveyors should remain concentrated in architectural, engineering, and related service firms, and federal government agencies. Areas such as urban planning, emergency preparedness, and natural resource exploration and mapping also should provide employment growth, particularly with regard to producing maps for the management of emergencies and updating maps with the newly available technology. However, employment may fluctuate from year to year as a function of construction activity or with mapping needs for land and resource management.