WATER STUDIES INSTITUTE

Located at the Great Lakes Campus on Lake Michigan, the Great Lakes Water Studies Institute (GLWSI) at Northwestern Michigan College is strategically positioned to engage individuals and organizations, both locally and globally, in advancing skills, knowledge and understanding of the world's dynamic water resources.

Programs

- Marine Technology, Bachelor of Science (https://catalog.nmc.edu/programs-az/water-studies/marine-technology/)
- Water Quality & Environmental Technology, Associate in Applied Science Degree (https://catalog.nmc.edu/programs-az/water-studies/water-quality/)

Courses

Water studies

WSI 105 - Intro to Freshwater Studies
Credit Hours: 3, **Contact Hours: 3**
This course is designed to provide an exploration to the field of water studies, with specific focus on freshwater. Students will discuss the impact of water related challenges and opportunities in the context of the great lakes of the world. Focus will be given to the new and emerging career and educational pathways associated with water resources and their management. In addition to regular class lectures, invited experts from business, education and community organizations will introduce relevant topics of local and global significance including policy, law, sustainable development, history, engineering, health, and commerce. Group 2 course. Communications - Direct, Degree Req:Cultural Persp/Div, Infused: Writing Intensive.
Recommended Prerequisite(s): MTH 100, ENG 111 - may be taken concurrently

WSI 106 - Introduction to Water Quality
Credit Hours: 3, **Contact Hours: 3**
This course is designed to provide an exploration of water related industries and applications, with specific focus on freshwater, water quality, and associated technologies. Areas of instruction include water resources, water remediation and the use of technology in the management of these freshwater systems. In addition to regular class lectures, invited lectures will introduce relevant topics of local and global significance as related to water resources. Group 2 course.

WSI 110 - OSHA HAZWOPER 40 hour
Credit Hours: 3, **Contact Hours: 3**
This course provides training on how to remain safe on a job site. It is for those involved in clean-up operations, voluntary clean-up operations, disposal, emergency response operations, and storage, and treatment of hazardous substances or uncontrolled hazardous waste sites. Group 2 course.

WSI 150 - Introduction to Site Assessment and Remediation
Credit Hours: 3, **Contact Hours: 4**
This course provides an introduction to the principles and techniques used for site assessment, remediation strategies, and monitoring techniques of contaminated groundwater and soils. Areas of emphasis include an overview of Phase I/II environmental site assessments (ESA), Environmental Impact Statements (EIS), Site Health and Safety Plans (HASP), and the practice of Standard Operating Procedures (SOP's) commonly used in various industries. Group 2 course. Communications - Direct.
Required Prerequisite(s): WSI 106, placement into ENG 111

Recommended Prerequisite(s): GEO 115

WSI 200 - GL Research Technologies
Credit Hours: 3, **Contact Hours: 4**
Advancements in Great Lakes research and monitoring techniques allow for an increased ability to access and assess remote locations through the use of enabling technologies and platforms including: Research Vessels, Remotely Operated Vehicles (ROV), SONAR systems (single beam, multibeam, scanning) and oceanographic buoy systems. Focus will be directed at understanding the basics of how each component is used and gain firsthand experience operating systems and collecting information. Field activities will take place in local water bodies, Grand Traverse Bay and onboard the R/V Northwestern. Group 2 course. Completion of MTH 111 and ENG 111 or appropriate placement scores.
Recommended Prerequisite(s): Recommended competencies: Ability to work/learn aboard R/V Northwestern and in the field

WSI 210 - Underwater Acoustics and Sonar
Credit Hours: 3, **Contact Hours: 4**
This course provides a foundation for the use of acoustics in the marine environment while focusing on best practices for underwater search, survey and visualization programs. Multiple sonar systems are presented and are representative of current industry equipment, operations and practices. Emphasis is placed on understanding field applications where sonar platform, water depth and temperature, target range and size, acoustic frequency and object reflectivity/absorption have an effect on target detection, resolution and data accuracy. Group 2 course.
Required Prerequisite(s): MTH 111 or higher

Recommended Prerequisite(s): PHY 105, Placement into ENG 111

WSI 211 - Sonar for Search & Recovery
Credit Hours: 1.5, **Contact Hours: 2**
This course provides training in the best use practices of multiple acoustic platforms for use in search and recovery operations typical to law enforcement, homeland security and first responders from multiple agencies. Group 2 course. Quantitative Reasoning.
Recommended Prerequisite(s): Prior use of sonar equipment in search and recovery applications

WSI 212 - Sonar for Marine Engineering
Credit Hours: 2, **Contact Hours: 3**
This course provides both classroom theory and hands-on practicum/field operations performed individually and in groups. Emphasis areas include demonstrating techniques of sonar operations critical to sonar performance, sonar data collection and data interpretation for use in marine engineering, survey and underwater construction activities. Group 2 course. Quantitative Reasoning.
Recommended Prerequisite(s): Prior use of sonar equipment in marine engineering applications

WSI 215 - Marine GIS & Data Processing
Credit Hours: 3, **Contact Hours: 4**
This course builds upon the basics of GIS taught in GEO 115 - Introduction to GIS, with a focus on basic spatial analysis techniques using standard and maritime/marine datasets. More advanced cartographic methods and spatial data management techniques are introduced using ArcGIS Desktop, Hypack, and other computer tools. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): ENV 115 or GEO 115 with a 2.0 or higher.

Recommended Prerequisite(s): Students must have intermediate computer and internet skills, typically acquired in ENV115 or GEO115 or similar

WSI 230 - Water Policy & Sustainability
Credit Hours: 3, **Contact Hours: 3**
This course is designed to provide a basic understanding of the fundamental principles of water law and policy and human relationships, use, threats, and conflicts over water and aquatic resources. The course emphasizes a new integrative approach to water issues based on the nexus of the water commons to health, food, quality of life, energy, climate change, ecosystem, and economy. Group 2 course. Communications - Direct, Critical Thinking - Direct, Degree Req:Cultural Persp/Div, Infused: Writing Intensive.
Required Prerequisite(s): ENG 111 and MTH 100 or higher, both may be taken concurrently

Recommended Prerequisite(s): PLS 101, WSI 105

WSI 240 - ROV Systems and Operations
Credit Hours: 3, **Contact Hours: 4**
This course introduces the technology of remotely operated vehicles (ROV) as a system used for subsea activities including scientific study and research, subsea exploration and industrial applications. International Marine Contractors Association (IMCA) and Association for Diving Contractors International (ADCI) guidelines will be used for training. Students will gain firsthand experience operating the ROV for the purpose of collecting information from docks, piers, and research vessels. Group 2 course. Communications - Direct.
Required Prerequisite(s): EET 103 and MTH 111 or higher.

Recommended Prerequisite(s): ENG 111; Recommended competencies: Students should have basic computer skills and be comfortable working around water from either a boat or dock/pier

WSI 250 - Groundwater Monitoring and Aquifer Sampling
Credit Hours: 4, **Contact Hours: 6**
This hands-on course will introduce students to sampling protocols, procedures, quality control, preservation technology, field analysis, and data interpretation. Students will learn how to sample soil, sediments, surface water, groundwater, and air using industry-accepted protocols and industry standard equipment. Proper logbook development, Chain of custody and quality assurance (QA) and quality control (QC) methods will be presented. Troubleshooting of equipment will be emphasized. Group 2 course. Quantitative Reasoning.
Required Prerequisite(s): WSI 150, EET 103

WSI 290 - Freshwater Studies Internship
Credit Hours: 1-3, **Contact Hours: 1-3**
The internship in Freshwater Studies is a field experience for students interested in developing competencies to address significant water-related issues impacting our region and the world. Students engage in research activities with local and global community partners to collaborate in the implementation of best water management practices. The program is customized according to students' background and specific career goals. Activities can include activities involving the monitoring of: water quality, invasive species, water distribution systems, and ecosystems. Group 2 course. Communications - Direct.

WSI 300 - Remote Sensing and Sensors
Credit Hours: 3, **Contact Hours: 4**
This course provides a foundation in the use of electronic sensors for remote observations. The focus will be on applications for marine and near-shore environments, though any sensor system/platform may be discussed. Basic sensor science will be applied to the study of remote sensing instruments, including marine acoustics, terrestrial acoustics, visible, laser/LIDAR, multispectral, and hyperspectral. Sensor development and evolution will be studied, as well as related current events including instruments used in deep-sea, commercial, military, and space science industries. Group 2 course.
Recommended Prerequisite(s): Placement into ENG 111

WSI 304 - Marine Electronics
Credit Hours: 3, **Contact Hours: 4**
Marine Electronics focuses on the systems, applications, electronics, and safety requirements specific to the marine and ROV environments. The design, repair and integration of cabling, tether, communication devices, sensors, and components into electrical systems will be emphasized. Students will use test equipment and protocols to develop troubleshooting methods to analyze and integrate this technology. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): EET 104 or EET 204

WSI 310 - Sonar Systems and Operations
Credit Hours: 4, **Contact Hours: 6**
This course provides advanced training for the use of sonar systems in the subsea environment. Students will utilize multiple sonar systems for the purpose of profiling and imaging nearshore infrastructure; positioning and navigation of subsurface equipment; and interpreting collected sonar data for use in marine subsurface applications. Specific sonar systems utilized will include multibeam sonar, side scan sonar, scanning sonar and USBL systems. Group 2 course.
Required Prerequisite(s): WSI 200, WSI 210

WSI 315 - Advanced Marine Survey & Data
Credit Hours: 3, **Contact Hours: 4**
This course provides a foundation in the coordination of maritime surveys from a pre-deployment standpoint. Students will be expected to have a strong understanding of the remote sensing science including capabilities and limitations of the sensor systems to be used. A major focus of the course will be to develop student skillsets for processing and merging marine and terrestrial datasets from a wide range of sources and systems. Significant time will be devoted to proper manipulation of data using commercial and freely-available tools. Group 2 course.
Required Prerequisite(s): WSI 215 - may be taken concurrently

Recommended Prerequisite(s): WSI 300

WSI 390 - Marine Tech Internship
Credit Hours: 2-4, **Contact Hours: 2-4**
The purpose of the internship is to provide on-the-job training for the student who wishes to pursue a career in a technical field of study. The internship will be customized to meet the learning needs of the student and the job requirements of the sponsoring firm. Students spend 10-15 hours per week in this paid, supervised on-the-job training experience. In addition to the required 50 hours per credit in a work site, students participate in semi-monthly seminars. Students must apply one month prior to the semester in which they will complete the internship. Group 2 course.
Recommended Prerequisite(s): 60 credits of program specific courses with a GPA of 2.0 or higher

WSI 397 - I/S Marine Technology
Credit Hours: 1-3, **Contact Hours: 1-3**

WSI 400 - Marine Technology Capstone
Credit Hours: 4, **Contact Hours: 4**
This course requires the synthesis and integration of knowledge and skills acquired across the Marine Technology curriculum for completion of a team oriented project and will require significant written, oral and visual deliverables including a final presentation. These field based projects will demonstrate a comprehensive approach to mission planning, technical equipment competency, budgeting, data collection/processing and dissemination to an audience. Group 2 course. Communications - Direct, Critical Thinking - Direct.
Required Prerequisite(s): WSI 390, WSI 405, WSI 433, WSI 440 can be taken concurrently.

WSI 405 - Marine Industry
Credit Hours: 3, **Contact Hours: 3**
This course focuses on contemporary issues and current events in the marine industry. It is intended to explore the global marine technology market while providing industry perspective from the marine sector including consequences of pollution, safety regulations, policy development, technology advances, and economics. Students will evaluate trends and conditions expected to influence the industry over the next five years. Group 2 course. Critical Thinking - Direct.
Required Prerequisite(s): Completion of 60 credit hours within major, Must include WSI 200, WSI 210, WSI 240

WSI 433 - Marine Project Management
Credit Hours: 3, **Contact Hours: 3**
This class covers the practice of project management, specific to the underwater marine environment (ROV/AUV/Sonar Technologies). The course will emphasize the core principles of project management, including scope development, schedules, resource planning, budgets, risk management strategies and communication methods. The curriculum aligns with the Project Management Institute “Body of Knowledge” and students can earn a Certified Associate in Project Management (CAPM) certification. Group 2 course. Communications - Direct, Critical Thinking - Direct.
Required Prerequisite(s): WSI 300, WSI 310, WSI 440

Recommended Prerequisite(s): WSI 315, WSI 440

WSI 440 - Advanced Marine Platforms
Credit Hours: 3, **Contact Hours: 4**
This course focuses on the use of complex marine platforms in multiple marine environments including multiple sonar systems, unmanned underwater vehicles and remotely operated vehicles. Students will learn mission planning, platform mobilization, launch and recovery techniques, remote guidance, and advanced troubleshooting of autonomous and remote systems. Subsea applications will include scientific study and research, subsea exploration and industrial applications. Group 2 course. Quantitative Reasoning.
Required Prerequisite(s): WSI 200, WSI 210, WSI 215, WSI 240 and instructor permission.

Course	Title	Credits
WSI 105	Intro to Freshwater Studies	3
WSI 106	Introduction to Water Quality	3
WSI 110	OSHA HAZWOPER 40 hour	3
WSI 150	Introduction to Site Assessment and Remediation	3
WSI 200	GL Research Technologies	3
WSI 210	Underwater Acoustics and Sonar	3
WSI 211	Sonar for Search & Recovery	1.5
WSI 212	Sonar for Marine Engineering	2
WSI 215	Marine GIS & Data Processing	3
WSI 230	Water Policy & Sustainability	3
WSI 240	ROV Systems and Operations	3
WSI 250	Groundwater Monitoring and Aquifer Sampling	4
WSI 290	Freshwater Studies Internship	1-3
WSI 300	Remote Sensing and Sensors	3
WSI 304	Marine Electronics	3
WSI 310	Sonar Systems and Operations	4
WSI 315	Advanced Marine Survey & Data	3
WSI 390	Marine Tech Internship	2-4
WSI 400	Marine Technology Capstone	4
WSI 405	Marine Industry	3
WSI 433	Marine Project Management	3
WSI 440	Advanced Marine Platforms	3