

MARITIME

Programs

- Maritime - Bachelor of Science Degrees (<https://catalog.nmc.edu/programs-az/maritime/maritime/>)
- Maritime - Deck Officer, Bachelor of Science (<https://catalog.nmc.edu/programs-az/maritime/maritime-deck-officer/>)
- Maritime - Engineering Officer, Bachelor of Science (<https://catalog.nmc.edu/programs-az/maritime/maritime-engineering-officer/>)
- Maritime - Power Systems, Bachelor of Science (<https://catalog.nmc.edu/programs-az/maritime/maritime-power-systems/>)

Courses

Maritime - Deck

MDK 100 - Survival at Sea

Credit Hours: 1, Contact Hours: 1

Division: Maritime

This course of instruction covers the following: concentrated instruction and training for the U.S. Coast Guard certification as Proficiency in Survival Craft and Rescue boats (PSC); including the fundamentals of seamanship, small boat handling with power and sail; construction equipment, and marking of the standard lifeboat; construction, equipment, and operation of inflatable life rafts; abandon ship procedures, man overboard procedures, and survival swimming; the launching and retrieval of lifeboats; sailboat nomenclature and operation. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 104 - Rigging & Ship Maintenance Lab

Credit Hours: 1, Contact Hours: 1

Division: Maritime

The purpose of this course is to provide the cadet an opportunity to acquire practical experience in general seamanship: including marlinespike seamanship, line handling; splicing line, splicing wire rope; rigging, block and tackle nomenclature and use; vessel maintenance, the practical application of the procedures and equipment needed in vessel upkeep. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 106 - Watchstanding I

Credit Hours: 1, Contact Hours: 1

Division: Maritime

The purpose of this course is to provide an opportunity for the cadet to acquire practical experience in shiphandling with vessels sufficiently large to duplicate shiphandling problems encountered with much larger vessels. Cadets are exercised in line handling, towing, anchoring techniques, landing techniques, and shipboard safety. Cadets will then advance through the use of simulation to shiphandling exercises dealing with the general principles of vessel control and the problems of handling a vessel in narrow channels. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 112 - Rules of the Nautical Road

Credit Hours: 2, Contact Hours: 2

Division: Maritime

Comprehensive study of the International Rules of the Road (COLREGS) including their origin, purpose, history, technical provisions, and application. Included is a comparative study of both international and inland rules, their interpretation and practical application as well as a study of case histories and legal interpretations resulting from collisions at sea. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 121 - Navigation I

Credit Hours: 3, Contact Hours: 3

Division: Maritime

An introduction to the principles of piloting and marine navigation. Includes chart projection, the magnetic compass, chart usage, buoyage systems, aids to navigation, fixes and running fixes, and the use of standard tables. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Corequisites: MDK 122

MDK 122 - Navigation I Lab

Credit Hours: 1, Contact Hours: 1

Division: Maritime

This lab is taken concurrently with MDK 121 and concentrates on applying the principles of piloting to plotting on the chart. Chart projection and use will be introduced. Dead reckoning, terrestrial fixes, set and drift, lines of position, and the use of navigational instruments will be covered. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Corequisites: MDK 121

MDK 149 - Damage Control & Safety

Credit Hours: 2, Contact Hours: 2

Division: Maritime

This course is designed to give the cadet a comprehensive knowledge of shipboard safety with particular emphasis on firefighting and damage control. Subject areas include: personal safety, pollution, U.S. Coast Guard rules and regulations, temporary damage repair, shoring principles and practical shoring problems. STCW. Group 2 course.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved curriculum guide and any deviation from this guide needs to be approved by the department head.

MDK 200 - Ship Business & Labor Relation

Credit Hours: 3, Contact Hours: 3

Division: Maritime

This course provides instruction in the organization, administrative functions, and management of a merchant vessel as well as the systems of operation of ship's business. It includes the study of union contracts, grievance procedures and labor management relations.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 206 - Watchstanding II**Credit Hours: 1, Contact Hours: 1**

Division: Maritime

The purpose of this course is to begin to develop a cadet's piloting and watch management skills. The use of the Shiphandling Simulator/ Academy Vessels will allow the development of the Bridge Team Concept through piloting exercises.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 210 - Deck Sea Project I**Credit Hours: 6, Contact Hours: 6**

Division: Maritime

During this internship the cadet is aboard TS State of Michigan or a Great Lakes commercial vessel. The cadet follows a prescribed course and studies: vessel operations, safety and navigation equipment and techniques. In addition the cadet spends a minimum of eight hours per day under the supervision of licensed officers gaining experience in various duties and responsibilities. STCW.

Required Prerequisite(s): Must complete first academic year with a 2.0 or higher in all required courses. All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 221 - Lakes Piloting**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

Study of the Great Lakes and principal ports; this includes currents, depths, aids to navigation, prevailing winds and their effects, recommended courses, shoals, reefs, and high traffic areas. Historic analysis will explain current practices.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 222 - River Piloting**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

An in-depth study of the rivers, channels, and the aids to navigation in these rivers and channels. The focus will be on the rivers that make up the Great Lakes connecting bodies such as the St. Mary's, St. Clair, Detroit Rivers and the Welland Canal.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 242 - Ship Stability**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

A study of the principles of stability; righting moment and righting arm; calculation of metacentric height; inclining experiment; stability computers and tables; practical stability and trim considerations. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 250 - Stability for the Engineer**Credit Hours: 1, Contact Hours: 1**

Division: Maritime

Principles, terms, and procedures used in the determination of transverse, longitudinal, and damage stability of ships. Investigation of the physical laws affecting a floating body. Effects of cargo operation, free surface, fuel consumption, and flooding on vessel stability. Scrutiny of case studies involving both partial or total loss of stability. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 290A - Academic Service Internship**Credit Hours: 1-4, Contact Hours: 1-4**

Division: Maritime

MDK 311 - Deck Sea Project II**Credit Hours: 6, Contact Hours: 6**

Division: Maritime

This internship is a continuation of MDK 210 and is designed to provide the cadet with advanced knowledge and sailing time to meet the licensing requirements prescribed by the U.S. Coast Guard and the criteria established by the Maritime Administration. STCW.

Required Prerequisite(s): Completion to second academic year with a 2.0 or higher in all required courses. All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 312 - Deck Sea Project III**Credit Hours: 6, Contact Hours: 6**

Division: Maritime

This internship is a continuation of MDK 311 and is designed to provide the cadet with advanced knowledge and sailing time to meet the licensing requirements prescribed by the US Coast Guard and the criteria established by the Maritime Administration. Group 2 course.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved curriculum guide and any deviation from the curriculum guide needs to be approved by the department head.

MDK 313 - Mate of Towing**Credit Hours: 3, Contact Hours: 6**

Division: Maritime

This course will provide knowledge and practical experience required for Deck Cadets to complete the Towing Officer Assessment Record (TOAR) and requisite sea days necessary to obtain their Mate of Towing (Great Lakes & Inland) endorsement to their Merchant Mariner Credential. Group 2 course. Communications - Direct, Critical Thinking - Direct, Quantitative Reasoning.

Required Prerequisite(s): MDK 210

MDK 324 - Navigation III**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

An introduction into nautical astronomy concerning: the practical application of celestial navigation, the solving of the spherical triangle, star identification, measurement of time and the use of the instruments. This course will cover plane, mid-latitude and mercator sailings and how to apply them to navigational problems through the various time zones. Sunrise, sunset, twilight, moonrise and moon-set calculations for a moving vessel will be covered. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Recommended Prerequisite(s): ENG 111 and MTH 111

MDK 330 - Medical First Aid Provider**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

This course meets the mandatory minimum requirements specified under STCW as related to proficiency in medical first aid for all merchant mariners. This course is part of the STCW certification process. Cadets will learn to take immediate action upon encountering an accident or other medical emergency. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 331 - Electronic Navigation**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

An in depth study of the various electronic navigation systems with emphasis on RADAR. Covers the theory, operation, use, advantages, disadvantages and general maintenance of: RADAR, gyrocompass, GPS, speed logs, fathometers, and electronic chart systems. REQUIRED COURSE that must be completed successfully before the student may receive an original "RADAR Observer Certificate". STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Recommended Prerequisite(s): ENG 111 and MTH 111

Corequisites: MDK 332

MDK 332 - Electronic Navigation Lab**Credit Hours: 1, Contact Hours: 1**

Division: Maritime

A practical course to understand the use and operation of a marine radar; including how to avoid collision situations using Rapid Radar Plotting. This required course must be successfully completed before the student may receive an original "Radar Observer Certificate". STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Recommended Prerequisite(s): ENG 111 and MTH 111

Corequisites: MDK 331

MDK 333 - Automatic Radar Plotting Aids**Credit Hours: 1, Contact Hours: 1**

Division: Maritime

This course presents the principals and operation of automatic radar plotting aids. It includes the legal aspects of ARPA including IMO and USCG standards, the theory in input and processing characteristic of ARPA, the theory of operation, control functions and adjustments, the acquisition and tracking of contacts, the limitations and potential errors of ARPA and special ARPA related features. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Recommended Prerequisite(s): ENG 111 and MTH 111

Corequisites: MDK 331

MDK 341 - Ship Construction**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

A study of hull construction as applied to all types of vessels. Includes construction nomenclature, criteria of design, methods of construction, materials used in construction and stress calculations. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Recommended Prerequisite(s): ENG 111 and MTH 111

MDK 345 - Dry Cargo Stowage**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

Principles and problems of the stowage and carriage of cargoes. Bulk cargo, container cargo, refrigerated cargo, grain cargoes and dangerous cargoes. Cargo handling operations both loading and offloading equipment. Cargoes stowage plans will be developed and reviewed. Students will critique loads they were involved with during their time aboard ship. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Recommended Prerequisite(s): ENG 111 and MTH 111

MDK 404 - Marine Supervisory Lab**Credit Hours: 1, Contact Hours: 1**

Division: Maritime

This course will provide senior cadets with the experience of supervising subordinate cadets. This experience will include job planning, sequencing of tasks, tools and equipment needed, and personnel required to complete the job. The student will experience what it will be like to be responsible for the crew both in terms of safety and output. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 411 - Marine Communications**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

This course is designed to acquaint the student with communication systems commonly found in the Marine Industry. It includes the basic layout of the Global Maritime Distress and Safety System (GMDSS), communication equipment requirements, licensing requirements, principles and procedures for marine communications, the characteristics of radio wave propagation, frequencies, and modulation. Included also is the Morse Code Flashing Light, and general Distress Signals. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Recommended Prerequisite(s): ENG 111 and MTH 122

MDK 431 - ECDIS**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

The purpose of this course is to meet the training requirements in STCW, as amended, for the operational use of Electronic Chart Display and Information Systems (ECDIS). This course provides the knowledge, skill and understanding of ECDIS emphasizing both the application and learning of ECDIS in a variety of underway contexts. This is achieved through use of a sophisticated navigation simulation integrated with a type-approved ECDIS. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Recommended Prerequisite(s): ENG 111; MTH 111 or higher

MDK 445 - Liquid Cargo Stowage**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

A study of the tanker industry and the operational aspects of the tank vessel, pollution, prevention, precautions and procedures; layouts of different types of tankers; operations sequence and oil tanker construction and terminology. USCG and OPA '90 regulations will be covered. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Recommended Prerequisite(s): ENG 111 and MTH 111

MDK 446 - Bridge Resource Management**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

Bridge resource management will be taught using small group discussions, case studies and simulation exercises. Areas that will be addressed will be route planning, watch management, pilotage of specific routes and ship handling from a 3rd mates perspective. The three hour class will start with a 30 minute group discussion of the class objective, then exercises followed by a critique of the exercises. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MDK 448 - Pilot/Mate License Prep**Credit Hours: 4, Contact Hours: 4**

Division: Maritime

A complete review of all professional subjects studied in the Maritime program pragmatically developed to reflect the essentials of the U.S. Coast Guard examinations. Cadets must complete all MDK courses with a 2.0 or better and receive a satisfactory grade in this course prior to being granted permission to sit for USCG license exams.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Recommended Prerequisite(s): ENG 111 and MTH 111

MDK 450 - Vessel & Port Security Officer**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

This course will provide required knowledge and skills for individuals designated to perform the duties and responsibilities of a Vessel Security Officer as defined in the Standards for Training, Certification, and Watchkeeping for Seafarers (STCW). Additionally, this course will provide required knowledge and skills for individuals designated to perform the duties and responsibilities of a Port Facility Security Officer as required in the Maritime Transportation Security Act (MTSA) and The International Ship and Port Facility Security Code (ISPS). Group 2 course.

MDK 454 - GMDSS**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

The purpose of this course is to meet the training requirements in STCW code, as amended, for the General Operator's Certificate for the Global Maritime Distress and Safety System (GMDSS). A student successfully completing this course and passing the prescribed examination will be licensed and enabled to efficiently operate a ship station's GMDSS equipment, and to have primary responsibility for radio communications during Distress incidents. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Recommended Prerequisite(s): ENG 111 and MTH 111; elementary computer skills

Maritime - Engine

MNG 100 - Intro to Vessel Operations**Credit Hours: 1, Contact Hours: 1**

Division: Maritime

This course is a general introduction to vessel operations. Topics covered include; the duties and responsibilities of vessel personnel, an introduction to the engine propulsion systems, the use of tools and auxiliary machinery, personal safety procedures, marine pollution prevention, and governmental regulations. This course provides a foundation for the deck and engineering cadet to build upon in his/her GLMA program of study. STCW

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 104 - Engine Systems Graphics**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

The course will acquaint the student to the proper use of measuring systems and drafting equipment. The course will introduce the techniques used in the production of multi-view projection, orthographic representation, auxiliary views, section views, and dimensioning. The student will be familiar with the correct (ANSI) symbols used in piping, electrical, and fluid power schematics. The student will be exposed in the use of CAD to produce the listed topics. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Corequisites: MNG 110

MNG 105 - Shipboard Information Systems**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

This course will introduce the student to the PC and its use as typically found aboard a Merchant Vessel. Basic computer setup, maintenance, and system troubleshooting are covered. Operating systems, communications programs, databases, word processors, spreadsheets, internet research, and CBT programs are discussed and demonstrated. The future of computers in the marine industry is explored. Special emphasis is given to group communications, group dynamics and problem solving and recognition, by developing process. Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 110 - Engineering Mechanics**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

Survey of the construction, operation, and maintenance of shipboard systems. The major emphasis will be on piping, valves, control valves, and pumps. Practical application of the above items will be supported in the lab portion of this course with computer simulation exercises. STCW. Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Corequisites: MNG 104

MNG 234 - Electronic Fundamentals**Credit Hours: 4, Contact Hours: 4**

Division: Maritime

This course bridges the gap between theoretical physics and practical hands on technology. Industrial electrical safety, shock hazards and emergency procedures are stressed. The cadet receives practical hands on experience with both analog and digital meters. Digital and analog circuits are created both in the lab and as computer simulations. Practical considerations of circuit construction in the field are discussed in terms of ABS, USCG, and IEEE regulations and requirements. Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 250 - Fluid Systems**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

This course will introduce the cadet to the shipboard hydraulic and pneumatic systems. The cadet will be introduced to the principles of fluid power: theory, components construction, operation, installation and maintenance, with an overview of these systems on a ship. STCW. Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 260 - Maritime Machining**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

This is a basic course that when completed a student will know the fundamentals and be able to operate common machine tool equipment like an engine lathe, band saw and vertical milling machine. Also covered will be measuring and inspection tools, drill press and surface plate. Quantitative Reasoning.

Required Prerequisite(s): Completion of first academic year. All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 270 - Issues in Power Production**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

This course will delve into current issues in the field of power production, including such areas as local, state, and federal requirements and interfaces. Renewable energy such as solar, wind, and biomass will be covered in detail. The future of energy and how it affects society will be explored. The student will develop an understanding of issues currently facing the power production issue.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 271 - Maritime Welding**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

A welding theory and practice course. Manipulative skills are emphasized for the Gas Metal Arc and Shielded Metal Arc Welding processes. Plasma Arc and Oxy-Fuel Cutting are also introduced. Appropriate reading assignments are included. Critical Thinking - Direct. Required Prerequisite(s): Completion of first academic year. All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Recommended Prerequisite(s): ENG 111 and MTH 111

Corequisites: MNG 271L

MNG 271L - Maritime Welding Lab**Credit Hours: 0, Contact Hours: 0**

Division: Maritime

See MNG 271 for course description. Critical Thinking - Direct. Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Recommended Prerequisite(s): ENG 111 and MTH 111

Corequisites: MNG 271

MNG 275 - Refrigeration**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

This course provides instruction in the operation and maintenance of refrigeration and air conditioning equipment used on merchant vessels. It covers the theory of refrigeration and the practical operation of refrigeration plants. The student is introduced to the Environmental Protection Agency (EPA) rules governing halogenated refrigerants (CFCs). A discussion of the proper procedures to recover, recycle, and reclaim (CFCs) is also discussed. Lecture is reinforced with the use of hands-on labs. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 290 - Power Systems Internship**Credit Hours: 5-6, Contact Hours: 5-6**

Division: Maritime

During this course, the student will be working in a commercial power facility following a prescribed course in the study of plant operations with particular emphasis on the machinery room and auxiliary equipment, including safety requirements. In addition, the student spends a minimum of eight hours a day under the supervision of a licensed operator gaining experience in the various engineering duties and responsibilities.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 314 - Diesel Engineering**Credit Hours: 7, Contact Hours: 7**

Division: Maritime

A comprehensive course dealing with the development of the diesel engine as it applies to marine propulsion. This course is designed to cover the construction, operation, and maintenance of the marine diesel engine and its support systems. Lecture is reinforced with extensive use of hands-on labs and computerized simulations. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 317 - Engineering Sea Project I**Credit Hours: 3, Contact Hours: 3**

Division: Maritime

During this course the cadet is on board the TS State of Michigan. The cadet follows a prescribed course of study in vessel operations with particular emphasis on engine room and auxiliary equipment, including safety requirements. In addition, the cadet spends eight hours a day under the supervision of a licensed officer gaining experience in various engineering duties and responsibilities. STCW. Critical Thinking - Direct.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 318 - Engineering Sea Project II**Credit Hours: 6, Contact Hours: 6**

Division: Maritime

This course is a continuation of MNG 317 and is designed to provide the cadet with advanced knowledge and sailing time to meet the licensing requirements of the U.S. Coast Guard, STCW and the criteria established by the Maritime Administration. STCW. Critical Thinking - Direct.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 319 - Engineering Sea Project III**Credit Hours: 6, Contact Hours: 6**

Division: Maritime

This course is a continuation of MNG 318 and is designed to further enhance the cadet's professional knowledge and sailing time to meet the licensing requirements of the U.S. Coast Guard, STCW and the criteria established by the Maritime Administration. STCW. Critical Thinking - Direct.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 321 - Marine Boilers**Credit Hours: 3.5, Contact Hours: 3.5**

Division: Maritime

This course is an intensive study of Marine Boilers and covers all types of Water Tube boilers. Emphasis is placed on construction, operation and maintenance of equipment. Sub systems such as fuel handling and combustion chemistry, air handling; water preparation and chemistry, automated combustion systems and water regulation systems are covered in detail. Special emphasis is placed on USCG regulations and STCW competencies. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 322 - Marine Turbines**Credit Hours: 2.5, Contact Hours: 2.5**

Division: Maritime

This course is an in-depth study of marine turbine propulsion plants. It covers theory, construction, operation, maintenance and inspection procedures typically associated with marine use. Associated systems such as lubrication, exhaust and condensate systems are also covered. Drive trains, reduction gear, stern tubes shafting and propellers are also discussed. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 323 - Marine Steam Lab**Credit Hours: 1, Contact Hours: 1**

Division: Maritime

This is a hands-on course intended to reinforce MNG 321 and MNG 322. Students will disassemble, inspect, and reassemble machinery typical of what is found aboard ship. Machinery condition will be noted and recommendations made. Machinery records will be updated. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

MNG 335 - Electric Machines and Controls**Credit Hours: 4, Contact Hours: 4**

Division: Maritime

This course covers the theory, application, operation, and maintenance of rotating machines as typically found aboard U.S. Merchant Ships and related industrial applications. Generators (DC and AC), motors (DC, multiple and single phase AC), transformers, and related equipment are covered. Special attention is given to magnetic relay and electronic logic control circuits. Regulations specific to CFR title 46 and IEEE are reviewed. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Corequisites: MNG 336

MNG 336 - Electric Mach. & Controls Lab**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

This course is a companion class to MNG 335. Course material is reinforced with practical hands-on experience with universal electrical lab machinery. The operating characteristics of typical rotating machines are studied. Special attention is given to problems associated with multiple generator AC distribution. Safe and effective troubleshooting techniques are practiced on live 110/208 volt electrical control systems. STCW.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Corequisites: MNG 335

MNG 455 - Engine Room Resource Mgmt.**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

This course uses the Engineering Simulators to strengthen the watch standing skills of the engineering cadet. The cadet will be required to operate shipboard systems, manage engine room personnel, and become familiar with preparing reports required in the operation of a modern engine room.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Corequisites: MNG 466, MNG 496

MNG 466 - Engine Room Business**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

This course is intended to acquaint the Cadet to the every day management and administrative activities confronting the Marine Engineer. The Cadet will be introduced to management and personnel skills necessary to deal with people problems peculiar to the marine environment. General issues of alcohol, drug abuse, and sexual harassment in the marine environment will be discussed, and placed in perspective with USCG and STCW protocols.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Corequisites: MNG 455, MNG 496

MNG 496 - License Preparation - Engine**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

A complete review of all professional subjects studied in the Maritime Engineering program. This course is designed to cover the essentials of the Third Assistant Engineer's examination administered by the U.S. Coast Guard. The final grade for this course is dependent on taking the U.S. Coast Guard license exam.

Required Prerequisite(s): All prerequisites for all GLMA courses are satisfied by following the approved Course Sequence Guide and any deviation from this guide needs to be approved by the cadet's adviser.

Corequisites: MNG 455, MNG 466

Naval Science

MNS 100 - Naval Science**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

This course is required of all Maritime Academy cadets and is an introduction to Naval Science specifically oriented toward Merchant Marine officers. It is intended to familiarize students with the role of the Merchant Marine in national defense and policy and with the various concepts of cooperation between the Navy and the Merchant Marine Industry. Group 2 course.

MNS 200 - Naval Science II**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

This course is required of all Maritime Academy cadets who are midshipmen in the Strategic Sealift Midshipman Program and optional for all other Maritime Academy cadets. It familiarizes the student with naval missions and heritage as well as to assist the Merchant Marine officer make the transition from civilian sailor to naval officer. Group 2 course.

Required Prerequisite(s): MNS 100

MNS 250 - Leadership and Ethics**Credit Hours: 2, Contact Hours: 2**

Division: Maritime

This course is required of all Maritime Academy cadets who are midshipmen in the Strategic Sealift Midshipman Program and optional for all other Maritime Academy cadets. It introduces students to western moral traditions and ethical philosophy with a variety of topics, such as military leadership, core values, and professional ethics that will prepare them for their role and responsibilities as a leader in the U.S. Navy of the 21st century. Group 2 course.

Required Prerequisite(s): MNS 200 or instructor permission.

Water Studies Institute

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 (HASPs), 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.