# Master of Science

**Program in**

# Marine Engineering

## 20015-2016 Catalog

**United States Merchant Marine Academy**
**300 Steamboat Road**
**Kings Point, NY 11024**

**(516) 726-5722**
**http://www.usmma.edu/academics/graduate-program**

## Authorization

The Merchant Marine Act of 1936 authorized the Merchant Marine Academy to train Merchant Marine officers and in 1949 Congress authorized the Academy to award Bachelor of Science degrees. The Defense Authorization Bill of 2004 authorized the Academy to offer Master of Science degrees. Subsequent to Congress' authorization, the Academy began offering a Master of Science degree in Marine Engineering.

The United States Merchant Marine Academy is operated by the Maritime Administration of the United States Department of Transportation.

## Organization

The Master of Science in Marine Engineering (MMarE) program is administered by the USMMA Department of Marine Engineering, one of the academy's two degree granting departments. The USMMA Academic Dean/Assistant Superintendent for Academic Affairs is responsible for the overall administration of the Academic Division.

## Accreditation

Middle States Commission on Higher Education

## MMarE Administrators

Rear Admiral James Helis, PhD, Superintendent
Capt. David Palmer, PhD, Interim Academic Dean
Capt. Joseph Poliseno, Engineering Department Head
Dr. William Caliendo PhD, P.E., MMarE Program Director

*The United States Merchant Marine Academy welcomes domestic students of any race, color, creed, sex and national or ethnic origin into its Master of Science in Marine Engineering program.*

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## MMarE Program Vision

The vision of the USMMA's Master of Science program in Marine Engineering is to take advantage of Twenty-first Century technology and offer the domestic and international marine industries a superior on-line Master's level education.

## MMarE Program Mission

The mission of the USMMA's Master of Science program in Marine Engineering is to offer practicing marine professionals the courses and educational experiences consistent with accepted academic and technical standards and consistent with the needs of the present and future marine industry.

## MMarE Program Goals

The goals of the United States Merchant Marine Academy's practice orientated Master of Science program in Marine Engineering are:

- **Students shall demonstrate advanced level knowledge in core marine engineering topics.**
- **Students shall become proficient in new computational tools such as computational fluid dynamics.**
- **Individual students shall be enabled to expand their knowledge of specialized topics related to marine technologies.**
- **Students shall be able to creatively apply knowledge to address challenges facing the marine community.**
- **Students shall be able to understand the technical, political and social dynamics that impact the discipline of marine engineering.**

## WHY MARINE ENGINEERING GRADUATE STUDY at the USMMA?

**Success, Advancement, and Promotion.** In today's internationally competitive environment the knowledge that comes from advanced higher education is necessary for advancement. For engineers the proper graduate education can be the decisive difference, the characteristic that sets the motivated engineer apart from colleagues and advances careers.

The surest investment a person can make is an investment in him/her self and the most valuable investment a company can make is an investment in its human capital, its professional work force. The United States Merchant Marine Academy's on-line, distance-learning Master of Marine Engineering program is an ideal investment for practicing marine engineers and engineers in similar fields such a power generation.

The United States Merchant Marine Academy's Master of Science in Marine Engineering program is designed for the practicing engineer seeking to enhance his/her technical foundation and professional growth while continuing full employment. Ending at the Master's level with the potential of continuing on for additional professional education, the MMarE program is a natural extension of undergraduate programs in Marine Engineering. For individuals without formal undergraduate Marine Engineering education, the MMarE program can build upon related engineering education and enhance an individual's prior education in a manner that supports professional growth and responsibility.

As a practice focused program, a requirement for admission is that upon admission to the program, the candidate have had two years of professional experience. By adding to an individual's undergraduate education and complementing two or more years of professional experience with advanced education, graduates of the MMarE program are in a position to excel as engineers and technical leaders.

Designed to allow enrollment by working professionals throughout the world, the program uses a combination of

asynchronous and synchronous distance-learning delivery. The fact that some courses may be enhanced by mid-semester, two-day in-residence sessions adds to the practice focus of the program.

The Academy is in compliance with the provisions of the United States Federal Higher Education Opportunity Act (HEOA), Public Law 100-315 concerning the verification of student identity in distance learning courses, as outlined in Dean's Memorandum 225.

The 36 credit program consists of a 21 credit core addressing all the principal aspects of Marine Engineering including a course in maritime policy. The core program is augmented by 15 credits of electives. The program offers students the opportunity to undertake independent design and research activity. The courses are all taught by subject experts and are designed to blend theory and application in a manner that enhances learning and develops skills in creative thinking.

Information and application forms may be obtained from the program web page: **http://www.usmma.edu/after-graduation/graduate-program**

## MMarE Program Description

As a means of increasing its support of the marine industry and the Nation, the United States Merchant Marine Academy has established the Master of Science in Marine Engineering (MMarE) program. The program focuses on the marine engineering aspects of ship design, operations and maintenance and marine equipment design; complements the traditional naval architecture and ocean engineering graduate programs available in the United States; and augments the formal education of marine industry professionals who have received their education in marine engineering as well as non-marine engineering undergraduate programs.

To insure that the program supports the marine industry and is available to as many practicing professionals as possible, the program is available as a distance-learning program. The distance-learning program involves a combination of asynchronous on-line lectures and synchronous on-line discussion

sessions via the Internet. In addition to the on-line classes and associated academic and research work, the students may be required to participate in a two-day, on campus session for selected courses during which appropriate class or lab sessions will be held. The on-campus sessions will be scheduled during the eighth ($8^{th}$) or ninth ($9^{th}$) week of the course. See the Academic Calendar for details. To optimize the student's time, the Academy will attempt to schedule the on-campus sessions in a manner that will allow students to participate in resident sessions for two courses in the two days.

The 36-credit MMarE program will center on a 21- credit core, augmented with 15 - credits of electives including the option to undertake a 3 to 6 credits thesis/design project. Germane elective tracks, such as electrical power and propulsion, will be offered. The intent of the thesis/design projects will be to allow the students the opportunity to explore relevant areas of interest and to enhance the profession's body of knowledge. Significant student reports, term papers and thesis may be electronically published.

## Master of Marine Engineering Academic Program

The heart of the 36-credit MMarE program is a required, 21 credits core consisting of the following seven courses:

| | |
|---|---|
| EM610 | Computational Methods |
| EM621 | Advanced Marine Power Plants |
| EM622 | Thermal System Design and Optimization |
| EM623 | Advanced Marine Materials |
| EM631 | Electrical Power Systems |
| EM650 | Internal Combustion Engine Analysis and New Technologies |
| EM670 | Marine Industry Policy |

The student must augment the core with 15 credits of electives.

Attempt is made to offer electives that address the needs of the marine industry and of interest to the students. Typical electives to be offered are:

| | |
|---|---|
| **EM615** | Computational Fluid Dynamics |
| **EM620** | Marine Propulsion Systems (1) |
| **EM624** | Vibrations of Marine Machinery and Structures |
| **EM625** | LNG Vessel Operations and Design Considerations |
| **EM626** | Marine Nuclear Propulsion |
| **EM632** | Control Theory & PLC Applications |
| **EM633** | Solid State Power Systems |
| **EM634** | Marine Electrical Systems and Propulsion |
| **EM642** | Reliability Engineering and Operations Research |
| **EM645** | Marine Engineering Management I |
| **EM646** | Marine Engineering Management II |
| **EM647** | Marine Engineering Management III |
| **EM660** | Hydrostatics and Basic Hydrodynamics (1) |
| **EM661** | Propulsion & Propulsors |
| **EM680** | Thesis/Design Project 1 (2) |
| **EM681** | Thesis/Design Project 2 (2) |
| **EM690** | Independent Study |

(1) - Only for students who have not had formal education in marine engineering and/or naval architecture
(2) - Faculty advisor/mentor for specific thesis/design projects/course will be selected from the Engineering Faculty at-large, depending on area of interest

Specific elective course offerings will depend on student interest and availability of faculty. Individual student elective course selections will be determined after the student confers with the MMarE Program Director or assigned faculty advisor.

## Standard Six-Semester Program
## *(Classes Entering Fall and Subsequent Classes)*

| **First Semester** | **Second Semester** |
|---|---|
| EM610, Computational Methods<br><br>EM650, I.C. Engine Analysis and New Technologies | EM631, Electrical Power Systems<br><br>EM621, Advanced Marine Power Plants |
| **Third Semester** | Fourth Semester |
| EM622, Thermal System Design and Optimization<br><br>EM23, Advanced Marine Materials | EM670, Marine Industry Policy<br><br>Elective 1 |
| **Fifth Semester** | **Sixth Semester** |
| Elective 2<br><br>Elective 3 | Elective 4<br><br>Elective 5 |

## Standard Six-Semester Program
## *(for Students Requiring ME/NA Prerequisites)*

| **First Semester** | **Second Semester** |
|---|---|
| EM610, Computational Methods<br><br>EM620, Marine Propulsion Systems Elective 1) | EM631, Electrical Power Systems<br><br>EM660, Hydrostatics and Basic Hydrodynamics (Elective 2) |
| **Third Semester** | **Fourth Semester** |
| EM23, Advanced Marine Materials<br><br>EM650, I.C. Engine Analysis and New Technologies | EM670, Marine Industry Policy<br><br>EM621, Advanced Marine Power Plants |
| **Fifth Semester** | **Sixth Semester** |
| EM622, Thermal System Design and Optimization<br>Elective 1 | Elective 3<br><br>Elective 4 |

# Admission Requirements

The USMMA Master of Science in Marine Engineering (MMarE) program is intended to expand the knowledge base of experienced, practicing engineering professionals. Accordingly, all viable candidates must have engineering work experience in addition to an undergraduate education in engineering or a closely related discipline, such as physics or chemistry. In addition, admission to the MMarE program is currently limited to citizens of the United States of America.

Admission to the program requires two or more years of engineering experience and successful completion of an accredited engineering program (Marine Engineering, Naval Architecture, Ocean Engineering, Mechanical Engineering, Electrical Engineering, Nuclear Engineering, etc.). Up to one year of experience may be granted for cadet shipping or internship accomplished as part of an undergraduate degree program. Candidate admission will be based on undergraduate academic performance, undergraduate program focus and professional experience since earning the undergraduate degree. Consideration will be given to those applicants who hold a valid Professional Engineers license or USCG Merchant Mariners Credential as an Assistant Engineers, or higher, in the assessment of an applicant's academic preparedness. (Proof of licensure must be provided with the application). Selection for admission to the program will be made by the MMarE Admissions Committee after careful review of the candidate credentials and experience. Admission to an individual MMarE course as a non-matriculated student will be made by the Graduate Program Director.

Admission from other related programs, such as non-engineering maritime programs, may be considered pending the candidate's completion of essential mathematics, science and engineering prerequisite coursers.

For acceptance, students are expected to have successfully completed undergraduate mathematics courses addressing calculus through multi-variable calculus and ordinary and partial differential equations. Candidates with deficient undergraduate mathematics coverage will be required to complete the appropriate mathematics courses prior to enrolling in the MMarE program. Completion of necessary prerequisite courses should be completed at local institutions of higher education after course approval by the MMarE Program Director. Candidates, who have been away from either the use of, or the study of, calculus and/or

differential equations for an extended period of time are encouraged to avail themselves of a refresher course at a local college or university.

The MMarE Admissions Committee will determine admission to the MMarE program on a rolling basis.

For consideration, an applicant must submit the following:

- MMarE Program Application Form
- Undergraduate Engineering Transcript
- Applicants educated in non-English speaking countries must submit verification of their TOEFL score
- Two (2) completed personal recommendation forms including one from an undergraduate engineering professor and one from a supervisor or employer
- Application fee check ($125.00) made out to "DOT/MARAD". Please include "MMarE Program" in the memo area.

Individuals requesting admission as non-matriculating students interested in enrolling in one or more course must submit the following:

- Letter stating why the individual desires to enroll in the particular course
- Copy of the applicant undergraduate engineering transcript
- One (1) completed recommendation from or supervisor or employer

Applicants will be informed of admission decisions on a rolling basis but no later than July 1, of the admission year.

Admission decision to individual MMarE courses as a non-matriculated student will be made by the MMarE Program Director or his designee.

Applicants will be informed of admission decisions on a rolling basis.

## Program Requirements

Students enrolled in the MMarE program are expected to enroll in core courses prescribed in the MMarE curriculum and to work with an advisor to select elective courses that will satisfy their interest and needs. Students are expected to complete the

program in five (5) years and meet the program graduation requirements.

**Graduation Requirements**

The minimum requirements for graduation are:

1. Complete the required MMarE syllabus previously noted.

2. Successfully complete the required core courses with a minimum grade of "C". Grades of "C-" will not be accepted. Students who earn a grade of less than "C" in a core course will be required to repeat the course. Students who earn a grade of less than "C" in an elective course will be permitted to repeat the course or select a substitute elective.

3. Earn a Cumulative Quality Grade Point Average of 3.0 for all courses taken, including any courses with a grade less then "C-".

## Assignment of Credit Hours

All courses for the USMMA Master of Science in Marine Engineering (MMarE) are 3 credit courses. A three-credit course is defined as a combination of two hours of asynchronous and one hour of synchronous course work. The weekly asynchronous lessons are downloaded from the course management system. The weekly one hour of synchronous presentation/class discussion are conducted through the use of a web-based meeting program.

Design project or thesis coursework (three or six credits, respectively) will contain an appropriate level of effort to the credit load of structured courses.

## Transfer Course Credit

Courses forming part of the MMarE program and completed elsewhere with a grade of "B" or better (3.0 on a 4.0 scale) will be considered for transfer if the course is equivalent to a MMarE program course. The transfer proposal must be approved by the MMarE Program Director. The proposal must be supported by

copies of the catalog description of the course and the course syllabus obtained from the college or university at which the course was taken. Additionally a sample of the work associated with the course must be submitted. A maximum of two (2) courses will be permitted for transfer into the MMarE program. For transfer consideration, the course must have been completed within the past five years of the date of the transfer proposal.

For a student who has completed a USMMA Power Certificate, and has been accepted into the MMarE program, all four courses from the Power Certificate may be applied to Master of Science degree.

For a student who has completed the MMarE program, and has enrolled in the USMMA Power Certificate, up to two courses (the core electrical engineering course, and one elective electrical engineering course) from the MMarE degree may be applied to Power Certificate.

**Academic Load**

Although the normal student load is two courses per semester, students who wish to accelerate their graduation may take up to four courses per semester. Enrolling in more than two courses per semester requires special approval from the MMarE Program Director.

Enrolled (matriculated) students are expected to complete the program in five (5) calendar years. Students who do not complete more than one (1) course in three (3) semesters will be considered as not making progress toward the degree and will be reviewed by the **MMarE Academic Review Committee**.

**Grading Procedure**

At the commencement of individual courses, each faculty member shall inform the students of the grading standards to be used in evaluating the student's performance. These standards will normally be included in the course syllabus posted by the faculty member.

**Grade Changes**

Grade changes are restricted to cases in which an error was made in computing a final course grade, or when an instructor re-grades an exam, paper or project that had been submitted while the course was ongoing. Requests for grade changes will not be approved for other reasons such as work submitted after the course ended. Grade change forms are submitted by the instructor and require the MMarE Program Director's, Engineering Department Head's and the Academic Dean's approval.

## Add/Drop Requirements

Students may petition to add a required or elective course within five business days of the start of the academic semester. Students have up to six (6) weeks from the start of the class to drop a course. Under extraordinary circumstances, such as illness, the MMarE Program Director may recommend to the Academic Dean to extend the add/drop period.

The grade of "W" will be recorded when a course is formally dropped.

## Grading System

Authorized grades for the MMarE program are:

A --- Outstanding

B --- Above Average

C --- Average

D --- Minimally passing, but does not satisfy graduation requirements

E --- Exempt

F --- Unsatisfactory/Failing

I --- Incomplete

W --- Withdrawal

A plus suffix (+) may be assigned to the grade of "B", "C" or "D" to show strong performance at the grade level. A minus suffix (-) may be assigned to grades of "A", "B" or "C" to show below average performance at the grade level.

## Grades Requiring Approval of the Academic Dean

The grades of "E", "I", and "W" must have the approval of the MMarE Program Director, the Engineering Department Head and the Academic Dean.

"I" grades must be completed by the date specified on the approval Incomplete Grade Form.

## Incomplete Grades, "I"

An "I" grade may be given where a faculty member determines that, due to special circumstances, the requirements of the course could not be met by the end of the semester. The work required to resolve the Incomplete must be completed by the date specified on the Incomplete Grade Form.

Normally, an incomplete grade will be resolved by the end of the seventh ($7^{th}$) week of the succeeding semester. An extension beyond the seventh ($7^{th}$) week requires the approval of the MMarE Program Director and the Academic Dean. A grade of "I" that has not been resolved, or that is not approved for extension beyond the seventh ($7^{th}$) week of the succeeding semester, will be converted to an "F".

## Average Computations

### Quality Point Average, (QPA)

The QPA is calculated at the end of each semester by dividing the quality points earned in the semester by the credit hours attempted during the semester.

### Cumulative Quality Point Average, (CQPA)

The CQPA is calculated at the end of each semester by dividing the total quality points for the duration of the student's enrollment in the MMarE program by the total credit hours the student attempted since enrolling in the program.

**Quality Points Earned**

The quality points earned for taking a given course will be calculated by multiplying the credit value of the course by the unit quality points associated with the earned grade. The following table will be used in the calculation of quality points:

| Letter Grade | Unit Quality Points | Letter Grade | Unit Quality Points |
|---|---|---|---|
| A | 4.00 | C- | 1.67 |
| A- | 3.67 | D+ | 1.33 |
| B+ | 3.33 | D | 1.00 |
| B | 3.00 | E | 0 |
| B- | 2.67 | F | 0 |
| C+ | 2.33 | I | 0 |
| C | 2.00 | | |

*- Not be use to satisfy the MMarE graduation requirements. C-, D+, and D must be repeated or, if it is an elective, it may be replaced by another elective course.

## Repeat Grades

For courses failed, or repeated in the attempt of earning a higher grade, the student's CQPA will be charged for the initial credits attempted and for the credits associated with the repeat courses. Grades of "I", "P" or "W" will not be included in the QPA or CQPA calculations.

## Academic Status

**Minimum Standards for Satisfactory Progress**

| Credits attempted | COPA Equal or Greater Than |
|---|---|
| 3 | 2.00 |
| 6 | 2.33 |
| 9 | 2.67 |
| 12 or More | 3.00 |

Graduate students are considered academically proficient if their previous term QPA is at least a 3.00, their CQPA is equal or above the values noted in the following table and no "F" grades were earned for the previous semester.

Graduate students will be assigned an academic deficiency if they are not making satisfactory progress toward graduation as explained in the **Minimum Standards for Satisfactory Progress** table and the **Academic Load** section noted above.

### Academic Deficiency Status Categories

The USMMA academic deficiency status categories are:

**Academic Warning** (**AW**) – the least serious academic deficiency status

**Academic Probation** (**AP**) – serious academic deficiency status

**Referred for Disenrollment** (**RFD**) – student's case will be reviewed by the **MMarE Academic Review Board** (**ARB**)

Students who are on an academic deficiency status for one semester and who fail to become academically proficient the next semester will be assigned the next more serious status.

Other factors affecting the down-grading of academic status categories are:

1. Receiving a grade of less than "C" for a course twice

2. Failing two or more required courses

In assigning academic deficiency status, the worst case applies. For example, if a student meets the semester QPA and CQPA as noted in the **Minimum Standards for Satisfactory Progress** table, but earns an "F" grade in a course, his/her case will be placed in the next more serious status, **AW.** If the example student was in an **AW** status, based on **QPA** and/or **CQPA**, and he/she earned an "F" in a course, the student will be assigned the status of **AP**.

**MMarE Academic Review Committee (MMarE-ARC)**

The **MMarE-ARC** will consist of the following USMMA Administration and Faculty:

Academic Dean
Engineering Department Head
MMarE Program Director
Two (2) MMarE Program Faculty Members

**Disposition of Referred for Disenrollment Cases**

The **MMarE-ARC** will request input from the student in question and faculty having knowledge of the student's ability and/or performance. It will review all of the facts at-hand and make an appropriate decision. The action decisions are:

1. Assign an appropriate academic status
2. Suspend the student with instruction to take or retake prerequisite or required courses as a means of strengthening his/her academic abilities and chances for successful completion of the program
3. Recommend to the USMMA Superintendent to disenroll the student

If a case reviewed by the **MMarE-ARC** results in a recommendation for disenrollment, the Dean will transmit the recommendation to the Superintendent.

The USMMA Superintendent is the final authority in all disenrollment cases.

**Leave of Absence**

Students who are progressing toward a degree in accordance with the **Minimum Standards for Satisfactory Progress** and are not

otherwise in an **Academic Deficiency Category** may, at any time, request a **Leave of Absence**. This request must be approved by the Dean. An official request for a leave of absence should be submitted to the Dean via the MMarE Program Director and the Engineering Department Head. An approved leave of absence will extend the allowable time to complete the degree by a defined period.

**Academic Advising**

Each student enrolled in the MMarE program will be assigned an Academic Advisor as soon as he/she enrolls. The academic advisor will be the MMarE Program Director or his designee and will work with the student to develop a coherent set of electives to augment the required core courses.

As the student's interest and the program goals become more focused, the academic advisor may be changed to better service the student. If a student elects to undertake a thesis or design project to satisfy elective requirements, the academic advisor may be change to be the same person as the thesis/ design project advisor.

**Official Record Keeping**

Official academic records for students enrolled in the MMarE program will be maintained by the USMMA Registrar's office. At the end of each semester the Registrar's Office will issue an official grade report for the courses registered for during the semester in question.

Official transcripts documenting a student's performance in the MMarE program will be available from the Registrar's Office in accordance with the Registrar's Office policies.

## Academic Schedule

The MMarE academic schedule departs from the traditional three semester USMMA academic schedule and will be based on a conventional two semester academic year with occasional summer semesters for students who want to accelerate the program completion. Each graduate program semester will consist of

approximately 14 teaching weeks and one week of examination. Although the starting and ending dates for each semester will vary from year to year, the starting dates for each semester will be approximately:

**Fall Semester** --- Last week in August
**Spring Semester** --- First week in January
**Summer Semester** --- First week in May

## Distance-Learning Student Responsibilities

Students are required to participate in all asynchronous classes, attend the synchronous class sessions and do all assignments associated with the courses. Students will be allowed to miss up to three (3) synchronous class sessions per course, but will be required to play back the synchronous class session and will be responsible for the subject matter of the lesson. In addition, the student will be required to attend the two-day, on-campus, in-residence session for appropriate courses. Under very special conditions, the on-campus, in-residence session requirement may be waived.

All homework's, papers, projects and other assignments identified in the course syllabus will be due on the posted due date.

Course grading policy will be indicated in the course syllabus.

## Distance-Learning Computer Requirements

Since the MME program depends upon online delivery, having the appropriate hardware and software is essential. Accordingly, all participants must have routine access to a personal computer. This is best accomplished by owning a laptop that can be used either at home or work as well as for travel. The computer should be at least a Pentium III MHz with a minimum of 1 MB of RAM and running a current version of the Windows operating system (Vista or later). It will also need to have a sound card (these are usually built into laptops).

The system software should include Microsoft Office (Word, PowerPoint, Excel). The Microsoft Word equation editor will

need to be installed during initial configuration. Participants will need to obtain other software for specific courses, some of which will be free and some will need to be purchased. Information on these programs will be provided in the course outlines.

It is the student's responsibility to ensure sufficient audio reception either through an appropriate phone connection or voice-over-IP connection.

A multimedia headset that includes a microphone will be needed for the telephone connection of the voice over IP aspect of the weekly web conferences. These headsets can be purchased at any office supply or electronics store for less than $20.

Participants will also need a high speed internet connection such as DSL or cable modem. A low speed (dial-up) connection will be it will be inadequate and put participants at a disadvantage in terms of the time it takes to access program materials, participate in sessions, and complete their assignments.

## Tuition and Fees

Tuition and fee levels for the program will be set by May 1st of the previous academic year and will be held constant for the academic year of record. All tuition will be posted on the Academy web site (http://www.usmma.edu/after-graduation/graduate-program). Textbooks and course specific material are the responsibility of the individual student.

Application fees are due with the application form. The tuition must be paid in full two weeks before the start of the new semester. Application fees are non-refundable. Tuition will be refundable according to the following schedule:

| | |
|---|---|
| Prior to the beginning of the second week | 75% |
| Prior to the beginning of the third week | 50% |
| Prior to the beginning of the fourth week | 25% |
| After the fourth week | 0 |

## Scholarships and Grants

Various professional organizations and classification societies offer grants and scholarships to their members to support marine engineering graduate studies. These include the American Society of Naval Engineers and the Society of Naval Architects and Marine Engineers. Applications for these scholarships are obtained from the sponsoring professional organizations or classification societies.

Graduates of the United States Merchant Marine Academy or any of the six state maritime academies/colleges are eligible for special scholarships offered by the American Bureau of Shipping. Requests for the Special ABS scholarships should be addressed to MMarE Program Director.

## Career Placement

Career placement services are not offered to students or graduates of the MMarE program.

# Master of Marine Engineering Course Descriptions

**EM610, Computational Methods** – 3 Credits

This course provides a working knowledge of selected computational methods used in engineering problem solving. The course will be presented from the perspective of computational mathematics as a tool. As such, basic theory will be presented, however use as a practical tool in modern engineering analysis and design will be stressed. The course will review classic solution of ordinary and partial differential equations in mechanics and the thermal sciences, with these same solutions accomplished numerically via use of a commercially available computer programing software incorporating a mathematics package.

**EM615, Computational Fluid Dynamics** – 3 Credits

This course introduces students to the use of computational fluid dynamics in marine engineering. After completing the course students will have a basic understanding of Computational Fluid Dynamics (CFD), and be able to solve simple CFD problems using a commercial CFD package.

**EM620, Marine Propulsion Systems** – 3 Credits

This is an introductory course addressing the fundamentals of marine propulsion prime-movers, propulsion systems and associated auxiliary machinery and systems. Diesel, gas turbines and steam propulsion plants will be addressed as well as the required fluid support systems, transmission systems and basic control systems. Students will be expected to apply knowledge of the engineering sciences (fluid dynamics, heat transfer, strength of materials and thermodynamics) to the analysis of marine power plants.

Prerequisites: Undergraduate Thermodynamics

**EM621, Advanced Marine Propulsion Plants** – 3 Credits

The study of marine propulsion plants beyond the conventional diesel, gas turbine and steam power plants. Topics of study will include combined diesel-exhaust gas turbine plants, combined gas turbine-steam turbine plants, nuclear gas cooled and water cooled

reactor plants and fuel cell based plants. Thermodynamic and operating issues will be studied.

Prerequisites: Marine Power Plants or equivalent

**EM622, Thermal System Design and Optimization** – 3 Credits

This course addresses the simulation and optimization of thermal systems, including gas turbines, air conditioning, and steam propulsion. Components are simulated using various modeling techniques and combined into systems. The systems are examined for operating characteristics and optimization within a concept.

**EM623, Advanced Marine Materials** – 3 Credits

The advanced materials course will focus on materials science and engineering for Marine Engineers and Naval Architects. The first portion of the course will consist of an review of materials science concepts as well as overview of engineering materials used in the maritime industry to include, fabrication and testing of engineering materials, applicable engineering standards and rules, joining methodologies (focused on welding considerations/ metallurgy), and composites (focus on mechanics of fiber reinforced composites). The second portion of the course is on application specific materials engineering considerations for the maritime industry to include corrosion, fatigue, temperature considerations, failure analysis and future trends.

**EM624, Vibration of Marine Machinery and Structures** – 3 Credits

This course examines the theory of mechanical vibrations for free and forced vibration of damped single-degree-of-freedom systems as well as multi-degrees of freedom problems to include the determination of natural frequencies and critical speeds. Vibration analysis and testing techniques, dynamic balancing and vibration isolation methods are also considered with emphasis on applications in the maritime environment.

**EM625, LNG Vessel Operational and Design Considerations** – 3 Credits

This course will examine LNG vessel and shore side operations, vessel design and construction considerations, LNG cargo tank design, LNG cargo operations, cargo handling systems, propulsion plant types and operations including traditional steam

turbine plants, the introduction of diesel, diesel electric and gas turbine for LNG vessel prolusion and LNG reliquefaction systems.

**EM626, Marine Nuclear Propulsion** – 3 Credits

To provide a qualitative and quantitative overview of the topics necessary to understand marine-nuclear propulsion. The course will be presented from the perspective of the nuclear reactor as an alternative heat source to, for example, oil-fired boilers in a conventional propulsion plant utilizing the Rankine steam cycle (albeit somewhat older vintage). The course will be fast-paced, with the information presented at a depth consistent with the course objective and time constraints. The course project will be a Matlab/Simulink simulation of a commercial marine-nuclear propulsion plant providing the essential dynamics observed during selected operating scenarios.

The students will be guided through the model's development as the course progresses; using data from the Nuclear Ship Savannah's propulsion plant design documentation (the Savannah is the world's first nuclear powered merchant ship). The Savannahs reactor/reactor plant design is similar to many existing, land-based pressurized water reactor designs in operation throughout the world today. As such, the student will derive an understanding of these reactors as well.

Prerequisites: Undergraduate thermodynamics, heat transfer, fluid flow, differential equations. Familiarity with PC operation.

**EM631, Electrical Power Systems** – 3 Credits

After completing this course, the student will be able to analyze, operate, and design power systems in conventional and all-electric ships; size shipboard power components to meet the load requirements; learn to implement the current industry standards; and suggest improvements in a real power system he or she is familiar with.

Prerequisites: AC Circuits, Electrical Machines, and Advanced Math for Engineers (Fluency in complex algebra of R + j X and phasor diagram is presumed).

Prerequisites: Undergraduate Electrical Engineering Engineering, Undergraduate Engineering Mathematics

**EM632, Control Theory and PLC Applications** – 3 Credits

This course covers the study of control systems; classical design methods; open and feedback control; Laplace transform and frequency response; Proportional, Proportional-Integral, and Proportional-Integral-Derivative modes of control; analog and digital E-controllers; analysis of control systems; gain and phase margin; stability properties. The course also covers Programmable Logic Controllers and their use in industrial automation and other applications. Topics include ladder diagrams, input/output devices, counters, timers, interrupts, systems and networking, and application programming design.

**EM633, Power Electronics** – 3 Credits

This graduate level Solid State Power Electronics course provides a review of the fundamentals of modern power electronics switching devices, and their uses for control of AC and DC systems. The course covers in more depth rectifiers, phase-controlled rectifiers, inverters, DC choppers, AC and DC machine controllers, and their applications, including practical converter design considerations.

**EM634, Marine Electrical Systems and Propulsion** – 3 Credits

Design of the shipboard electrical distribution systems aboard ship. Estimating shipboard electrical loads, sizing of conductors, sizing short-circuit calculations, overload device sizing, selection and coordination, and protection schemes for general electrical loads, motor loads, motor control centers, and transformers. Power factor and power factor correction, harmonics and filtering, normal and emergency power systems. Use of CFR's, N.E.C., and IEEE codes and standards in the design process. Prerequisites: Electrical Power Systems

**EM640, Economics of Marine Engineering Systems** – 3 Credits

The course objective is building problem solving and decision making skills for the engineering environment. Topics include engineering economy theory, cost analysis and estimation, depreciation and depletion models, engineering project economics, replacement analysis, decision making under risk and uncertainty, sensitivity analysis, capital budgeting decisions. Practical applications to ship design and operations, and also to marine equipment manufacturing are presented as case studies.

Prerequisites: Undergraduate Economics

**EM642, Reliability Engineering and Operations Research** – 3 Credits

The course covers the fundamental theorems in reliability, parts failure modes, mean time to failure, de-rating for reliability, series and parallel reliabilities, systems design with redundancies in active and dormant modes, part counts of reliability estimates, failure mode and effect analysis, MIL-Standard-217. Operations Research part of the course covers linear programming, optimization under constraints, simplex method, queuing model, transportation model, and decision making analysis.

Pre-requisites: Advance Mathematics, and Probability and Statistics.

**EM645, Marine Engineering Management I** – 3 Credits
(Analysis and Management of Marine Projects)

The course is intended to build problem solving, decision making and project managing skills for the marine engineering environment. Topics include engineering economy theory, cost analysis and estimation; initiation, analysis, justification and decision making regarding maritime engineering projects; project mobilization including in-house preparation and proposals, bidding and contracting, organization and preliminary planning; replacement analysis; project implementation including planning and scheduling, control and resource management; project monitoring and quality control; evaluation and management of changes; sensitivity analysis; capital budgeting decisions. Practical applications to ship design and operations, and also to marine equipment manufacturing are presented as case studies.

**EM 646, Marine Engineering Management II** – 3 Credits
(Management of Shipyard Operations)

The course introduces to the managerial and economic principles of shipyard production and operation. Topics include: overview of American and world shipyards, modern shipyard production organization and methods, manufacturing process design, production capacity, materials and inventory management, fundamentals of shipyard project management, work force management, product and production quality management, production planning and scheduling, specifics of production management in ship repair, shipyard facilities management.

**EM 647- Marine Engineering Management III** – 3 Credits
(Ship Maintenance and Repairs)

The course is intended to build skills in fundamentals of ship engineering operations, organization, management and practical methods of shipboard maintenance; fundamentals of computerized maintenance and inventory control system; methods of cost estimating and analysis related to ship repairs and ship operations, basics of contract management. Practical applications to marine engineering practice are presented as case studies.

**EM650, Internal Combustion Engine Analysis and New Technologies** – 3 Credits

The Internal Combustion Engines course will address marine propulsion and auxiliary diesel (compression ignition) engines. Topics of study will include cycle analysis and design ratio parameters of marine diesel engines. Students will study methods to improve engine performance through intake system design, the fuel injection combustion process, and new technology fuel injection methods. The highly critical and timely topics of exhaust gas analysis and emissions standards will be examined. Students will also study the latest enhancements to fuel and lubricating oils and current developments and advances in material technologies applicable to internal combustion engines. The course will include an on-site laboratory with a formal report to be submitted after completion of the lab exercise.

**EM660, Hydrostatics and Basic Hydrodynamics** – 3 Credits

This course is an introduction to principles of naval architecture for the non marine engineer, ship nomenclature, geometry, hydrostatics; it also explores concepts of intact and damaged stability, hull structure strength calculations and ship resistance and propulsion.

**EM661, Propulsion & Propulsors** – 3 Credits

This course investigates ships and craft resistance, propulsion and the propulsors utilized to propel the vessel. Resistance will be studied considering all its facets including friction, wavemaking and form, considering both displacement vessels and those with dynamic lift including planing craft, hydrofoils, and air cushion vehicle. Propulsion considerations will investigate the hull/propulsor interaction and both resistance and propulsion will

include how model testing is utilized for prediction and ship trials for verification. The consideration of propulsors will begin with propellers and their selection and design, including in an environment of cavitation. Other propulsive devices will be addressed as well as ducts, thrusters, cycloidal propellers and waterjets. Throughout the course specific ship applications will be considered.

Prerequisite: EM660, Hydrostatics and Basic Hydrodynamics or equivalent.

**EM 670, Marine Industry Policy** – 3 Credits

To understand where the Merchant Marine is today and where it will be in the future, it is necessary to understand its origins and history. From the earliest days of the republic, the United States government has taken an active role in creating the nation's maritime policy. From laws dealing with tariffs and tonnage taxes to the modern Maritime Securities Program, the history of the commercial Merchant Marine has been intertwined with that of the government. At times it has fostered innovation and the development of technologies, at others it has hindered and stymied growth. This course will examine the history of the United States' maritime policy and the history of the US Merchant Marine, with a specific interest toward the rise of the Merchant Marine in the early 19th century, the decline of the Merchant Marine following the Civil War, and its attempted resurrection under the Merchant Marine Act of 1936. We will also study how the use of new technologies, globalization, and the growth of commerce in the late twentieth century has created the merchant fleets of today.

**EM 680 & 681, Thesis/Design Project 1 & 2** – 3 Credits each

The intent of this course is to allow students to investigate a relevant marine engineering topic as agreed to by the student and approved by the MMarE program director. The student is expected to undertake significant independent research in the execution of the project. The result of this course will be a significant design project or thesis suitable for publishing.

If the work undertaken in EM680 is the initial phase of a combined two semester thesis/design project, a grade of "P" will be assigned for the first semester's work. Upon completion of the project, a common grade for EM680 and EM681 will be posted and will replace the "P" grade given in EM680.

Prerequisites: 1. Formal agreement and plan approved by the thesis or project advisor
2. Approval by MMarE Program Director

**EM 690 Independent Study** – 3 Credits each

This course designation is for students wishing to pursue study in an area not covered in current course offerings.

## MMarE Faculty Qualifications

**David Breslin**
M.E.A. (Industrial & Systems Engineering), Virginia Polytechnic Institute & State University
M.S. (Aerospace Engineering), Virginia Polytechnic Institute & State University
B.E. (Mechanical Engineering), Stevens Institute of Technology
Licenses: Professional Engineer, VA

**Boris Butman**
PhD. (Marine Engineering Management), Maritime Technical University (current name), Leningrad, USSR
BS & MS (Shipyard Engineering), Shipbuilding College, Leningrad, USSR

**John Daidola**
PhD. Stevens Institute of Technology
M.S.E. (Naval Architecture & Marine Engineering), University of Michigan
B.S.E. (Naval Architecture & Marine Engineering), University of Michigan
Licenses: Professional Engineer; NY, FL, WA, CT, NJ, PA, MA SC, VT, AL, MS, ME, MA, RI, DE, LA, TX, CA

**Jose Femenia**
M.S. (Mechanical Engineering), City College of NY
B.E. (Marine Engineering), SUNY Maritime College
Licenses: USCG: Third Assistant Engineer (Steam & Motor) (Ret.), Professional Engineer, NY

**James Harbach**
Engineer (Mechanical Engineering), Polytechnic University
M.E. (Mechanical Engineering), Cornell University
B.S. (Marine Engineering), U.S. Merchant Marine Academy
Licenses: USCG: First Assistant Engineer (Steam) Unlimited Horsepower; Third Assistant Engineer (Diesel) Unlimited Horsepower,
Professional Engineer, NJ

**Nagy Hussein**

Ph.D. (Mechanical Engineering), Catholic University of America
M.S. (Mechanical Engineering), Howard University
B.S. (Marine Engineering), Suez Canal University

**Milton Korn**

M.S. (Electrical Engineering), Polytechnic University
B.E. (Electrical Engineering), SUNY Maritime College
B.S. (Computer Science-Mathematics), SUNY Maritime College
Licenses: USCG, Chief Engineer (Steam, Motor & Gas Turbine)
Professional Engineer, NJ, NY

**Raymond L. Mathewson, Jr.**

O.E. (Engineers Degree in Ocean Engineering),
Massachusetts Institute of Technology
M.S. (Naval Architecture and Marine Engineering),
Massachusetts Institute of Technology
B.E. (Marine Engineering),

**Salvatore R. Mercogliano**

Ph.D. (History), University of Alabama
M.A. (Maritime History and Naval Archeology),
East Carolina University
B.S. (Marine Transportation), SUNY Maritime College
Licenses: USCG: Second Mate (Unlimited)

**Charles Munsch**

ME (Ocean Engineering), Stevens Institute of Technology
B.E. (Naval Architecture), SUNY Maritime College
Licenses: USCG: First Assistant Engineer (Steam)
Third Assistant Engineer (Motor)

**Mukund Patel**

Ph.D. Rensselaer Polytechnic Institute
M.S. (I.E), University of Pittsburgh
M.E. Gujarat University
B.E.E Surdar University
Licenses: Professional Engineer, PA
Chartered Engineer, United Kingdom

**Yvonne Traynham**

Ph.D. (Mechanical Engineering), University of New Orleans
M.S. (Mechanical Engineering), University of New Orleans
B.S. (Nuclear Engineering), University of Florida
Licences: Professional Engineer, LA, MS

**James Turso**

Ph.D., Nuclear Engineering, Penn State University

M.S., Electrical Engineering, University of Idaho
M.S., Nuclear Engineering Penn State University
M.S., Mechanical Engineering, Manhattan College
B.E., Marine Engineering SUNY Maritime College
Licenses: USCG: Third Assistant Engineer (Steam/Motor)
Professional Engineer, PA

**Matthew Werner**

MBA, Long Island University
M.S. (Ocean Technology and Commerce), Webb Institute
B.S. (Naval Architecture and Marine Engineering), Webb Institute
Licenses: Professional Engineer, NY