UMBC UGC New Course Request: NAVY 300 Naval Ship Systems I (Engineering)

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COURSE INFORMATION:

Course Number(s)	NAVY 300
Formal Title	Naval Ship Systems I (Engineering)
Transcript Title (≤30c)	Nav Ship Systems I - Eng
Recommended Course Preparation	Math 151 & Math 152, completion or concurrent enrollment in Physics 121.
Prerequisite **NOTE:** Unless otherwise indicated, a prerequisite is assumed to be passed with a "D" or better.	Permission by the Professor of Naval Science
Credits	3
Repeatable?	☐ Yes ☒ No
Max. Total Credits	3 This should be equal to the number of credits for courses that cannot be repeated for credit. For courses that may be repeated for credit, enter the maximum total number of credits a student can receive from this course. E.g., enter 6 credits for a 3 credit course that may be taken a second time for credit, but not for a third time. Please note that this does NOT refer to how many times a class may be retaken for a higher grade.
Grading Method(s)	☒ Reg (A-F) ☐ Audit ☐ Pass-Fail

PROPOSED CATALOG DESCRIPTION (no longer than 75 words**):**

This course introduces the student to a comprehensive fundamental understanding of United States naval engineering principles and systems. Topics include thermodynamics, incompressible fluid flow, electrical theory, hydraulics and pneumatics, power train components, fluid/lube oil systems, desalination, fundamentals of nuclear power, propulsion systems (internal combustion, gas turbines, and steam), electrical distribution, ship stability and control and damage control. Students will also examine case studies to apply and analyze course topics within naval ships systems contexts.

RATIONALE FOR NEW COURSE:

a) **Why is there a need for this course at this time?** For students to be successful U.S. Navy and Marine Corps officers, understanding of engineering systems fundamentals and core concepts is critical to professional performance and technical proficiency. The Navy and Marine Corps are charged with maintaining superiority in the maritime domain, and comprehension of fundamental theories and basic operations of naval engineering systems. Classes on thermodynamics, incompressible fluid flow, electrical theory, hydraulics and pneumatics, power train components, fluid/lube oil systems, desalination, fundamentals of nuclear power, propulsion systems (internal combustion, gas turbines, and steam), electrical distribution, ship stability and control and damage control will inform the future Navy and Marine Corps officer.

b) **How often is the course likely to be taught?** The course will be piloted in the Fall 2016 semester and the course will be taught every fall semester (once per Academic Year). Once approved, the course will be adopted into the NROTC program at UMBC as part of its Naval Science curriculum offerings.

c) **How does this course fit into your department's curriculum?** This course is designed to fulfill the U.S. Navy-mandated ship engineering systems requirement. The class is a foundational skills course for midshipmen/students focused on joining the NROTC program and commissioning as an officer in the U.S. Navy. Students will practice the maritime proficiency professional competency required to become a naval officer, and develop a basic understanding of naval engineering systems concepts that are core to the Navy such as theory and employment of engineering systems, including thermodynamics, incompressible fluid flow, electrical theory, hydraulics and pneumatics, power train components, fluid/lube oil systems, desalination, fundamentals of nuclear power, propulsion systems (internal combustion, gas turbines, and steam), electrical distribution, ship stability and control and damage control. Physical aspects of marine propulsion, naval architecture, electrical systems, and auxiliary engineering systems integration will be discussed.

d) **What primary student population will the course serve**: This course is intended for NROTC scholarship students and those students who wish to join the NROTC program and commission as an officer in the U.S. Navy or Marine Corps. It is open to all enrolled UMBC students with approval by the Professor of Naval Science. This course is designed for midshipmen/students in their third year of academic study within the NROTC program, although other students may be accepted for attendance on a case-by-case basis. A thorough knowledge of calculus and calculus based physics is essential for completion of this course.

e) **Why is the course offered at the level (ie.100, 200, 300, or 400 level) chosen?** This course is intended for NROTC scholarship students and those UMBC students seeking to join the NROTC unit who desire a commission in the U.S. Navy. It is offered at the 300 level with the intention, but not required, for participating students to have completed MATH 151 & 152 as well as PHYS 121 for background prior to this course. The four-year curriculum track for NROTC scholarship students is designed for enrollment of midshipmen/students to this course who are in their junior year of collegiate study. Course completion for students participating in NROTC on two- or three-year curriculum tracks will be accepted pending referral from NROTC Academic Advisors.

f) **Explain the appropriateness of the recommended course preparation(s) and prerequisites(s).** Based upon the complexity of thermodynamics, incompressible fluid flow, electrical theory, hydraulics and pneumatics, power train components, fluid/lube oil systems, desalination, fundamentals of nuclear power, propulsion systems (internal combustion, gas turbines, and steam), electrical distribution, ship stability and control and damage control, this course requires background in calculus and calculus based physics. This class is one of the required naval science courses required for completion of the commissioning requirements for the NROTC scholarship, however, it is open to all UMBC students with permission from the Professor of Naval Science.

g) **Explain the reasoning behind the P/F or regular grading method.** Students are able to take a pass/fail course only after they have completed 30 or more credits. Because this class is a core course within the student's Naval Science curriculum continuum, it should only be available as a course with a regular grading method.

h) **Provide a justification for the repeatability of the course.** The Ship Systems I (Engineering) course will be offered once per academic year, dependent on the availability of classrooms and associated resources. It is a core course in the NROTC curriculum continuum, and must be completed with a grade of C or higher. Students may repeat the course only one time, consequent to academic review by the Professor of Naval Science.

ATTACH COURSE OUTLINE (mandatory):

NAVY 300 – SYLLABUS
NAVAL SCIENCE – NAVAL SHIPS SYSTEMS I (ENGINEERING)

Fall 2016

Meeting Times: Monday / Wednesday or Tuesday / Thursday 0800-0915

Location/Time: TBD

Course Coordinators: CAPT Troy Mong
UC 116, 410-455-8035
tmong@umbc.edu

CDR Stew Wennersten
UC 116, 410-455-8035
swenners@umbc.edu

Office Hours: The coordinators' office door is open most of the time – feel free to drop in and visit. If no one is available, please arrange an appointment via email. When sending an email, always include your full name and course number in the subject line. Also, use your UMBC email account to ensure validity and delivery.

Fixed office hours for the Course Coordinators will be provided on the official syllabus for this class.

Resources: Texts, assigned readings and handouts, websites, and potential guest lecturers. Texts will be loaned to all NROTC students by the Department of Naval Science, and to all other UMBC students as available. The texts are the property of the U.S. Government. Students can highlight the texts, but should not write in the margins. The books must be returned at the end of the semester in usable condition. If the text is unavailable from the Department of Naval Science, students can either buy or rent the textbooks. Additionally, a copy of each text can be found in the UMBC Albin O. Kuhn Library.

Texts: The following resources will be distributed during the first class.

1. Carr, Matthew A. Principles of Naval Engineering. Annapolis, MD: Naval Institute Press, 2012.
2. Blank, David A., Arthur E. Bock, and David J. Richardson. Introduction to Naval Engineering. 2nd edition, Annapolis, MD: Naval Institute Press, 1985.
3. Kennedy, J. A., LT, USN, and R. A. Koonce, LT, USN. Safety for the Division Officer.

Computers: Students are permitted to use computers during class for note-taking and other class-related work. All electronic media will be provided by the NROTC unit. Those using computers during class for work or communication not related to that class must leave the classroom for the remainder of the class period.

Blackboard Site: A Blackboard course site is set up for this course. Each student is expected to

check the site throughout the semester as Blackboard will be the primary venue for outside classroom communications between the instructors and the students. Students may access the course site and support at https://blackboard.umbc.edu.

Course Description: NAVY 300 is designed to fulfill the U.S. Navy-mandated naval ships systems formal education requirement. The class is an upper level course designed to provide students with the fundamentals of applied shipboard engineering principles and systems. Topics include thermodynamics, incompressible fluid flow, electrical theory, hydraulics and pneumatics, power train components, fluid/lube oil systems, desalination, fundamentals of nuclear power, propulsion systems (internal combustion, gas turbines, and steam), electrical distribution, ship stability and control and damage control. Students will also examine case studies to apply and analyze course topics within naval ships systems contexts. The curriculum composes a foundational knowledge course for midshipmen/students focused on joining the NROTC program and commissioning as an officer in the U.S. Navy or Marine Corps.

Prerequisites: Permission of the Professor of Naval Science. Foundational knowledge in calculus, physics, algebra, geometry, and chemistry.

Course Purpose: For students to be successful U.S. Navy officers, comprehension of naval ship systems engineering characteristics is critical to professional performance and advancement. The Navy and Marine Corps are charged with maintaining superiority in the maritime domain, and fundamental understanding of engineering systems, familiarity with engineering programs and department organization, and the importance of watchstanding principles will inform the student officer candidates. The course will consist of 1.25 hours of instruction twice each week and practical assessments.

The purpose of this course is to help you develop professional core competencies:

I. ACADEMIC STANDARDS

A. Demonstrate a proficiency of the English language through usage, both spoken and written.

B. Demonstrate the ability to solve quantitative problems in a logical manner.

C. Demonstrate basic computer skills.

II. LEADERSHIP AND MANAGEMENT

A. The student will comprehend the relationship of the Naval Services' Core Values to the roles and responsibilities of a Naval Leader.

B. The student will comprehend the following personal qualities and be able to relate them to a leader's effectiveness:

1. Honor
2. Judgment
3. Decisiveness
4. Integrity
5. Bearing
6. Courage (moral and physical)
7. Knowledge
8. Loyalty

C. The student will comprehend the relationship of between authority, responsibility, and accountability within a task-oriented organization.

D. The student will comprehend the basic principles of human behavior and group dynamics.

E. The student will comprehend the influence of the officer-enlisted professional relationship on a leader's ability to achieve organizational goals.

F. The student will comprehend the leader's moral and ethical responsibilities to the organization and society.

G. The student will comprehend the relationship of integrity, moral courage and ethical behavior to authority, responsibility and accountability.

III. PROGRAMS AND POLICIES

A. The student will know Navy safety and environmental programs.

IV. TECHNICAL FOUNDATIONS

A. The student will know the concepts of work, power and efficiency and their application to propulsion systems.

B. The student will know the basic operation, key components and safety considerations of propulsion systems.

C. The student will know the basic principles of auxiliary systems.

D. The student will know the basic principles of electrical power generation, distribution and electrical safety.

E. The student will comprehend the factors and criteria for structural integrity and operational employment in platform designs.

F. The student will comprehend the basic principles of fluid dynamics.

V. MARITIME PROFICIENCY

A. Know terms, nomenclature and use of shipboard deck equipment and fittings.

B. Comprehend shipboard safety and preparedness.

C. With respect to shipboard damage control, the student will:

1. Know how shipboard watertight integrity is obtained through installed shipboard features to increase material conditions of readiness.

2. Know the procedures, objectives and priorities in combating progressive deterioration from fire and underwater hull damage.

3. Know the classes of fire and agents, equipment and procedures used to extinguish them.

4. Know the use of equipment, materials and procedures for countering progressive flooding and structural deterioration.

5. Know the procedures for donning and doffing damage control breathing equipment.

Course Learning Outcomes: By the end of this course, students will be able to understand and comprehend:

- The concept of an integrated naval engineering system, including definitions, purposes, and various components.
- The military requirements and general characteristics of naval engineering systems.
- Functional elements of various naval engineering systems such as pumps, motors, circuit breakers, turbines, reduction gears, shafts, and basic control systems.

- The need for system integration and the effects of delays, malfunctioning equipment, and reaction times on the ability of the system to perform its job.
- The requirement for command, control, and integration.

COURSE STRUCTURE

This is a course instructed by a Department of Naval Science faculty member. Each week, students and faculty will meet Monday / Wednesday or Tuesday / Thursday 0800 – 0915. Course activities include the following:

- Class Participation/Attendance/Homework (20%). Students are expected to **read** and **study** any handouts provided ahead of class. This will enable the students to comprehend the topics covered during the week and to be prepared for class. Students will also participate in class discussions to demonstrate comprehension of fundamental course core competencies. Students should complete applicable assignments after each lesson to ensure complete understanding of the material – all concepts are related. Participation is both quantitative and qualitative. Unexcused absences, tardiness, and lack of class preparedness will result in the reduction of this grade (2% per absence, 1% per tardiness). Late homework submissions will incur a 25% per day penalty.
- Quizzes (15%). Quizzes may not always be announced. These will usually be at the beginning of class focused on material covered since the last exam or the assigned reading.
- Topic Project (20%). In groups of two, students will complete a two part project on particular *naval engineering topics* intended to teach students to write and speak effectively and to critically review work of a complex nature. Due to advances in naval technology, projects should focus on recent technology (last 30 years) as much as possible. Students may propose any subjects that match the criteria above, but all changes must be approved by the instructor beforehand.
    - Term Paper: The paper should be written as though the student has been assigned to write an information paper on the particular *engineering technology* for their Commanding Officer. The intention of the paper is to clearly and concisely provide an overview to the Commanding Officer. The paper should describe the topic effectively, discuss how it works, advantages, disadvantages, current uses/employment, and future uses/employment. Historical examples may be used for emphasis to enhance understanding, but should not be the focus of the paper. Students may modify their topics (abstract, outline and sources), but should attempt to have completed a substantial amount of literature review before submitting their proposal. **Term paper deadlines are delineated on the class schedule.** Though brainstorming may be completed in groups, the term paper, any drafts and proposals are to be completed individually. Plagiarism will not be tolerated.
        - General Requirements:
            - 5-7 pages (does not include title, contents, or bibliography pages)
            - Double spaced, 12 point, Times New Roman, 1" margins
            - In-text parenthetical citations and a works cited page, MLA Format
            - Minimum of five sources – mix of electronic and paper

    - Title, table of contents, and bibliography pages
  - Topic Presentations: Groups will complete an 8-12 minute presentation pertaining to a specific class day topic. This should include an introduction, current and future fleet applications, and how the specific engineering has or will change respective warfare communities. Students should be prepared to have their presentation critiqued by their Instructor and their classmates. **Presentation dates are delineated on the class schedule.**
  - Team project grading for the project will be 20% peer-based and 80% instructor-based based on criteria to be determined, announced, and posted to the course website.
- Tests (45%). All exams will include True-False and multiple choice questions along with scenario-driven essay questions. The student's familiarity with course material, as well as its application to a real-world situation will determine the exam's grade. All material taught in class or covered in the required reading may appear on an exam. The first two exams are not cumulative. The final will be cumulative. Exams will be closed book and closed notes. Additional details will be discussed in class.

GRADING AND EVALUATION

Letter grades will be assigned on a straight 90+ = A, 80+ = B, etc. basis. There is no curving; the grade is a reflection of how much students learned, not how much more or less they learned when compared to other students.

EVALUATION	% of GRADE
Class Participation / Attendance	10
Homework	10
Quizzes	15
Topic Project (Term Paper + Topic Presentation)	20
Tests (3)	45
TOTAL	100

COURSE POLICIES

Classroom Conduct: This seminar will be commensurate with a junior-level course. The Instructor acts as a facilitator to ensure discussions remain pertinent to the subject matter and that the interaction among students remains on a professional level. Thorough preparation and participation are critical to success, but so are demonstrated respect and consideration for your classmates' views and opinions. Inappropriate behavior or conduct will not be tolerated and can result in dismissal from the course.

Apart from the military courtesies extended to the instructor by the NROTC students, the classroom behavior of all students should be "collegiate," courteous, and respectful. Students are free to interject and question, even without waiting for direct recognition from the instructor (i.e. raising hand and being called upon), so long as the interjection is not unduly disruptive. Both students and the instructor will "police" classroom behavior.

Respect the viewpoints of others. Discussions of controversial subject matter will arise in class. Your candid opinions are required to meet seminar objectives. However, remarks intended to

offend classmates, or slurs that target race or religion will not be tolerated. And while students are encouraged to have "thick skins" regarding the viewpoints of others, when remarks create a hostile classroom environment the dialogue suffers. A simple standard will be applied to controversial remarks: Was the intent of the remark to heighten the dialogue?

Any views expressed by the instructor, unless specifically attributed otherwise, should be considered the personal views of the instructor and may not be representative of any official policy or viewpoint of the government, U.S. Naval Services or UMBC.

Honor Code: "A midshipman does not lie, cheat, or steal, nor tolerate those who do." All students are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion).

Attendance: Your presence at every class session, including discussion sections, is mandatory and expected. Unusual circumstances will be handled on a case-by-case basis. Absences are to be arranged with the Instructor prior to the class session. Subsequent make-up work will be assigned accordingly. If you need to miss class due to illness, or are otherwise unexpectedly detained, you must notify your class leader no later than 15 minutes prior to the beginning of class. An "excused" absence is at the sole discretion of the Instructor. Unauthorized absences will negatively affect your grade. All NROTC scholarship students are expected to attend every class, as it is their appointed time and place of duty for that day.

COURSE SCHEDULE

The following is a tentative timeline and is subject to change.

Wk	Date	Topic	Item Due
1		**Course Introduction and Book Checkout** **Lesson 1 – Principles of Measurement** Read: Syllabus; 11-16; 511-516	- Blackboard Familiarization
2		**Lesson 2 – Thermodynamics: Energy and Heat** Read: 10, 17-20, 27; 9-14, 18, 22-28	
3		**Lesson 3 – Thermodynamics: Thermodynamic Processes** Read: 16-17, 21-26; 14-15, 28-38	
4		**Lesson 4 – Auxiliary Equipment** Read: 34-61; 19-22, 477-501	
5		**Lesson 5 – Hydraulic Systems and Applications** Read: 65-74; Ch. 15	
6		**QUIZ 1** **Lesson 6 – Diesel Engine Theory** Read: 78=80, 85-88, 94-97; Ch. 11	
7		**Lesson 7-1 – Gas Turbines Theory**	- Term Paper Topics

		Read: 106-115; Ch. 12	
8		**Lesson 7-2 – Gas Turbines Theory** Read: 106-115; Ch. 12	
9		**Case Study 1 – Logs and Records** Read: Posted Blackboard Material **Test 1 Review**	
10		**TEST 1 – Weeks 1-9**	
11		**Lesson 8 – Main Steam Cycle** **Lesson 9 – Steam Turbines** Read: 132-136, 144-145; 41-48, Ch. 8	
12		**Lesson 10 – Condensate and Feed Systems** **Lesson 11 – Distilling Plants** Read: 221-228; Ch. 9, 10, 14	
13		**Lesson 12-1 – Nuclear Fundamentals** Read: Ch. 8; 89-114	- Term Paper Proposals
14		**QUIZ 2** **Lesson 12-2 – Nuclear Fundamentals** Read: Ch. 8; 89-114	
15		**Lesson 13 – Refrigeration / Air Conditioning Systems** Read: Ch. 9; Ch. 19	
16		**Case Study 2 – Tagouts and Gundecking** Read: Posted Blackboard Material **Test 2 Review**	
17		**TEST 2 – Section Weeks 11-16**	
18		**Lesson 14 – Compressed Air Systems** Read: 71-74; Ch. 18	
19		**Lesson 15 – Propulsion Train Components** Read: 81-84, 143-164	
20		**Lesson 16 – Ship Design and Engineering** Read: Ch. 20	
21		**Lesson 17-1 – Fundamentals of Electrical Theory I** Read: Ch. 16	
22		**QUIZ 3** **Lesson 17-2 – Fundamentals of Electrical Theory II** Read: Ch. 16	
23		**Lesson 18 – Shipboard Electrical Distribution** **Lesson 19 – Damage Control Systems** Read: Ch. 17, 25, 26	
24		**Presentations I**	- Term Paper (Peer Drafts)
25		**Presentations II**	
26		**Presentations III** **Test 3 Review**	
27		**TEST 3 – Cumulative (Emphasis on Weeks 18-23)**	- Term Paper (Final Draft)

IMPORTANT ACADEMIC POLICIES AND SERVICES

Disability Services: UMBC is committed to eliminating discriminatory obstacles that disadvantage students based on disability. Student Support Services (SSS) is designated to receive and maintain confidential files of disability-related documentation, certify eligibility for services, and determine reasonable accommodations. If you have a disability and want to request accommodations, contact SSS in the Math/Psych Bldg., room 213 or at 410-455-2459. If you require accommodations for this class, make an appointment to meet with me to discuss your SSS-approved accommodations, or any other concerns that you have.

Equity, Diversity, Equal Opportunity, and Affirmative Action: UMBC provides equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression.

Mental Health and Stress Management: As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Counseling Center at http://counseling.umbc.edu/services/.

Student Success Center: UMBC's comprehensive undergraduate academic support program designed to help students reach their academic goals and become independent, lifelong learners. The Learning Resource Center collaborates with students, faculty, staff, and the community to conduct programs that maximize learning success at an honors university.

Inclement Weather Policy: Students are strongly encouraged to consult the UMBC Student Handbook and Academic Catalog and the University website for detailed information regarding the above items.

VALUES STATEMENT

By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping other to commit these acts are all forms of academic dishonesty, and they are reprehensible. Academic misconduct could result in disciplinary action that may include, but not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, the Faculty Handbook, or the Policies section of the UMBC Director.