

SMO/SMOH Electives

Spring Semester AYE 2027

Math Elective (MATH EL)

SM244 Discrete Mathematics for Operations Research¹

SM291 Fundamentals of Mathematics²

SM342 Discrete Mathematics (Discrete Structures)

Military Elective (MIL EL)

SA410 Applications of Search & Detection Theory³

Track Electives (TRK EL1, TRK EL2)

Military Electives count as Track Electives

SA234 Data Wrangling & Visualization (formerly SA433)⁴

SA435 Decision Analysis

SM437 Experimental Design

Breadth Electives (BR EL1, BR EL2)

All Math Electives count as BR EL1

All Track Electives (including the Military Elective) count as BR EL1 or BR EL2

SM212 Differential Equations

SM222 Differential Equations with Matrices

SM332H Honors Real Analysis II

SM334 Real Analysis II

SM349 Number Theory

SM350 Analytic & Differential Geometry

SM361 Linear Algebra II

SM362 Modern Algebra

SM364 Intro to Scientific Computing

SM411 Intro to Complex Variables

Non-math breadth electives with no prereqs:

SE201 Principles of Microeconomics (limited seats)⁵

SE202 Principles of Macroeconomics (limited seats)⁵

IC210 / SI204 Intro to Computing

(Check MIDS for the full list of Breadth Electives)

Capstone Courses (SA475 in the matrix)

SA475 Naval Innovation Capstone II (prereq: SA485A Naval Innovation Capstone I)

SA475B OR for the Military, Business and Society ← “**Standard**” Capstone

¹For class of 2028+, SM244 replaces the math elective.

²Class of 2029 students interested in SMOH must take SM291 (validates SM244 in SMO matrix).

³Class of 2027 SMO majors have already taken SA410 as a required course.

⁴Course descriptions are included below for courses that appear in bold.

⁵**Students cannot receive credit for both FE210 and (SE201 or SE202). FE210 only counts as a Free Elective in the SMO matrix, so we recommend *not* taking FE210.**

Course Descriptions

SA234 Data Wrangling & Visualization

In this course, midshipmen will learn to (i) wrangle (i.e. clean and manipulate) large, messy data sets into forms suitable for modeling and analysis (in particular, operations research and statistical models), and (ii) create sophisticated visualizations of large data sets that provide useful insights for decision-making as well as further modeling and analysis. Prereq: SA233 or equivalent course in Python.

SA410 Applications of Search & Detection Theory

This course introduces applied probability models for the analysis of search and detection operations in the context of a variety of naval applications. Sonar equations, probability of detection, barrier detection, area search, and parallel sweep operations models are developed. Determination of measures of effectiveness in search problems is studied. Prereq: SM239.

SA435 Decision Analysis

This course provides an introduction to modern theory and methods for decision making under uncertainty. Students will learn how to model real-world problems that include uncertainty using decision trees in order to optimize their decisions. This course will use decision trees to consider the risk associated with uncertainty, the value of additional information, real options, multi-objective decision making, and utility theory. Prereq: SM239 or SM316 or Dept Chair approval.

SA475 Naval Innovation Capstone II

The second semester of the two-semester Naval Innovation Capstone sequence. Students continue, in three-to-four person teams, the real-world research project they began in SA485A, working with the same project sponsor for both semesters. Past project partners include the Joint Chiefs of Staff (J4 directorate), Commander Naval Air Forces Force Readiness Analytics Group (CNAF FRAG), Commander Naval Surface Forces, Marine Corps Recruiting Command (MCRC), Military Sealift Command, Naval Air Training Command, Lockheed Martin, MITRE Corporation, and Naval Information Warfare Center Atlantic (NIWC LANT). Students present their results in writing and orally. Prereq: SA485A Naval Innovation Capstone I.

SA475B OR for the Military, Business and Society

The standard capstone course for the Operations Research major. Students work in small teams on a semester-long project that applies one or more operations research methods to a real-world decision-making problem drawn from the military, business, or society. Students also read and make presentations on topics determined by the instructor, and present their project results in writing and orally. Prereq: 1/C SMO major or permission of the department chair.

SM437 Experimental Design

This is an advanced applied statistics course focusing on the collection and analysis of data arising from either sampling finite populations or arising from scientific experiments. Emphasis is placed on simple random sampling, stratified sampling, cluster sampling, ratio estimation, randomized block designs, factorial designs, and confounding. Prereq: SM339.

SM244 Discrete Mathematics for Operations Research

An introduction to discrete mathematics, with an emphasis on its applications to operations research. Topics include: logic and proofs, set theory, graph theory and its connections to matrix theory.

Credit cannot be received for both SM244 and SM291. Prereq: SM261 or SM263 or Dept Chair approval.

SM291 Fundamentals of Mathematics

This course introduces the fundamental techniques of mathematical proofs, including direct proof, proof by contradiction, induction, and contrapositive. Topics covered include logic, set theory, functions, and basic number theory. Emphasis is placed on developing clear and rigorous reasoning skills essential for advanced mathematics. Credit cannot be received for both SM291 and SM244. Prereq: Calc III (SM221 or SM223).

SM342 Discrete Mathematics

This course covers select topics in discrete mathematics, focusing on combinatorics (permutations, generating functions, recurrence relations, counting techniques, graph theory) and foundations and methods of proof. Prereq: SM122.