

Mathematics Major

The Mathematics Major (<http://www.usna.edu/MathDept/website/Mids/MathMajor/MathMajor.htm>) teaches midshipmen to think logically and critically; fundamental abilities that are invaluable to naval and marine officers. Mathematics plays a central role in virtually every technical and scientific field and is crucial in modern, accurate models of the environment. Mathematics provides training in analyzing problems, formulating methods of attack, and expressing results in a clear and logical manner. These same skills are applied aboard a ship or submarine, inside a fighter jet, and in all military communities. The Mathematics Major also provides an excellent foundation for graduate work in any technical field as well as in economics, business, or law.

The Navy and Marine Corps have a great need for officers with problem-solving capabilities. The preparation that mathematics majors receive in studying problems analytically and in pursuing logical solutions is invaluable in nuclear training, in advanced engineering, and in the fleet. Successful completion of the mathematics major provides the background and skills to excel in areas where mathematics is applied.

Elective courses offer the opportunity for students to study a wide variety of topics such as operations analysis, fluid flows, cryptography, chaos, wavelets, fractals, target motion analysis, submarine tactics, elliptic curves, computer arithmetic, geometric tomography for medical diagnosis, etc. An honors program is available (<http://www.usna.edu/MathDept/website/Mids/Honors.htm>), allowing selected students to do in-depth research. The Naval Academy Mathematics Department consists of about 60 faculty members (<http://www.usna.edu/MathDept/website/Faculty/FacultyInfo.htm>) who are actively engaged in state-of-the-art research in mathematics and its applications. About 17 members of the faculty are military officers; they bring first-hand experience in applying mathematics and mathematical thinking to specific naval and marine problems. The civilian faculty devotes a substantial portion of time to current research in various specialty fields in pure and applied mathematics, as well as in operations research. Many faculty members conduct research with outside institutions, including the Naval Research Laboratory, the Naval Surface Warfare Center, the Office of Naval Research, and other federal agencies.

Opportunities for further education in applied mathematics or operations research exist at the Naval Post-Graduate School in Monterey, California and at other professional naval establishments. Midshipmen in the Mathematics Major also compete for places in the Voluntary Graduate Education Program (VGEP), the Direct Graduate Education Program, and for prestigious national and international fellowships. Recent mathematics majors have earned Master degrees through VGEP studies at the George Washington University, George Mason University, and the University of Maryland, while IGEP participants have continued their mathematical studies at MIT, the University of Pennsylvania, the University of Wisconsin, the University of Texas, and the University of Chicago Business School. Mathematics majors have also gone directly to the Navy's medical school in Bethesda, Maryland.

Curriculum Requirements (In addition to the requirements of plebe year)

Professional: NE203, NL302, NL400, NN204, NS310, NS40X;

Science: SP211, SP212;

Humanities: HH205, HH206, and two electives including one at the 300/400 level;

Engineering: EE301, EE302, EM300, EN200, ES419, one mathematics, science, or engineering (MSE) free elective;

Mathematics: SM221 or SM251, SM222;

Major - Both Tracks: SM261, SM280, SM233, SM291, SM239, SM331, one free elective;

Applied Mathematics Track: SM365, SM339, SM474 or SA412, three applied mathematics electives (at least one at the 400 level), one additional major elective.

Mathematics Track: SM362, SM334 or SM411 or SM461 or SM462, SM472, two mathematics track electives, two additional major electives (at least one at the 300/400 level). At least one mathematics track course in addition to SM472 must be at the 400 level.

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Majors must select one of the following two tracks.

Applied Mathematics Track: SM365, SM339, SM474 or SA412, three applied mathematics electives (at least one at the 400 level), one free major elective.

Mathematics Track: SM362, SM334 or SM411 or SM461 or SM462, SM472, two mathematics track electives, and two free major electives (at least one at the 300/400 level). At least one mathematics track course in addition to SM472 must be at the 400 level.

Note: Other courses may be used as major or track electives upon approval of the Chair. All choices of track electives require the approval of the midshipman's academic adviser or the Chair. Warning: not all electives are offered every semester.

Applied Mathematics Track

SA367	Intro to Math Modeling
SA401	Linear Models and Optimization
SA402	Dynamic and Stochastic Models
SA410	Appl Search and Detection Theory
SA412	Proj in Op Analysis or Stat (Capstone)
SA421	Simulation Modeling
SA430	Logistics
SA442	Applied Statistics II
SM311P	Mathematical Methods for Physics
SM315	Intro to Partial Differential Equations
SM321	Topics in Applied Math I
SM339	Applied Statistics I
SM342	Discrete Math
SM411	Introduction to Complex Variables
SM421	Topics in Applied Math II
SM425	Advanced Numerical Analysis
SM426	Numerical Methods for Diff Equations
SM439	Seminar in Statistics
SM465	Advanced Differential Equations
SM474	Projects in Comp and Sci Math (Capstone)

Mathematics Track

SM334	Elements of Advanced Calculus
SM411	Intro to Complex Variables
SM444	Discrete Structures II
SM461	Linear Algebra
SM462	Algebraic Structures
SM463	Topics in Analytical and Discrete Math
SM464	Topology
SM472	Projects in Math (Capstone)

Other Major Electives

SM259	Mathematical Logic
SM279	Multivariable Calculus
SM312	Engineering Math II
SM362	Modern Algebra
SM365	Intro to Scientific Computing
SI204	Intro to Computer Science
Reading courses and seminar courses labeled SM485 and SM486 count as major electives. The courses SA302, SM313, and SM314 do not count as major electives. It is inadvisable to take both SM312 and SM411 because of significant overlap of material.	

NOTE: Strong students seeking greater mathematical depth in required courses outside the major are encouraged to take SP221-222-226 in place of SP211-212.

Class of 2007 - Mathematics Major - SMA (Math Track) and SMP (Applied Math Track)

3/c Fall	3/c Spring	2/c Fall	2/c Spring	1/c Fall	1/c Spring
NN204 2-2-3 Navigation	NE203 3-0-3 Ethics and Moral Reasoning	NS310 1-2-2 Tactics	NL302 2-0-2 Leadership: Theory and Practice		NS401/2/3/4 2-2-3 Junior Officer Practicum
SP211 3-2-4 General Physics I	SP212 3-2-4 General Physics II		MSE Elective 3-0-3		NL400 2-0-2 Law - Junior Officer
SM221/251 4-0-4 Calculus III with Vector Fields	SM222 4-0-4 Differential Equations	EE301/EE331 3-2-4 Elec Fund & Appl or Elec Eng I	EE302 3-2-4 Electrical Machines and IT Systems	ES419 3-2-4 Weapons System Engineering	
HH205 3-0-3 Western Civ I	HH206 3-0-3 Western Civ II			3-0-3 HUM/SS Elective	3-0-3 HUM/SS Elective
			EN200 3-2-4 Naval Engineering I	EM300 3-2-4 Naval Eng II	
					Free Elective 3-0-3
SM261 3-0-3 Matrix Theory	SM233 2-2-3 Intro to Applied Math	SM239 3-0-3 Probability and Statistics	Applied: SM339 Applied Stat 3-0-3 Math: 3-0-3 SM334/411/461/462	Applied: 3-0-3 Track Elective Math: 3-0-3 SM/SA3xx/4xx Maj El	3-0-3 Major Elective
SM280 1-0-1 Topics in Mathematics	SM291 3-0-3 Fundamentals of Mathematics	SM331 4-0-4 Advanced Calculus I	SM/SA3xx/4xx 3-0-3 Track Elective	SM/SA4xx* 3-0-3 Track Elective	3-0-3 Capstone Course SM472/SM474/ SA412
		Applied: SM365 4-0-4 Intro to Sci Computing Math: SM362 3-0-3 Modern Algebra			
18	20	16-17	19	17	17

Major Credits: 41-42 Total Credits: 141-142 SMA and SMP

*This elective is not required to be 400 level for majors in the mathematics track who have taken one of SM411/461/462.

Class of 2007 - Mathematics Major - SMP - Applied Mathematics Track

3/c Fall	3/c Spring	2/c Fall	2/c Spring	1/c Fall	1/c Spring
NN204 2-2-3 Navigation	NE203 3-0-3 Ethics and Moral Reasoning	NS310 1-2-2 Tactics	NL302 2-0-2 Leadership: Theory and Practice		NS401/2/3/4 2-2-3 Junior Officer Practicum
SP211 3-2-4 General Physics I	SP212 3-2-4 General Physics II		MSE Elective 3-0-3		NL400 2-0-2 Law - Junior Officer
SM221/251 4-0-4 Calculus III with Vector Fields	SM222 4-0-4 Differential Equations	EE301/EE331 3-2-4 Elec Fund & Appl or Elec Eng I	EE302 3-2-4 Electrical Machines and IT Systems	ES419 3-2-4 Weapons System Engineering	
HH205 3-0-3 Western Civ I	HH206 3-0-3 Western Civ II			3-0-3 HUM/SS Elective	3-0-3 HUM/SS Elective
			EN200 3-2-4 Naval Engineering I	EM300 3-2-4 Naval Eng II	
					Free Elective 3-0-3
SM261 3-0-3 Matrix Theory	SM233 2-2-3 Intro to Applied Math	SM239 3-0-3 Probability and Statistics	SM339 3-0-3 Applied Statistics	3-0-3 Track Elective	3-0-3 Major Elective
SM280 1-0-1 Topics in Mathematics	SM291 3-0-3 Fundamentals of Mathematics	SM331 4-0-4 Advanced Calculus I	3-0-3 Track Elective	SM/SA4xx 3-0-3 Track Elective	SM474/SA412 3-0-3 Capstone Project
		SM365 4-0-4 Intro to Sci Comp			
18	20	17	19	17	17

Major Credits: 42

Total Credits: 142

SMP - Applied Mathematics Track

Class of 2007 - Mathematics Major - SMA - Mathematics Track

3/c Fall	3/c Spring	2/c Fall	2/c Spring	1/c Fall	1/c Spring
NN204 2-2-3 Navigation	NE203 3-0-3 Ethics and Moral Reasoning	NS310 1-2-2 Tactics	NL302 2-0-2 Leadership: Theory and Practice		NS401/2/3/4 2-2-3 Junior Officer Practicum
SP211 3-2-4 General Physics I	SP212 3-2-4 General Physics II		MSE Elective 3-0-3		NL400 2-0-2 Law - Junior Officer
SM221/251 4-0-4 Calculus III with Vector Fields	SM222 4-0-4 Differential Equations	EE301/EE331 3-2-4 Elec Fund & Appl or Elec Eng I	EE302 3-2-4 Electrical Machines and IT Systems	ES419 3-2-4 Weapons System Engineering	
HH205 3-0-3 Western Civ I	HH206 3-0-3 Western Civ II			3-0-3 HUM/SS Elective	3-0-3 HUM/SS Elective
			EN200 3-2-4 Naval Engineering I	EM300 3-2-4 Naval Eng II	
					Free Elective 3-0-3
SM261 3-0-3 Matrix Theory	SM233 2-2-3 Intro to Applied Math	SM239 3-0-3 Probability and Statistics	SM334/411/461/462 3-0-3	SM/SA3xx/4xx Major Elec 3-0-3	SM/SA3xx/4xx Major Elec 3-0-3
SM280 1-0-1 Topics in Mathematics	SM291 3-0-3 Fundamentals of Mathematics	SM331 4-0-4 Advanced Calculus I	SM/SA3xx/4xx 3-0-3 Track Elective	SM/SA4xx* 3-0-3 Track Elective	SM472 3-0-3 Senior Seminar
		SM362 3-0-3 Modern Algebra			
18	20	16	19	17	17

Major Credits: 41 Total Credits: 141 SMA - Mathematics Track

*This elective is not required to be 400 level for majors in the Mathematics track who have taken SM411, SM461, or SM462.

MATHEMATICS HONORS MAJOR (MATH TRACK AND APPLIED MATH TRACK)

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This program differs from the standard Mathematics program in that it has the following special course requirements:

1. SM331H (Real Analysis I) is required instead of SM331 and will be taken in a special section. SM332H (Real Analysis II) is also required and replaces the Free Elective found in the regular (SMA) matrix.
2. For the applied mathematics track, at least two of the three required track electives must be at the 400 level (in addition to the honors project).
For the mathematics track, one of SM411 or SM461 or SM462 is required, and the required mathematics track elective (in addition to the honors project) must also be at the 400 level
3. SM496, SA496, or SA412: An honors project or independent study course will be taken in place of the usual capstone project course (SM474, SM472, or SA412) found in the regular (SMA) matrix. This project will be more demanding than the usual capstone project and will include an oral report and a written report.

Class of 2007 - Mathematics Honors Major - SMAH (Honors Math Track) and SMPH (Honors Applied Math Track)

3/c Fall	3/c Spring	2/c Fall	2/c Spring	1/c Fall	1/c Spring
NN204 2-2-3 Navigation	NE203 3-0-3 Ethics and Moral Reasoning	NS310 1-2-2 Tactics	NL302 2-0-2 Leadership: Theory and Practice		NS401/2/3/4 2-2-3 Junior Officer Practicum
SP211 3-2-4 General Physics I	SP212 3-2-4 General Physics II				NL400 2-0-2 Law Junior Officer
SM221/251 4-0-4 Calculus III with Vector Fields	SM222 4-0-4 Differential Equations	EE301/EE331 3-2-4 Elec Fund & Appl or Elec Eng I	EE302 3-2-4 Electrical Machines and IT Systems	ES419 3-2-4 Weapons System Engineering	MSE Elective 3-0-3
HH205 3-0-3 Western Civilization I	HH206 3-0-3 Western Civilization II			3-0-3 HUM/SS Elective	3-0-3 HUM/SS Elective
			EN200 3-2-4 Naval Engineering I	EM300 3-2-4 Naval Eng II	
SM261 3-0-3 Matrix Theory	SM233 2-2-3 Int Appl Math	SM239 3-0-3 Probability and Statistics	Applied: SM339 Applied Stat 3-0-3 Math: 3-0-3 SM411/461/462	Applied: SM/SA4xx Track Elective 3-0-3 Math: 3-0-3 SM/SA3xx/4xx Maj El	3-0-3 Major Elective
SM280 1-0-1 Topics in Mathematics	SM291 3-0-3 Fundamentals of Mathematics	SM331H 4-0-4 Real Analysis I	SM332H 4-0-4 Real Analysis II	SM/SA4xx 3-0-3 Track Elective	SM/SA496 0-6-3 or SA412 3-0-3 Project/Study
		Applied: SM365 4-0-4 Intro to Sci Computing Math: SM362 3-0-3 Modern Algebra	SM/SA3xx/4xx: 3-0-3 Track Elective		
18	20	16-17	20	17	17

Major Credits: 42-43

Total Credits: 142-43

SMAH and SMPH