

Volgenau School of Engineering - Systems Engineering, BS

Catalog Year: 2019 - 2020		Grades		
Mason Core Reqs (18 credits)	Course Information	Credits	Earned	Needed
Written Communication:	ENGH 101 (100)	3		
*Oral Communication	*Satisfied by Major Requirements			
*Quantitative Reasoning	*Satisfied by Major Requirements			
*Information Technology	*Satisfied by Major Requirements			
Arts		3		
Global Understanding		3		
Literature		3		
*Natural Science	*Satisfied by Major Requirements			
*Social & Behavioral Science	*Satisfied by ECON 103			
Western Civ/World History		3		
**Written Communication	ENGH 302 - **Natural Science Section Only	3		
*Capstone/Synthesis	*Satisfied by Major Requirements			
Major Requirements (104 credits) Students in the Systems Engineering, BS program must complete all mathematics, science, and VSE courses with a grade of C or better				
Systems Engineering Requirements (55 credits)		Credits	Earned	Needed
SYST 101	Understanding Systems Engineering	3		
SYST 210	Systems Design	3		
SYST 220/221	Dynamical Systems I with Systems Modeling Laboratory	4		
SYST 320	Dynamical Systems II	3		
SYST 330	Systems Methods	3		
SYST 335	Discrete Systems Modeling and Simulation	3		
SYST 371	Systems Engineering Management	3		
SYST 395	Applied Systems Engineering	3		
SYST 470	Human Factors Engineering	3		
SYST 473	Decision and Risk Analysis	3		
SYST 489	Senior Seminar	3		
SYST 490 & 495	Senior Design Project I & II	6		
OR 441	Deterministic Operations Research	3		
OR 442	Stochastic Operations Research	3		
Select 3 approved technical electives selected from one of the Technical Emphasis Areas below		9		
Aviation Systems: SYST 420, 460, 461				
Bioengineering: BENG 313 and Two from: BENG 304, 406, 420				
Control Systems: ECE 201, 220, 421				
Computer Network Systems: SYST 420, ECE 465, TCOM 500				
Data Analytics: SYST 468, IT 214, STAT 463 or SYST 438				
Environmental Engineering: CEIE 240, CEIE 355, CEIE 450 or CEIE 453				
Financial Engineering: SYST 438, SYST 488. Choose one from: STAT 463, 455; SYST 468; MBUS 304				
Mechanical Engineering: Option 1: Mechanical Design: ME 211 or CEIE 210, ME 212 or CEIE 310, ME 341 or ME 231 Option 2: Thermal Fluids: ME 221, 322, 323				
Operations Research: OR 481, SYST 420, SYST 468				
Software-Intensive Systems: CS 310, CS 321, CS 332				
Additional Support Coursework (49 credits)		Credits		
COMM 100 or 101	Public Speaking or Fundamentals of Communication	3		
ECON 103	Contemporary Microeconomic Principles	3		
ENGR 107	Introduction to Engineering (Mason Core)	2		
CDS 130 or CS 112	Computing for Scientists or Introduction to Computer Programming	3-4		
SYST 230 or CS 222	Object-oriented Modeling & Design or Computer Programming for Engrs	3-4		
MATH 113, 114, and 213	Analytic Geometry and Calculus I, II, & III	10		
MATH 203	Linear Algebra	3		
MATH 214	Elementary Differential Equations	3		
STAT 344	Probability and Statistics for Engineers I	3		
STAT 354	Probability and Statistics for Engineers and Scientists II	3		
PHYS 160/161 and 260/261	University Physics I & II	8		
Four credits from: PHYS 262/263; BIOL 213; CHEM 211/213 or CHEM 271/272		4		
Advisor Notes:				



Volgenau School of Engineering

SYSTEMS ENGINEERING, B.S. 2019 – 2020

As the systems around us grow more complex, the need grows for engineers who understand not just the pieces, but how they interact. Whereas other engineering disciplines concentrate on individual aspects of a system (electronics, ergonomics, software, etc.), systems engineers focus on the system as a whole. Systems engineers work as the lead of their projects, integrating all the disciplines and specialty groups into a team effort, forming a structured development process that proceeds from concept to design to production to operation. Systems engineers consider both the business and the technical needs of all customers with the goal of providing a quality product that meets the user needs.

Our nationally recognized program in systems engineering at George Mason University prepares students for immediate employment and provides a foundation for a lifetime of learning. Our program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>. Our educational program reflects the systems engineer's unique perspective that considers all aspects of a system throughout the entire lifetime of that system. The systems engineering program at George Mason is interdisciplinary, drawing from other engineering disciplines, computer science, operations research, statistics, psychology and economics. The core systems engineering courses tie together these diverse threads to provide a comprehensive understanding of how individual disciplines fit into the development of complex, large scale systems.

Students gain depth in a technical area by selecting a sequence of technical electives that constitute an emphasis. Students choose their own emphasis with the help of their advisor. A year-long senior design project provides hands-on experience in applying various systems engineering methods and tools. In the first two years, students obtain a basic foundation in mathematics, natural sciences, computing, writing, humanities, arts, and social sciences. The systems engineering program builds on this foundation, teaching theoretical knowledge, practical skills, and the ability to apply systems thinking to problems. Teamwork, collaborative learning, analytical skills, practical problem solving, and oral and written communication are strongly stressed.

The mission of the undergraduate program is to equip students with the ability to participate productively in the many professional activities associated with engineering a trustworthy system that satisfies client needs. The term "system" is interpreted broadly to include information, telecommunication, defense, health delivery, transportation, energy or manufacturing systems, as well as corporate processes.

To earn the Bachelor of Science degree, students must satisfy all baccalaureate degree requirements as described in the George Mason University Catalog. These requirements include the completion of at least 123 credits that count towards graduation including at least 45 credits of upper-division level courses (numbered 300 or above), and fulfillment of all degree requirements.

We invite requests for additional information. Please contact:

Volgenau School of Engineering, Department of Systems Engineering and Operations Research
George Mason University, Mail Stop 4A6, Nguyen Engineering Building Suite 2100, Fairfax, VA 22030
Phone: (703) 993-1670 Fax: (703) 993-1521 <http://seor.gmu.edu> email: seor@gmu.edu

SYSTEMS ENGINEERING, B.S.

2019-2020 Sample Schedule for Undergraduate Systems Engineering Majors

First Semester

MATH 113 Analytic Geometry and Calculus I	4
ECON 103 Contemporary Microeconomic Principles	3
ENGR 107 Introduction to Engineering	2
Mason Core ¹	3
Mason Core ¹	3
	15

Second Semester

CDS 130 Computing for Scientists or CS 112 Introduction to Computer Programming	3/4
MATH 114 Analytic Geometry and Calculus II	4
PHYS 160 University Physics I	3
PHYS 161 University Physics I Laboratory	1
SYST 101 Understanding Systems Engineering	3
	14/15

Third Semester

SYST 230 Object-Oriented Modeling and Design or CS 211 Object-Oriented Programming	4/3
MATH 213 Analytic Geometry and Calculus III	3
PHYS 260 University Physics II	3
PHYS 261 University Physics II Laboratory	1
SYST 210 Systems Design	3
Mason Core ¹	3
	16/17

Fourth Semester

Natural Science (see list below) ³	4
MATH 203 Linear Algebra	3
MATH 214 Elementary Differential Equations	3
SYST 220 Dynamical Systems I	3
SYST 221 Systems Modeling Laboratory	1
Mason Core ¹	3
	17

Fifth Semester

STAT 344 Probability & Statistics for Engrs & Scientists I	3
SYST 320 Dynamical Systems II	3
OR 441 Deterministic Operations Research	3
ENGH 302 Adv Comp (Nat Sci section) ²	3
Technical Elective ⁴	3
	15

Sixth Semester

STAT 354 Probability & Statistics for Engrs & Scientists II	3
SYST 330 Systems Methods	3
SYST 335 Discrete Systems Modeling & Simulation	3
SYST 371 Systems Engineering Management	3
SYST 395 Applied Systems Engineering	3
	15

Seventh Semester

SYST 470 Human Factors Engineering	3
SYST 473 Decision and Risk Analysis	3
SYST 489 Senior Seminar	3
SYST 490 Senior Design Project I	3
Technical Elective ⁴	3
	15

Eighth Semester

SYST 495 Senior Design Project II	3
OR 442 Stochastic Operations Research	3
Technical Elective ⁴	3
Mason Core ¹	3
Mason Core ¹	3
	15

¹ <http://catalog.gmu.edu/mason-core> Mason Core Categories: One course from each: Oral Communication, ENGH 100 or 101, Arts, Global Understanding, Literature, Western Civilization/World History. SYST majors do not need to seek out Science, Math, IT, and Social Science categories as they are built into the major curriculum.

² ENGH 100 or 101 and Mason Core-Literature must be completed before taking ENGH 302.

³ The 4 credits of Natural Science must be chosen from the following list of courses. Students who select the Bioengineering technical emphasis area are strongly encouraged to take BIOL 213. Students who select the Environmental Engineering technical emphasis area must take CHEM 211/213 or CHEM 271/272.

- PHYS 262 - University Physics III Credits: 3 AND PHYS 263 - University Physics III Laboratory Credits: 1
- CHEM 271 - General Chemistry for Engineers Credits: 3 and CHEM 272 General Chemistry for Engineers Lab Credit: 1 (or) CHEM 211 - General Chemistry I Credits: 3 and CHEM 213 General Chemistry Laboratory I Credit: 1
- BIOL 213 - Cell Structure and Function Credits: 4

⁴ The Systems Engineering program requires nine credit hours of technical electives. Students must select one of ten specialization areas: Aviation Systems, Bioengineering, Computer Network Systems, Control Systems, Data Analytics, Environmental Engineering, Financial Engineering, Mechanical Engineering, Operations Research or Software Intensive Systems. **All specializations and the corresponding plan of study must be approved by the student's advisor. Some courses in the above specializations have additional pre-requisites. Refer to the catalog for the list of courses <https://catalog.gmu.edu/>**

Technical electives are normally composed of 300- and 400- level courses. Two hundred (200)- level courses are only included for special reasons (e.g., if they are prerequisites for other 300- and 400- level technical electives or if they are needed for the FE/EIT exam).