SYSTEMS ENGINEERING, M.S., WITH AN OPTION FOR A TECHNICAL FOCUS

Program Overview

Modern technological programs#are characterized by high complexity, multidisciplinary considerations, and strong interactions between science, technology,#business, and human civilization. Systems Engineering is the body of knowledge evolved to effectively manage such systems. Our program#offers#study options and technical focus areas that allow students to customize the program to meet their needs.#The optional technical foci available are aeronautics and space systems; civil engineering; computer science; cybersecurity; electrical engineering; engineering management; mechanical engineering.

Schedule

All courses are offered online and synchronously with the exception of course of the following technical-focus areas, which are in person: civil engineering, computer science, electrical engineering, and mechanical engineering. In-person courses are offered in the LMU Westchester campus. All courses meet one evening per week for three hours.

Registering for courses is the student's responsibility. A student is expected to make reasonable progress toward the degrees to remain in good standing at the University. A full-time course load is considered to be two courses in Fall and Spring semesters.

Program Educational Objectives

The Systems Engineering graduate program has established the following program educational objectives. Graduates of the program will:

1. Apply the fundamental principles of systems engineering#to complex problems
2. Become leaders of innovative technology projects and businesses
3. Develop multidisciplinary skills#to architect, design, and#manage complex#systems throughout their life cycle
4. Apply principles of project management and lean engineering to improve operational efficiency
5. Develop technical skills to model, analyze, and design integrated engineering systems

Admission Requirements

- Application to Graduate Admission#and a $50 application fee. To apply online, visit http://graduate.lmu.edu.
- Transcript documenting B.S. in engineering or B.A. in Program Management or equivalent degree (GPA of 3.0 or better) from an accredited university program
- If the applicant's GPA is below 3.0, also submit two letters of recommendation from past professors or current employer.
- Two years' work experience is preferred.
- Brief personal statement discussing how the graduate program fits the applicant's career goals
- The undergraduate education of all applicants, regardless of their previous degrees, should include the following subject areas:
  - College-level differential and#integral calculus
  - Physics (mechanics and electromagnetics)
  - Computer programming experience
  - Statistics
- These courses need not be taken at Loyola Marymount University. However, the student should make certain that courses taken elsewhere satisfy the above requirements. Applicants who do not have adequate background might be required to take additional undergraduate courses. Coursework required as condition of admission may not be waived.
- Transfer Credit: Students may transfer six (6) semester hours for#courses#completed at another regionally accredited college or university. Credits to be transferred must be taken prior to admission. Each transferred course grade must be at least B (3.0), and the course must not have been used to satisfy degree requirements at another college or university.

Graduation Requirements

- The overall minimum GPA required for graduation is 3.0.#Students who receive a grade of less than "B" in any 500-level course or a grade of less than "C" in any 600-level course will not have the course count toward their degree.
- The requirement for the#M.S. in Systems Engineering degree is 10 courses (30#semester hours), as follows:

Code	Title	Semester Hours
Select three of the following core Systems Engineering online courses:		9
SYEG 500	Systems Engineering (required)	
SYEG 540	Systems Thinking: Major Tech Changes/Impacts	
SYEG 600	Advanced Systems Engineering and Program Management	
SYEG 640	Model Based Systems Engineering	
SYEG 650	Systems Architecture	
SYEG 668	Systems Engineering Modeling and Analysis	
Selected courses from the technical focus areas:		
SYEG 551		
SYEG 554	Engineering for Autonomy	
SYEG 557	Agile Development and Project Management	
SYEG 570	Spacecraft Design	
SYEG 572	Spacecraft Communications and Radar	
SYEG 584	Occupy Mars: Explorations in Space Travel and Colonization	
SYEG 586	Launch Vehicle Technology and Design Evolution	
SYEG 587	Resilient Space Systems Design	
SYEG 662	Secure Software Development	
Special or independent studies:		
SYEG 698	Special Studies	
SYEG 699	Independent Studies	
Select three of the following core Engineering Project Management courses:		9
SYEG 510	Project Management (required)	
SYEG 520	Engineering Leadership and Integrity	
SYEG 530	Lean Engineering and Management	
SYEG 557	Agile Development and Project Management	

SYEG 560	Introduction to Cybersecurity	
SYEG 576	Business Law for Engineers	
SYEG 577	Engineering Economics and Finance	
SYEG 600	Advanced Systems Engineering and Program Management	
SYEG 620	Manufacturing Processes and Quality Systems	
SYEG 673	New Product Design and Development	
SYEG 679	Startup Entrepreneurship and Managing Engineering Innovation	
Select three technical electives, depending on the technical focus area, from the following:		9
Systems Engineering (online courses):		
SYEG 500 and 600 level courses		
Electrical Engineering (in-person courses):		
Two EECE 5000 or 6000 level courses		
EECE 6901	Graduate Capstone Project I	
EECE 6902	Graduate Capstone Project II	
Mechanical Engineering (in-person courses):		
MECH 500 or 600 level courses		
Civil Engineering (in-person courses):		
CIVL 500 and 600 level courses		
Cybersecurity (online courses):		
SYEG 560	Introduction to Cybersecurity	
SYEG 563	Cyberdefense	
SYEG 662	Secure Software Development	
Computer Science (in-person courses):		
SYEG 554	Engineering for Autonomy	
SYEG 557	Agile Development and Project Management	
SYEG 651	Software Architecture	
Aeronautics and Space Systems (online courses):		
Select three of the following:		
SYEG 570	Spacecraft Design	
SYEG 572	Spacecraft Communications and Radar	
SYEG 584	Occupy Mars: Explorations in Space Travel and Colonization	
SYEG 586	Launch Vehicle Technology and Design Evolution	
SYEG 587	Resilient Space Systems Design	
SYEG 588	Satellite Guidance, Control, and Operations	
MECH 544	Propulsion	
Engineering Management (online courses):		
Select three of the following:		
SYEG 520	Engineering Leadership and Integrity	
SYEG 530	Lean Engineering and Management	
SYEG 577	Engineering Economics and Finance	
SYEG 620	Manufacturing Processes and Quality Systems	
SYEG 679	Startup Entrepreneurship and Managing Engineering Innovation	
In-person courses from the Business Analytics or MBA programs with the designation BSAN, MBAA, MBAD, MBAE, MBAF, MBAG, MBAH, MBAP with concurrence from the program director of the Business Analytics and/or MBA programs, and if prerequisites are satisfied. Students with technical emphasis in Engineering Management can complete up to 6 units of MBA courses that count for the emphasis. To maintain eligibility to apply to the dual-degree program, these students should complete these MBA courses, if any, after completion of all SYEG courses. Otherwise, switching to the dual-degree program will not be possible.		
SYEG 695	Preparation for Capstone Project [1]	0
SYEG 696	Graduate Capstone Project [1]	3
Total Semester Hours		**30**

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Note: SYEG 695 Preparation for Capstone Project and SYEG 696 Graduate Capstone Project are not required if completing the technical emphasis in Electrical Engineering.

Note:#Electives are scheduled only if a sufficient number of students sign up. With the approval of the Director, the above curriculum can be adjusted to meet the student's individual educational needs. Taking three technical electives allows the student to graduate with an M.S. in Systems Engineering with a technical focus in that area. The student must apply for the M.S. in Systems Engineering with their desired technical focus area when they apply to the M.S. in Systems Engineering program, or apply for a program transfer after they have started the program.

Note:#The Graduate Capstone Project is typically the last course taken in the program. It is designed to demonstrate the student's knowledge of all the systems engineering and systems management principles and lean engineering addressed in the prerequisite courses. The course is typically completed in one semester. SYEG 695 Preparation for Capstone Project should be taken the semester prior to taking SYEG 696 Graduate Capstone Project. It is unlikely that the project can be completed in one or two summer sessions due to the shortened schedule.

Note: 500-level courses taken as an undergraduate may not be repeated for graduate credit. If a 500-level course is cross listed with a 600 level course, graduate student must enroll in the 600-level course.

Master's Thesis Option

Preparation of a Master's Thesis is optional and#can fulfill up to a maximum of 6#semester hours of elective course requirements. The student electing the thesis option must obtain a thesis advisor before Departmental consent will be considered, and the thesis must conform to the Frank R. Seaver College of Science and Engineering requirements. The thesis and associated work#is#intended to advance the state of knowledge in the thesis subject not "rehash" previous work by others or a serve as a "literature search." The thesis ideally will form the basis for a paper or article, produced by a student, which would be submitted and hopefully published in a peer-reviewed journal or presented at a professional organization's conference. A thesis is completed after being successfully defended to the thesis committee. With direction from the Graduate Director, a thesis committee will be formed. The thesis committee consists of the student's thesis advisor, a full-time faculty member from the student's department, and a third member from other than the student's department.

Combined B.S./M.S. in Systems Engineering Program

This program is designed for LMU students to receive a combined B.S. and M.S. degree by continuing their studies in LMU's Masters programs immediately following their B.S. degree. The program allows students to complete the M.S. program in Systems Engineering in one year after completion of the B.S. program.

Only LMU students#in Engineering, Mathematics, Computer Science, and Physics with senior standing and a GPA of at least 3.0 are eligible to apply. The deadline for application is the end of Fall semester of senior year. Students can enter this program any term immediately following completion of their undergraduate degree requirements.

Graduation Requirements

The candidate for the combined B.S./M.S.E. degree must satisfy the following requirements (30 semester hours):

1. One Frank R. Seaver College of Science and Engineering 500-level course (3 semester hours) taken as an undergraduate may count toward the M.S. degree. This course can be double counted for the B.S. degree and the M.S. degree. The student is required to complete 27 additional semester hours after earning the B.S. degree.
2. In addition, for an admitted student, an extra Seaver College 500-level course (3 semester hours) may be taken in their senior year that counts towards the M.S. degree and not the B.S. degree. This potentially reduces the total number of additional semester hours after earning the B.S. degree to 24.
3. The remaining coursework required must be consistent with the graduation requirements for the M.S. in Systems Engineering program.

Admission Requirements

- Application to Graduate Admission#and a $50 application fee. To apply online, visit http://graduate.lmu.edu.
- GPA of at least 3.0
- Brief personal statement discussing how the graduate program fits the applicant's career goals

Dual M.S. in Systems Engineering/ Masters of Business Administration

The mission of the Dual Degree MS in Systems Engineering/MBA program is to educate working engineers and scientists in the engineering and business disciplines that will make them leaders of highly complex technical endeavors within their sponsoring organizations.

The dual degree MS/MBA program confers two degrees upon its graduates: an MBA and an MS in Systems Engineering. Taking the dual degree program saves the student several courses compared to the two programs taken separately. Students may obtain either an MS in Systems Engineering or an MBA degree as a stand-alone by fulfilling the individual degree requirements.

The dual-degree program is designed to be completed in approximately three years. Systems-engineering classes are completed first, followed by taking the required classes in the MBS program.

Program Educational Objectives (PEOs) and Learning Outcomes (LOs)

The PEOs of the MS degree and the LOs of the MBA degree are the same as those of the stand-alone degrees.

Admission Requirements

Students seeking admission should apply first to the Systems Engineering, M.S., with Technical Focus in Engineering Management. After completing 12 semester hours of systems-engineering courses with a GPA of 3.0, students can apply to the dual degree MS/MBA program. Students who are granted admission may begin enrolling in MBA courses upon approval from their respective program director.

Graduation Requirements

Students enrolled in the dual-degree MSE/MBA program are jointly advised by the program directors of the MS in Systems Engineering and MBA programs. It is recommended that incoming students take a full course load of systems-engineering courses the first year and begin the MBA curriculum in year two. Additional systems-engineering courses can be completed in year three.

Students need to complete 36 units of MBA courses (i.e., MBA curriculum without emphasis/specialization) and 24 credit hours of systems-engineering courses (i.e., MS in Systems Engineering curriculum without 6 units of elective courses) with a cumulative grade point average of at least B (3.0). Therefore, students need to complete a total of 60 credit hours to graduate. 15 credit hours of systems-engineering courses will be used to satisfy the emphasis/concentration requirement of the MBA degree. 6 credit-hours of MBA courses will be used to satisfy elective requirements of the MSE degree. Of the systems-engineering coursework, courses at the 500-level must be completed with a grade of B (3.0) or better, and courses at the 600-level must be completed with a grade of C (2.0) or better.

When the course requirements outlined above are completed, the student will be awarded both the MBA degree and the MS degree in Systems Engineering.

Certificates

The five graduate certificate programs offer a convenient advanced program for the engineering, systems engineers, and managers who would benefit from understanding the concepts, principles, and practices both in theory and in real world implementation for key areas in today's advancing technological world.

- Systems Engineering Certificate (online courses)
- Engineering Project Management Certificate (online courses)
- Cybersecurity Certificate (online courses)
- Computer Science/Software Architecture Certificate (in-person courses)
- Aeronautics and Space Systems Certificate (online courses)

Upon completion of the certificate program, the student may re-apply for the M.S. degree in Systems Engineering and have the courses completed for the certificate to be crediting towards the M.S. degree.

Admission Requirements

- Application to Graduate Admissions and a $50 application fee. To apply online, visit http://graduate.lmu.edu.

- Transcript documenting B.S. in engineering or B.A. in Program Management or equivalent degree (GPA of 3.0 or higher) from an accredited university program
- If the applicant's GPA is below 3.0, also submit two letters of recommendation from past professors or current employer.
- Resume demonstrating two years' work experience
- Brief personal statement discussing how the graduate program fits the applicant's career goals

GPA

Students who receive a grade of less than "B" in any 500-level course or a grade of less than "C" in any 600-level course will not have the course count toward their degree. The overall minimum GPA required for graduation is 3.0 in the M.S. programs and 2.7 in the Certificate programs.

Graduation Requirements

Code	Title	Semester Hours
Select three courses from one of the technical areas of study below		9
Systems Engineering Certificate		
three 500- or 600-level courses (from the Core Systems Engineering Courses in the M.S. in Systems Engineering program)		
Engineering Project Management Certificate		
Select three of the following:		
SYEG 520	Engineering Leadership and Integrity	
SYEG 530	Lean Engineering and Management	
SYEG 577	Engineering Economics and Finance	
SYEG 620	Manufacturing Processes and Quality Systems	
SYEG 679	Startup Entrepreneurship and Managing Engineering Innovation	
Cybersecurity Certificate		
Select three of the following:		
SYEG 560	Introduction to Cybersecurity	
SYEG 563	Cyberdefense	
SYEG 662	Secure Software Development	
SYEG 664	Advanced Cybersecurity Management	
Software Architecture Certificate		
SYEG 651	Software Architecture	
SYEG 554	Engineering for Autonomy	
SYEG 557	Agile Development and Project Management	
Aeronautics and Space Systems		
Select three of the following:		
SYEG 570	Spacecraft Design	
SYEG 572	Spacecraft Communications and Radar	
SYEG 584	Occupy Mars: Explorations in Space Travel and Colonization	
SYEG 586	Launch Vehicle Technology and Design Evolution	
SYEG 587	Resilient Space Systems Design	
MECH 544	Propulsion	
Total Semester Hours		**9**

Note:
Other systems engineering courses may be substituted for the above courses with the approval of the Graduate Program Director.

Schedule for Certificate Programs

The students can complete the certificate program in one year by taking one course per semester, including summer.

Courses for MS in Systems Engineering, Dual Degree, and Certificate Programs

The program designator "SYEG" is used for all courses and all study options offered by the Systems Engineering graduate program. The M.S. in Systems Engineering courses selected for the SYEG program must be approved by the Systems Engineering Program Director. The MBA course descriptions can be found in the MBA section. All courses are three (3) semester hours unless otherwise noted.

Code	Title	Semester Hours
SYEG 500	Systems Engineering	3
SYEG 510	Project Management	3
SYEG 520	Engineering Leadership and Integrity	3
SYEG 530	Lean Engineering and Management	3
SYEG 540	Systems Thinking: Major Tech Changes/Impacts	3
SYEG 554	Engineering for Autonomy (cross listed with Computer Science)	3
SYEG 557	Agile Development and Project Management (cross listed with Computer Science)	3
SYEG 570	Spacecraft Design	3
SYEG 572	Spacecraft Communications and Radar	3
SYEG 576	Business Law for Engineers	3
SYEG 584	Occupy Mars: Explorations in Space Travel and Colonization	3
SYEG 586	Launch Vehicle Technology and Design Evolution (online format)	3
SYEG 587	Resilient Space Systems Design	3
SYEG 598	Special Studies	1-3
SYEG 599	Independent Studies	1-3
SYEG 600	Advanced Systems Engineering and Program Management	3
SYEG 620	Manufacturing Processes and Quality Systems	3
SYEG 640	Model Based Systems Engineering	3
SYEG 650	Systems Architecture	3
SYEG 651	Software Architecture (cross listed with Computer Science)	3
SYEG 662	Secure Software Development (cross listed with Computer Science)	3
SYEG 664	Advanced Cybersecurity Management (cross listed with Computer Science)	3
SYEG 668	Systems Engineering Modeling and Analysis	3
SYEG 673	New Product Design and Development	3
SYEG 679	Startup Entrepreneurship and Managing Engineering Innovation	3
SYEG 695	Preparation for Capstone Project (one Saturday or evening meeting)	0
SYEG 696	Graduate Capstone Project	3
SYEG 698	Special Studies	1-3
SYEG 699	Independent Studies	1-3