USC Viterbi

School of Engineering

Daniel J. Epstein Department of Industrial and Systems Engineering

https://ise.usc.edu

Undergraduate Handbook

2020-2021

(consistent with 2020-2021 *USC Catalogue*)

Table of Contents

INTRODUCTION 3

DEPARTMENTAL COMMUNICATIONS 3

PROGRAM MISSION, OBJECTIVES, AND OUTCOMES 3

MISSION 3
OBJECTIVES 3
OUTCOMES 4
PROGRAM CRITERIA 4

COURSE REQUIREMENTS FOR BACHELOR OF SCIENCE IN INDUSTRIAL AND SYSTEMS ENGINEERING (BSISE) 5

COMMON REQUIREMENTS FOR ALL BSISE STUDENTS 5
OPERATIONS FOCUS GROUP 8
PATHWAYS TO GRADUATION 8
PREREQUISITE FLOW CHART FOR BSISE REQUIRED COURSES WITH OPERATIONS FOCUS GROUP ELECTIVES 9
STUDY PLAN FOR BSISE WITH OPERATIONS FOCUS GROUP (CARDINAL PATH) 10
STUDY PLAN FOR BSISE WITH OPERATIONS FOCUS GROUP (GOLD PATH) 11
INFORMATION SYSTEMS FOCUS GROUP 12
PATHWAYS TO GRADUATION 12
PREREQUISITE FLOW CHART FOR BSISE REQUIRED COURSES WITH INFORMATION SYSTEMS FOCUS GROUP ELECTIVES 13
STUDY PLAN FOR INFORMATION SYSTEMS FOCUS GROUP (CARDINAL PATH) 14
STUDY PLAN FOR INFORMATION SYSTEMS FOCUS GROUP (GOLD PATH) 15
APPROVED ENGINEERING ELECTIVES 16
GENERAL EDUCATION AND WRITING REQUIREMENTS 17

COURSE REGISTRATION 18

BASIC REGISTRATION PROCESS 18
TRANSFERRING COURSEWORK 20
SUBSTITUTIONS FOR REQUIRED COURSES AND APPROVAL OF ENGINEERING ELECTIVES 20

OTHER COURSEWORK 21

COOPERATIVE EDUCATION (CO-OP) – ENGR 395 21
SPECIAL PROBLEMS -- ISE 390 21
DIRECTED RESEARCH -- ISE 490 21
STUDY ABROAD 22

COMPUTING 23

DEGREE PROGRESS AND GRADUATION 24

STARS REPORTS 24
DEGREE CHECKS 24
GRADUATION 24

BEYOND GRADUATION 25

CAREER SERVICES 25
PROGRESSIVE DEGREE PROGRAM 25

ACADEMIC HONORS 26

ALPHA PI MU 26
OMEGA RHO 26
ACADEMIC AWARDS 26

STUDENT ORGANIZATIONS 26

STUDENT CHAPTER OF THE INSTITUTE OF INDUSTRIAL AND SYSTEMS ENGINEERS 26

DISCLAIMER 27

APPENDIX: TWO-YEAR STUDY PLANS 29

TWO-YEAR STUDY PLAN FOR BSISE WITH OPERATIONS FOCUS GROUP 30
TWO-YEAR STUDY PLAN FOR BSISE WITH INFORMATION SYSTEMS FOCUS GROUP 31

INTRODUCTION

Welcome to the Daniel J. Epstein Department of Industrial and Systems Engineering. As you begin your undergraduate studies in the department, you are entering into a type of apprenticeship. Over the next few years, you will be developing the skills and knowledge needed to practice our profession. Successful practice of a profession involves appropriate conduct in the workplace and adequate performance on assigned tasks. Your path toward becoming an engineer also involves making choices about areas of specialization that you will explore and tools that you will use. This handbook describes our expectations of you and provides advice to help you make choices along the way.

DEPARTMENTAL COMMUNICATIONS

It is important that business messages between students, staff, and faculty be communicated in a way that creates a record that may be retrieved and reviewed, as needed. Consequently, information of an enduring nature (such as answers to frequently asked questions) is posted on the department web site, located at https://ise.usc.edu . The primary medium for current business communications within the department is e-mail. This means that you should be in the habit of checking your e-mail account for new messages regularly (at least once each week). You should also maintain your collection of saved messages (review and delete unneeded messages) so that sufficient space remains within your account folder to receive new messages. Typically, messages are sent to students from the isedept@usc.edu e-mail address, or from the e-mail address of an individual staff or faculty member.

PROGRAM MISSION, OBJECTIVES, and OUTCOMES

Mission

The mission of the Daniel J. Epstein Department of Industrial and Systems Engineering undergraduate program is to:

- provide students with (1) the skills and knowledge to obtain employment and achieve leadership within the industrial and systems engineering profession or to proceed with graduate education, (2) the intellectual resources to continue life-long learning, and (3) the knowledge of professional ethics and critical reasoning skills necessary for contributing to society;
- provide employers of industrial and systems engineering professionals with candidates who are technically competent, business aware, collaborative, able to communicate effectively, and are ethically grounded;
- maintain and enhance the reputation of the department within the engineering, business, and academic communities.

Objectives

Graduates of the Bachelor of Science in Industrial and Systems Engineering program are prepared to achieve any of the following accomplishments.

- obtain employment in an organization that values and rewards people who demonstrate both technical competence and business awareness
- pursue graduate or professional education
- assume a leadership role in their employment organization or community
- utilize critical reasoning, collaboration, and creativity to contribute to society

Outcomes

By the time of graduation, all USC Viterbi School of Engineering students will develop the following abilities and knowledge:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- an ability to communicate effectively with a range of audiences
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Program Criteria

In addition to the abilities and knowledge listed among the Student Outcomes above, students in the Industrial and Systems Engineering undergraduate program will also develop an ability to design, develop, implement, and improve integrated systems that include people, materials, information, equipment and energy.

COURSE REQUIREMENTS for Bachelor of Science in Industrial and Systems Engineering (BSISE)

Common Requirements for all BSISE Students

COMPOSITION/WRITING REQUIREMENT: **7**

WRIT 150 Writing and Critical Reasoning (4)
WRIT 340 Advanced Writing (3)

GENERAL EDUCATION: **20**

One course in each of Category A, B, C, G, and H (4 ea)
Category D is fulfilled by Biology Elective
Category E is fulfilled by PHYS 151L or CHEM 105aL
Category F is fulfilled by MATH 125

PRE-MAJOR REQUIREMENTS: **32**

Math Requirements

MATH 125 Calculus I (4)

MATH 126 Calculus II, or
MATH 129 Calculus II for Engineers and Scientists (4)

MATH 225 Linear Algebra & Linear Differential Equations (4)

MATH 226 Calculus III, or
MATH 229 Calculus III for Engineers and Scientists (4)

Physics Requirements

PHYS 151L Fundamentals of Physics I (4)
PHYS 152L Fundamentals of Physics II (4)

Biology Elective

BISC 103L General Biology for the Environment and Life, or
BISC 104L How the Body Works, or
BISC 230L The Biology of the Brain: Current Topics in Neuroscience, or
HBIO 205L The Science of Sport (4)

Chemistry Elective

MASC 110L Materials Science, or
CHEM 105aL General Chemistry, or
CHEM 115aL Advanced General Chemistry (4)

MAJOR REQUIREMENTS: **45**

Engineering Requirement

ENGR 102 Engineering Freshman Academy (2)

Industrial & Systems Engineering Requirements

ISE 105 Introduction to Industrial and Systems Engineering (2)
ISE 150 Solving Engineering Problems via Computer Programming (3)
ISE 220 Probability Concepts in Engineering (3)
ISE 225 Engineering Statistics I (3)
ISE 315 Engineering Project Management (3)
ISE 330 Introduction to Operations Research: Deterministic Models (3)
ISE 331 Introduction to Operations Research: Stochastic Models (3)
ISE 410 Planning and Scheduling (3)
ISE 435 Discrete Systems Simulation (3)
ISE 440 Work, Technology, and Organization (3)
ISE 460 Engineering Economy (3)
ISE 495abx Senior Design Project (2;2)

Database Design Elective

ISE 382 Database Systems: Concepts, Design, and Implementation, or
DSO 435 Enterprise Data Architecture (4)

Human Factors Elective

ISE 370L	Human Factors in Work Design (4), or
ISE 470	Human/Computer Interface Design (3)

MAJOR ELECTIVES: **24**

At least 12 units must be from one of the approved Focus Groups.
At least 9 units must be from the Approved Engineering Electives list.

Total units required for the program: **128**

*Students selecting ISE 370 to satisfy the Human Factors Elective are only required to complete 23 units of Major Electives.

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Operations Focus Group

Students must complete the following courses...
ISE 335L Supply Chain Design (3)
ISE 375L Facilities Design (3)
ISE 426 Statistical Quality Control (3)

Plus at least one course from among the following…
ISE 232L Manufacturing Processes (3)
ISE 327 Six Sigma and Lean Operations (3)
ISE 350 Principles of Systems Engineering (3)
ACCT 410x Foundations of Accounting (4)

Pathways to Graduation

The study plans below show the two paths to graduation. Both the Cardinal path and the Gold path allow for completion of all BSISE degree requirements in eight semesters. Students who remain on their assigned path, i.e. complete courses shown on the prerequisite flow chart in the semesters shown on their assigned path, will find seats available in the courses they need each semester.

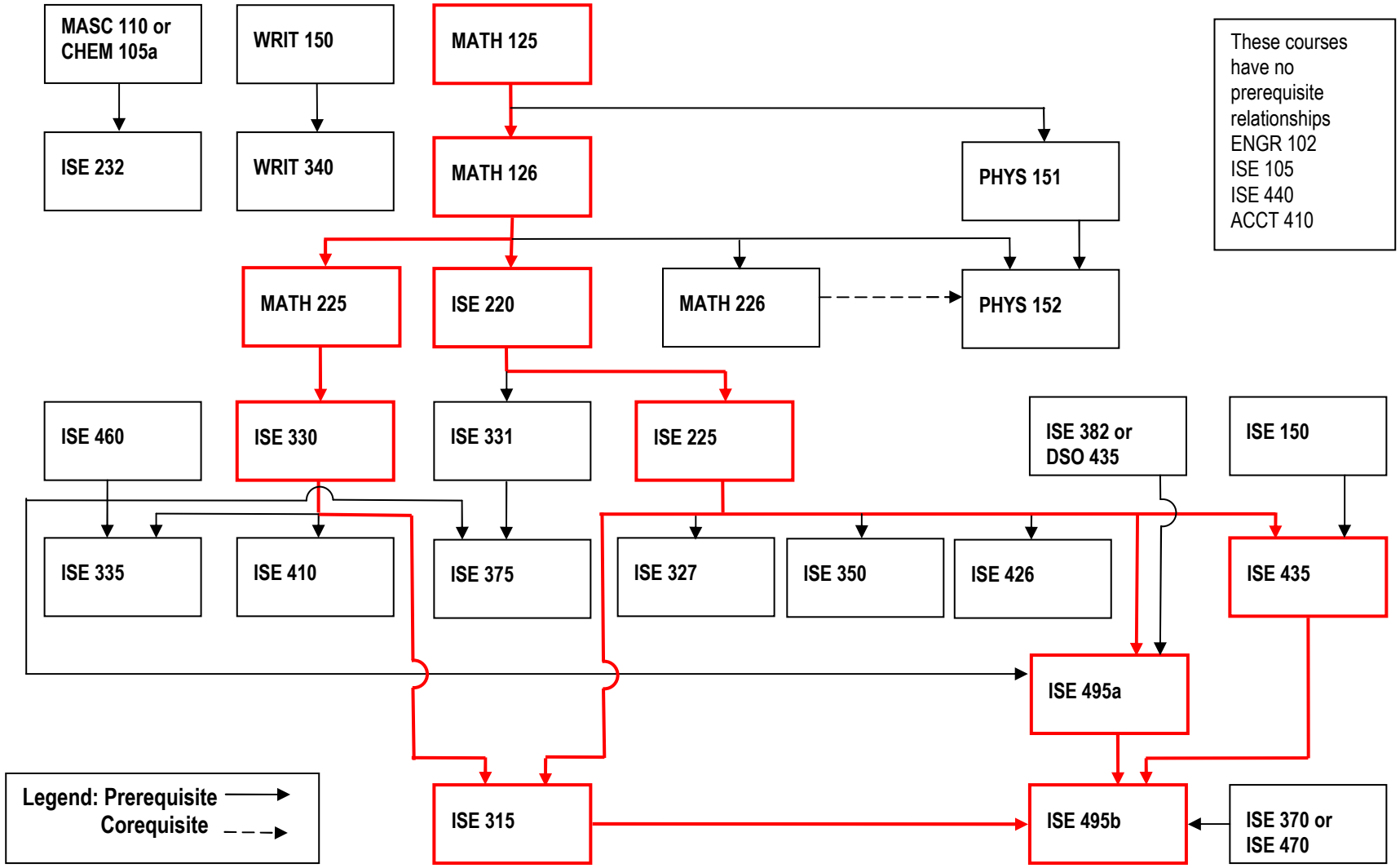
D-clearances for classes will be issued first to students who have a course listed on their assigned path for the coming semester. Students who stay on their assigned path will receive D-clearance for the courses on the path before their registration date. These students will be expected to register during the initial registration period. If they do not register for the course before their D-clearance expires, the seat in that class will become available to other students.

Students who request to take a course in a semester that does not agree with their assigned path will be placed onto a waitlist, and will only be considered for D-clearances after the initial registration period has ended. If seats are available after the initial registration period, D-clearances will be issued to students on the waitlist as the available seating allows.

Classes are scheduled to provide a seat for each student who is expected to take a course. Knowing the number of students assigned to a graduation path is the best way for the Department to plan for the number of classes to be offered.

Remaining on your assigned path is the best way for a student to assure timely progress toward graduation.

Prerequisite Flow Chart for BSISE required courses with Operations Focus Group electives



(longest course sequences are highlighted)

Study Plan for BSISE with Operations Focus Group (Cardinal path)

First Year, Fall Semester		
ISE 105	Introduction to Industrial and Systems Engineering (Fall only)	2
ENGR 102	Engineering Freshman Academy (Fall only)	2
MATH 125	Calculus I	4
WRIT 150	Writing and Critical Reasoning	4
General education	Category A,B,C,G, or H	4
		16
First Year, Spring Semester		
ISE 150	Solving Engineering Problems via Computer Programming	3
MASC 110L	Materials Science, or	
CHEM 105aL	General Chemistry, or	
CHEM 115aL	Advanced General Chemistry	4
MATH 126	Calculus II	4
General education	Category A,B,C,G, or H	4
		15
Second Year. Fall Semester		
ISE 220	Probability Concepts in Engineering	3
MATH 226	Calculus III	4
PHYS 151L	Fundamentals of Physics I: Mechanics and Thermodynamics	4
General education	Category A,B,C,G, or H	4
Free Elective		2
		17
Second Year, Spring Semester		
ISE 225	Engineering Statistics	3
ISE 331	Introduction to Operations Research: Stochastic Models	3
ISE 460	Engineering Economy	3
MATH 225	Linear Algebra and Linear Differential Equations	4
Free Elective		2
		15
Third Year, Fall Semester		
ISE 327	*Six Sigma and Lean Operations, or*	
ISE 350	*Principles of Systems Engineering*	*3*
ISE 330	Introduction to Operations Research: Deterministic Models	3
ISE 382	Database Systems: Concepts, Design and Implementation	4
ISE 435	Discrete Systems Simulation	3
WRIT 340	Advanced Writing	3
		16
Third Year, Spring Semester		
ISE 315	Engineering Project Management	3
ISE 335L	Supply Chain Design	3
ISE 370L	Human Factors in Work Design	4
ISE 495ax	Senior Design Project	2
Biology Elective		4
		16
Fourth Year, Fall Semester		
ISE 232	*Manufacturing Processes*	*3*
ISE 375L	Facilities Design	3
ISE 410	Planning and Scheduling	3
ISE 495bx	Senior Design Project	2
PHYS 152L	Fundamentals of Physics II: Electricity and Magnetism	4
		15
Fourth Year, Spring Semester		
ISE 426	Statistical Quality Control	3
ISE 440	Work, Technology, and Organization	3
ACCT 410x	*Foundations of Accounting*	*4*
General education	Category A,B,C,G, or H	4
General education	Category A,B,C,G, or H	4
		18

Total units required for the program: **128**

Italics indicates Operations Focus Group "Pick List" (must complete at least one of these)

Study Plan for BSISE with Operations Focus Group (Gold path)

First Year, Fall Semester		
ISE 105	Introduction to Industrial and Systems Engineering (Fall only)	2
ENGR 102	Engineering Freshman Academy (Fall only)	2
MATH 125	Calculus I	4
WRIT 150	Writing and Critical Reasoning	4
General education	Category A,B,C,G, or H	4
		16
First Year, Spring Semester		
ISE 150	Solving Engineering Problems via Computer Programming	3
MASC 110L	Materials Science, or	
CHEM 105aL	General Chemistry, or	
CHEM 115aL	Advanced General Chemistry	4
MATH 126	Calculus II	4
General education	Category A,B,C,G, or H	4
		15
Second Year. Fall Semester		
ISE 460	Engineering Economy	3
MATH 225	Linear Algebra and Linear Differential Equations	4
PHYS 151L	Fundamentals of Physics I: Mechanics and Thermodynamics	4
General education	Category A,B,C,G, or H	4
		15
Second Year, Spring Semester		
ISE 220	Probability Concepts in Engineering	3
ISE 330	Introduction to Operations Research: Deterministic Models	3
MATH 226	Calculus III	4
PHYS 152L	Fundamentals of Physics II: Electricity and Magnetism	4
General education	Category A,B,C,G, or H	4
		18
Third Year, Fall Semester		
ISE 225	Engineering Statistics	3
ISE 331	Introduction to Operations Research: Stochastic Models	3
ISE 335L	Supply Chain Design	3
ISE 370L	Human Factors in Work Design	4
WRIT 340	Advanced Writing	3
		16
Third Year, Spring Semester		
ISE 327	*Six Sigma and Lean Operations, or*	
ISE 350	*Principles of Systems Engineering*	*3*
ISE 375L	Facilities Design	3
ISE 382	Database Systems: Concepts, Design and Implementation	4
ISE 435	Discrete Systems Simulation	3
Free Elective		4
		17
Fourth Year, Fall Semester		
ISE 315	Engineering Project Management	3
ISE 426	Statistical Quality Control	3
ISE 440	Work, Technology, and Organization	3
ISE 495ax	Senior Design Project	2
Biology Elective		4
		15
Fourth Year, Spring Semester		
ISE 232	*Manufacturing Processes*	*3*
ISE 410	Planning and Scheduling	3
ISE 495bx	Senior Design Project	2
ACCT 410x	*Foundations of Accounting*	*4*
General education	Category A,B,C,G, or H	4
		16
Total units required for the program:		**128**

Italics indicates Operations Focus Group "Pick List" (must complete at least one of these)

Information Systems Focus Group

Students must complete the following course...
ITP 320x Enterprise Information Systems (4)

Plus at least 8 units from among the following…
DSO 431 Foundations of Digital Business Innovation (4)
DSO 433 Business Process Design (4)
ISE 350 Principles of Systems Engineering (3)
ITP 482 Engineering Database Applications (3)
ITP 487 Enterprise Data Analytics (4)

Pathways to Graduation

The study plans below show the two paths to graduation. Both the Cardinal path and the Gold path allow for completion of all BSISE degree requirements in eight semesters. Students who remain on their assigned path, i.e. complete courses shown on the prerequisite flow chart in the semesters shown on their assigned path, will find seats available in the courses they need each semester.

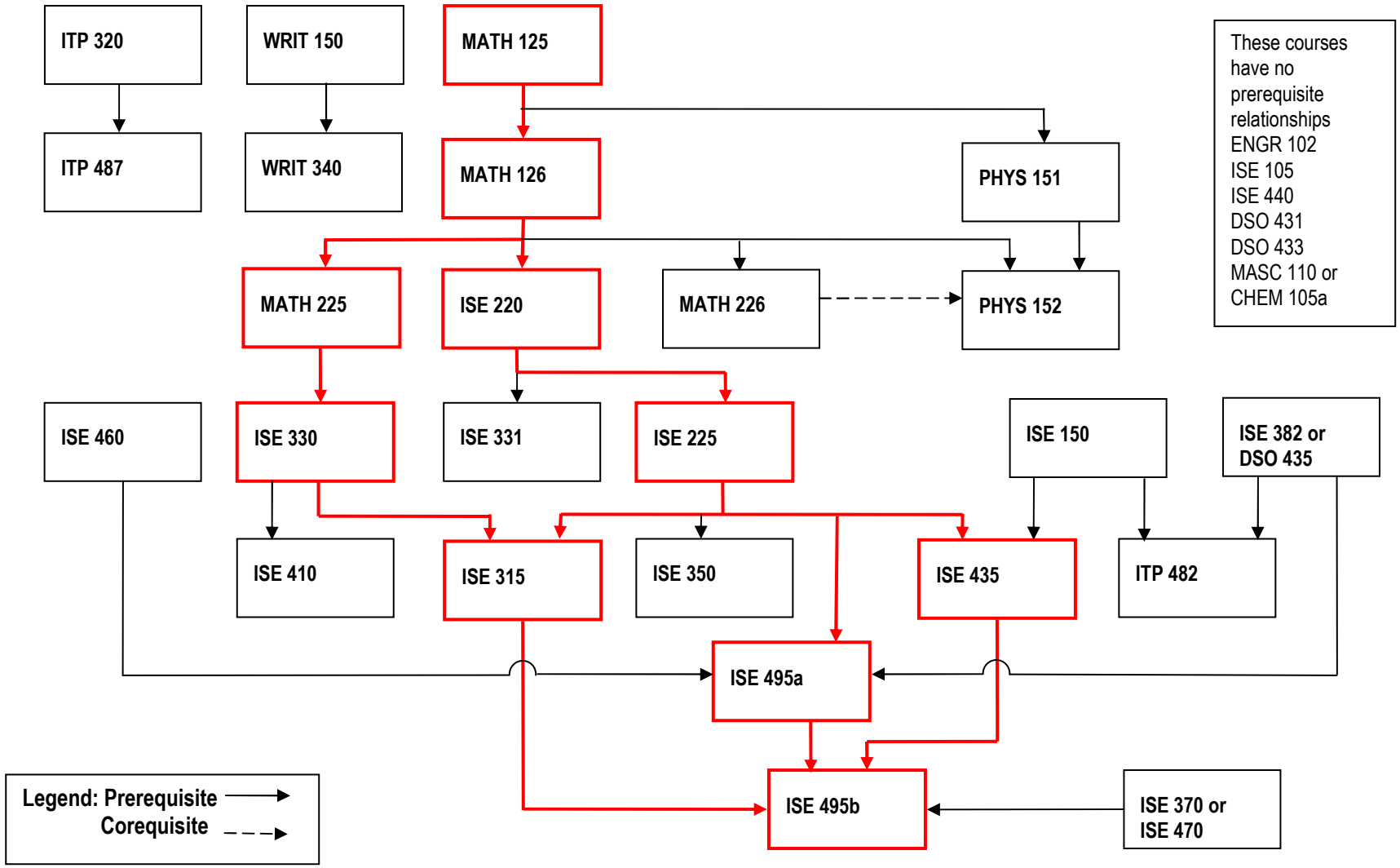
D-clearances for classes will be issued first to students who have a course listed on their assigned path for the coming semester. Students who stay on their assigned path will receive D-clearance for the courses on the path before their registration date. These students will be expected to register during the initial registration period. If they do not register for the course before their D-clearance expires, the seat in that class will become available to other students.

Students who request to take a course in a semester that does not agree with their assigned path will be placed onto a waitlist, and will only be considered for D-clearances after the initial registration period has ended. If seats are available after the initial registration period, D-clearances will be issued to students on the waitlist as the available seating allows.

Classes are scheduled to provide a seat for each student who is expected to take a course. Knowing the number of students assigned to a graduation path is the best way for the Department to plan for the number of classes to be offered.

Remaining on your assigned path is the best way for a student to assure timely progress toward graduation.

Prerequisite Flow Chart for BSISE required courses with Information Systems Focus Group electives



(longest course sequences are highlighted)

Study Plan for Information Systems Focus Group (Cardinal path)

First Year, Fall Semester		
ISE 105	Introduction to Industrial and Systems Engineering (Fall only)	2
ENGR 102	Engineering Freshman Academy (Fall only)	2
MATH 125	Calculus I	4
WRIT 150	Writing and Critical Reasoning	4
General education	Category A,B,C,G, or H	4
		16
First Year, Spring Semester		
ISE 150	Solving Engineering Problems via Computer Programming	3
MASC 110L	Materials Science, or	
CHEM 105aL	General Chemistry, or	
CHEM 115aL	Advanced General Chemistry	4
MATH 126	Calculus II	4
General education	Category A,B,C,G, or H	4
		15
Second Year. Fall Semester		
ISE 220	Probability Concepts in Engineering	3
ITP 320	Enterprise Information Systems	4
MATH 226	Calculus III	4
PHYS 151L	Fundamentals of Physics I: Mechanics and Thermodynamics,	4
		15
Second Year, Spring Semester		
ISE 225	Engineering Statistics	3
ISE 331	Introduction to Operations Research: Stochastic Models	3
ISE 460	Engineering Economy	3
MATH 225	Linear Algebra and Linear Differential Equations	4
General education	Category A,B,C,G, or H	4
		17
Third Year, Fall Semester		
ISE 330	Introduction to Operations Research: Deterministic Models	3
ISE 435	Discrete Systems Simulation	3
DSO 435	Enterprise Data Architecture (Fall only)	4
PHYS 152L	Fundamentals of Physics II: Electricity and Magnetism	4
Free Elective		2
		16
Third Year, Spring Semester		
ISE 315	Engineering Project Management	3
ISE 470	Human/Computer Interface Design (Spring only)	3
ISE 495ax	Senior Design Project	2
DSO 433	*Business Process Design (Spring only)*	*4*
General education	Category A,B,C,G, or H	4
		16
Fourth Year, Fall Semester		
ISE 410	Planning and Scheduling	3
ISE 495bx	Senior Design Project	2
DSO 431	*Foundations of Digital Business Innovation*	*4*
ITP 482	*Engineering Database Applications (Fall only)*	*3*
WRIT 340	Advanced Writing	3
		15
Fourth Year, Spring Semester		
ISE 350	*Principles of Systems Engineering*	*3*
ISE 440	Work, Technology, and Organization	3
ITP 487	*Enterprise Data Analytics*	*4*
Biology Elective		4
General education	Category A,B,C,G, or H	4
		18
Total units required for the program:		**128**

Italics indicates Information Systems Focus Group "Pick List" (must complete at least eight units of these)

Study Plan for Information Systems Focus Group (Gold path)

First Year, Fall Semester		
ISE 105	Introduction to Industrial and Systems Engineering (Fall only)	2
ENGR 102	Engineering Freshman Academy (Fall only)	2
MATH 125	Calculus I	4
WRIT 150	Writing and Critical Reasoning	4
General education	Category A,B,C,G, or H	4
		16
First Year, Spring Semester		
ISE 150	Solving Engineering Problems via Computer Programming	3
MASC 110L	Materials Science, or	
CHEM 105aL	General Chemistry, or	
CHEM 115aL	Advanced General Chemistry	4
MATH 126	Calculus II	4
General education	Category A,B,C,G, or H	4
		15
Second Year. Fall Semester		
ISE 460	Engineering Economy	3
ITP 320	Enterprise Information Systems	4
MATH 225	Linear Algebra and Linear Differential Equations	4
PHYS 151L	Fundamentals of Physics I: Mechanics and Thermodynamics	4
Free Elective		2
		17
Second Year, Spring Semester		
ISE 220	Probability Concepts in Engineering	3
ISE 330	Introduction to Operations Research: Deterministic Models	3
DSO 431	*Foundations of Digital Business Innovation*	*4*
MATH 226	Calculus III	4
PHYS 152L	Fundamentals of Physics II: Electricity and Magnetism	4
		18
Third Year, Fall Semester		
ISE 225	Engineering Statistics	3
ISE 331	Introduction to Operations Research: Stochastic Models	3
DSO 435	Enterprise Data Architecture (Fall only)	4
WRIT 340	Advanced Writing	3
Biology Elective		4
		17
Third Year, Spring Semester		
ISE 410	Planning and Scheduling	3
ISE 435	Discrete Systems Simulation	3
ISE 470	Human/Computer Interface Design (Spring only)	3
DSO 433	*Business Process Design (Spring only)*	*4*
General education	Category A,B,C,G, or H	4
		17
Fourth Year, Fall Semester		
ISE 315	Engineering Project Management	3
ISE 440	Work, Technology, and Organization	3
ISE 495ax	Senior Design Project	2
ITP 482	*Engineering Database Applications (Fall only)*	*3*
General education	Category A,B,C,G, or H	4
		15
Fourth Year, Spring Semester		
ISE 350	*Principles of Systems Engineering*	*3*
ISE 495bx	Senior Design Project	2
ITP 487	*Enterprise Data Analytics*	*4*
General education	Category A,B,C,G, or H	4
		13
Total units required for the program:		**128**

Italics indicates Information Systems Focus Group "Pick List" (must complete at least eight units of these)

Approved Engineering Electives

Students must select at least 9 units. Courses used for the focus group that also appear in the list below do apply toward the 9 unit requirement. Courses not listed may be petitioned for approval through the Department.

AME 341ab	Mechoptronics Laboratory I and II (3;3)
CE 408	Risk Analysis in Civil Engineering (3)
CE 460	Construction Engineering (3)
CE 471	Principles of Transportation Engineering (3)
DSO 427	Designing Spreadsheet-Based Business Models (4)
EE 326	Essentials of Electrical Engineering (4)
ENGR 305	Engineering Biology Matters (3)
ENGR 345	Principles and Practices of Global Innovation (3)
ENGR 401x	Communicating Science and Engineering to Children (3)
ISE 232L	Manufacturing Processes (3)
ISE 310L	Facilities and Logistics (4)
ISE 327	Six Sigma and Lean Operations (3)
ISE 335L	Supply Chain Design (3)
ISE 344	Engineering Team Management (3)
ISE 350	Principles of Systems Engineering (3)
ISE 375L	Facilities Design (3)
ISE 426	Statistical Quality Control (3)
ITP 215L	Introduction to 3D Modeling, Animation, and Visual Effects (2)
ITP 320x	Enterprise Information Systems (4)
ITP 325x	Ethical Hacking and Systems Defense (3)
ITP 421x	Advanced Programming for Enterprise Information Systems (3)
ITP 422L	Configuring Enterprise Resource Planning Systems (4)
ITP 454x	Enterprise Resource Planning, Design, and Implementation (3)
ITP 457	Network Security (4)
ITP 466	Building the High Tech Startup (4)
ITP 482	Engineering Database Applications (3)
ITP 486	Securing and Auditing Enterprise Resource Planning Systems (3)
ITP 487	Enterprise Data Analytics (4)
ITP 488x	Managing Supply Chains with Advanced Planning and Optimization (3)
NSC 335	Navigation I (3)
NSC 337	Naval Ship Systems II (Weapons) (3)

Students wishing to take courses not on the above list must petition the ISE Department for approval of the course. Please see Substitutions for Required Courses and Approval of Engineering Electives on page 20.

General Education and Writing Requirements

Students must complete the indicated number of courses from each of the eight categories shown below. Lists of courses that satisfy each category are available on the USC Schedule of Classes web site.

Core Literacies

- GE - A The Arts (1 course)
- GE - B Humanistic Inquiry (2 courses)
- GE - C Social Analysis (2 courses)
- GE - D Life Sciences (1 course)
- GE - E Physical Sciences (1 course)
- GE - F Quantitative Reasoning (1 course)

Global Perspectives

- GE - G Citizenship in a Global Era (1 course)
- GE - H Traditions and Historical Foundations (1 course)

Some courses listed in GE - G also appear in GE - C. Some courses listed in GE - H also appear in GE - B. So, careful selection of courses to satisfy GE - G and GE - H will also satisfy one course of the two-course requirement in each of GE - B and GE - C.

Furthermore, students are allowed to use courses required for their major to satisfy GE requirements. Typically, BS ISE students will satisfy GE - E by completing either PHYS 151L or CHEM 105aL. Similarly, BS ISE students will satisfy GE - F by completing MATH 125. GE - D should be fulfilled by completing the Biology elective, which consists of selecting one from among four biology courses that are directly related to ISE study.

With careful choice of courses, students can satisfy all of the General Education requirements listed above by completing five individual courses, in addition to PHYS 151L , MATH 125, and the Biology elective. So, the Study Plans given in this handbook incorporate five GE courses.

The writing requirement involves completion of WRIT 150 and WRIT 340, which require that you develop and demonstrate an ability to write acceptable college-level expository prose. The Viterbi School of Engineering writing program offers sections of WRIT 340 that are specifically designed to complement the study plans of engineering students. All Epstein ISE Department students are strongly encouraged to complete a section of WRIT 340 identified as Advanced Writing Communication for Engineers.

COURSE REGISTRATION

Basic Registration Process

Each semester, you should follow the steps below to register for the next semester's courses.

1. Review your progress – Compare your completed and in-progress courses to the Course Requirements and Prerequisite Flow Charts shown in this handbook.

2. Identify courses to take – Take note of the next required course that you need to take along each of the prerequisite chains. Look at the Study Plan for your assigned path toward graduation, to be aware of electives that you should complete. Your advisor will tell you which study plan you should follow, based upon the courses you have completed when you join the Department. Lists of courses that satisfy General Education requirements may be found in the *USC Catalogue* (http://catalogue.usc.edu). The *USC Catalogue* is also a good reference to browse for free electives.

3. Build a schedule – Visit the Schedule of Classes web site (http://classes.usc.edu) to find the days/times when courses are offered. Identify available sections of courses that do not create time conflicts with each other. The Spring semester schedule is usually posted in mid-October. The Fall semester schedule is usually posted in late-March. The Epstein ISE Department will generally schedule classes in accordance with the Study Plans shown in this handbook. Some courses are scheduled only one semester each year. Courses that are planned to be taken in different semesters may be scheduled at the same time on the same days. *The Epstein ISE Department does not control the scheduling of classes offered by other departments.*

4. Meet with your advisor – Freshman ISE students receive academic advising from the Viterbi First Year Excellence advisor, Taylor Relich. Taylor's office is located in RTH 110. Sophomore, Junior, and Senior ISE students receive advising from the ISE Undergraduate Advisor, Jessica de la Cruz-Gonzalez. Jessica's office is in GER 243. This year, advisors are scheduling online meetings with students. Your advisor will review your schedule to verify that it will produce acceptable progress toward your degree.

   It is necessary that you schedule an appointment to meet with an advisor. Because of the number of students with whom an advisor works to prepare for registration, walk-in access is not practical. Appointments may be scheduled by accessing the advisor's calendar via the myUSC web portal (http://my.usc.edu). *To see the advisor's calendar, you must access the myUSC portal from within the USC network. This means that you must either connect to the network while on-campus or connect to USC using a Virtual Private Network (VPN) client.* Information about VPN connections may be found at the USC Information Technology Services web site (http://itservices.usc.edu/vpn). Once you log in to the myUSC portal, click on the Undergraduate Advisement tab.

5. Clear registration holds – You are not allowed to register for courses until all registration holds have been cleared from your records. All ISE students are required to meet with an advisor each semester. When you meet with your advisor, the mandatory advisement registration hold for that semester will be removed from your record. To review other registration holds that have been placed on your record, log in to the On-line Academic Student Information System (https://camel2.usc.edu/oasis) and click on Permit to Register. A listing of contact information for University offices that may place registration holds on your record is available on the Registration Instructions page of the Schedule of Classes web site (http://classes.usc.edu/term-20193/roadmap/basic-steps). You may also access OASIS from the myUSC web portal.

6. Request departmental clearances – Courses that require an approval before registration are identified on the Schedule of Classes web site with section numbers that end in D. Most ISE courses require departmental approval before you can register. After your advisement meeting, your advisor will enter D-clearances for courses that appear on your graduation path for the next semester. To obtain D-clearances for other ISE courses, you should submit a request using the Department's online system. To access the system, log in to the myViterbi web portal (https://myviterbi.usc.edu) and click on the D-Clearance Request Manager tab. D-clearances for courses offered by other departments must be obtained from the offering department.

7. Register online – All students register for courses via the USC Web Registration site (https://webreg.usc.edu/Login). *You may select courses on the site only after the time indicated on your Permit to Register.* Links to instructions for using the web registration site are available on the site's log in page. You may also access Web Registration from the myUSC web portal.

8. Pay tuition and fees – You must pay your tuition and fees to complete the registrations process. See the Settle Your Bill section on the Registration Instructions page of the Schedule of Classes web site for information about making payments to the University.

Transferring Coursework

Many USC students take courses outside of USC because of economic or time constraints, or because they have transferred from another college. The following is a partial list of requirements and regulations regarding transferring work from outside USC. Refer to the *USC Catalogue* and/or to the Office of Academic Registration and Registrar web page (https://arr.usc.edu/services/articulation/generalinfo.html) for further information.

- Each course must have a grade of C- or better to transfer.
- If a course was failed at USC, the course may not be repeated elsewhere for unit credit.
- General education courses may not be taken outside of USC without prior permission from the Degree Progress Department.
- No engineering courses may be taken outside of USC without prior permission from the Epstein ISE Department for credit toward the BSISE.
- Physics courses used to substitute for PHYS-151 are transferable only on approval from the Physics Department.
- All students must satisfy the Residence Requirement (see the *USC Catalogue* for the Residence Requirement that applies to you).
- All non-ISE courses to be transferred must be approved by the USC Degree Progress Department for unit credit. The course must also be approved by the Epstein ISE Department, as a substitute for a BSISE degree requirement (see below).
- Accounting courses from other institutions will be accepted toward the BSISE if the courses were taken at an accredited two- or four-year institution for a minimum of three (3) semester hours of credit. Courses taken at institutions that operate on quarter-system calendars will be reviewed on a case-by-case basis.

Any unit deficiencies resulting from substitutions must be covered by other units on the student's transcript.

Substitutions for Required Courses and Approval of Engineering Electives

Substitutions for any required course or requests to use courses not listed in this handbook as satisfying an approved engineering elective must be petitioned for approval by the faculty. To submit a petition, please take note of the following instructions.

- Blank petition forms may be found on the Forms section of the Department's Undergraduate Program web page (https://ise.usc.edu/academics/undergraduate-program).
- The first line of any petition should clearly state the action to be approved, e.g. "Substitute IE 1234 from UC Riverside for ISE 330". Any explanation for the request may then follow.
- The petition form must be accompanied by a syllabus for the course that is requested to be approved.
- Completed petition forms and syllabi should be submitted via email to isedept@usc.edu.

The Epstein ISE Department faculty cannot approve unit credit for courses taken outside of USC. Only the USC Degree Progress Department can approve unit credit for transfer courses. Only the Epstein ISE Department faculty may approve a substitute course as satisfying an ISE degree requirement. Any unit deficiencies that result from a course substitution must be covered by other units on the student's transcript.

OTHER COURSEWORK

Cooperative Education (Co-Op) – ENGR 395

Obtaining work experience, professional contacts, and job skills prior to graduating is an excellent idea for juniors and seniors. The Co-Op program matches the interests of students with the needs of companies who are willing to participate in the program. Once the match is made, a faculty supervisor is selected, and a Student Training Plan/Learning Objectives form is completed with your employer supervisor. The Co-Op program is administered through the Viterbi School of Engineering Career Services Office (https://viterbicareers.usc.edu/students), RTH 218, (213) 740-9677. Please contact them for further details.

Co-Op activities are encouraged by the Epstein ISE Department as a relevant and valuable experience for undergraduate students. However, participation in Co-Op does not guarantee credit toward the BSISE requirements or electives. In order to use Co-Op toward the BSISE, the following conditions must be met:

1. Prior to starting Co-Op, the student must prepare a study plan outlining how the Co-Op experience will enhance his/her undergraduate experience. The work to be completed under Co-Op must incorporate educational or research content in industrial and systems engineering.

2. The student must present the study plan to his/her faculty advisor for approval prior to starting Co-Op.

3. The faculty advisor is required to periodically review the student's performance in Co-Op activities to ensure that progress is being made and that goals outlined in the study plan are being met.

4. The student must submit material as proof of original work, preferably in the form of a written report, to the faculty advisor for approval at the end of the Co-Op session. The contents of the report should adequately cover the objectives in the study plan.

Special Problems -- ISE 390

The Epstein ISE Department offers ISE 390 Special Problems, 1-4 units, which is available by special petition for seniors who need to complete degree requirements through individual study when regularly-offered courses would not do so. Enrollment in ISE 390 requires approval by the USC Committee on Academic Policies and Procedures (CAPP). CAPP will consider ISE 390 petitions only with evidence that the problem was created beyond the student's control. The student and the instructor must prepare a written contract of course requirements for presentation with the petition to CAPP. In all cases, ISE 390 registration must be recommended by the Department Chairman and the Dean of the School of Engineering. ISE 390 is only available for credit toward the BSISE.

It is the student's responsibility to schedule his/her courses to obviate the need to take ISE 390. If courses are taken in the recommended sequence, there should be no need for a ISE 390 registration. Please note that some courses are only offered in the fall or only offered in the spring.

Directed Research -- ISE 490

The Epstein ISE Department also offers ISE 490x Directed Research, 2-8 units, which is available by special petition to the Department for any junior or senior ISE student interested in pursuing faculty-guided study in topics not covered in regularly scheduled classes. The student and the faculty member must prepare a written contract of course requirements for approval by the Department Chair. Blank forms for the Directed Research contract may be found on the Forms section of the Department's Undergraduate Program web page (https://ise.usc.edu/academics/undergraduate-program). ISE 490x is not available for graduate credit and not available for any student on academic probation (or any other restricted academic status). A student may only have a maximum of eight units of ISE 490x on the transcript, and a maximum of sixteen units of all 490x classes on the transcript.

Study Abroad

There are two programs offered at USC that allow a student to study for a full semester at a university in another country while earning credits that apply directly to the student's USC transcript. The Dornsife College of Letters, Arts and Sciences offers an Overseas Study program that is open to engineering majors (https://dornsife.usc.edu/Engineering-overseas/) . The Viterbi School of Engineering offers an Exchange program with partner universities (http://viterbiundergrad.usc.edu/overseas/exchange). For information about study abroad courses that apply toward BSISE degree requirements, contact the ISE Department Associate Chair, Dr. Kurt Palmer.

COMPUTING

Throughout your undergraduate program, you will be introduced to several software tools that are useful for doing engineering work. Some of these tools are general-purpose office productivity programs, which are widely available at most businesses. Such office productivity programs have typically been adapted by the original developers, or copied by other developers, to run in a variety of Operating System (OS) environments, due to broad acceptance of these tools by home users.

By the way, not all versions of office productivity programs are identical. Available features can differ between versions of a program written by a single developer. Similar programs written by different developers often have different features. This means that software features demonstrated by instructors in ISE courses cannot be depended upon to exist in the software that you have on your computer. The current office productivity suite installed on Epstein ISE Department computers is Microsoft Office 2016.

You will also be introduced to several software tools that are specifically designed to perform engineering analyses. Such engineering software tools have typically been developed to run only in the Windows OS. The reason for this is that the Windows OS is, by far, the dominant OS installed on computers owned by companies who do engineering work. Software developers are not able to sell enough copies of their programs to people who use OS environments other than Windows to recover the cost of adapting their programs for those OS environments. Consequently, the Viterbi MyDesktop (vitual desktop environment made available to students enrolled in specific ISE courses) uses the Windows OS. The Viterbi MyDesktop can be accessed from the internet. It is the only source at USC where some software tools are available to students.

Some of the software licenses held by the Epstein ISE Department allow us to distribute copies of the software to students. These software tools run only in the Windows OS. The Windows OS is commonly installed on Personal Computers (PCs). If you own a Mac, it is possible to install the Windows OS; but, you must take extra steps to allow the Windows OS and Mac OS to both exist on your Mac.

There are at least three ways (discussed below) to run software written for the Windows OS on a Mac. All three ways require that you have a genuine copy of the Windows OS to install onto your Mac.

Boot Camp:

This is a component of the Mac OS 10.13 High Sierra operating system. It allows a Mac machine to load a compatible Windows OS rather than the Mac OS. Only one of the two operating systems can function at one time. The selection of operating system to load is made by the user during the system start up. Compatible Windows OSs include Windows 10, Windows 8.1, and Windows 7. For further information, visit https://support.apple.com/boot-camp

VirtualBox:

This open source project offers a freeware virtualization software for the Mac OS that supports the Windows OS as a guest operating system. It is possible to install Windows 10, Windows 8, or Windows 7 in the VirtualBox environment. Doing so will allow a Mac machine to run both the Mac OS X and a Windows OS simultaneously. For further information, visit www.VirtualBox.org

Parallels:

This is a third party, commercial product that allows for simultaneous execution of Windows compatible software inside the Mac OS. The Parallels software will function on Mac OS 10.14 Mojave, Mac OS 10.13.6 High Sierra and later versions, or Mac OS 10.12.6 Sierra and later versions.
A Student Edition is available for $40 at www.parallels.com/products/desktop/editions
The full version of Parallels Desktop 14 for Mac is available for $80 at www.parallels.com/products/desktop

DEGREE PROGRESS AND GRADUATION

Although this handbook was created to assist students throughout their academic career, the students are ultimately responsible for completing degree requirements. Undergraduates are subject to current regulations, policies and procedures printed in the *USC Catalogue*. Any changes in regulations, policies and procedures are immediate and supersede those in any prior catalogue.

STARS Reports

STudent Academic Records System (STARS) reports are produced by the Office of Academic Records and Registrar. This report contains all USC course work and accepted transfer work that applies toward degree requirements. The STARS report will list all requirements necessary for degree completion and indicate the student's current status as shown in official USC records. Students can access their reports on OASIS (www.usc.edu/oasis). You must use USC ID number and password to log in to OASIS directly. You may also access OASIS from the myUSC web portal, without needing your USC ID number. Any discrepancies on the STARS Report should be reported to the Epstein ISE Department Undergraduate Advisor, GER 243, (213) 740-7549, or isedept@usc.edu.

Degree Checks

Your advisor will complete a formal degree progress review during your third and fifth semesters at USC. Your advisor will generate a Course Plan for you using information from your STARS report. The Course Plan shows the courses you still need to complete for your degree and a recommended schedule to complete them. The Course Plan will be sent to you via e-mail with the subject Third Semester Audit or Fifth Semester Audit. During mandatory advisement meetings, your advisor will discuss with you your progress along the Course Plan.

Graduation

During the mandatory advisement meeting in the semester you are enrolled in ISE 495a (usually the first semester of your fourth year), your advisor will check to be sure that your courses for the next semester will complete your degree requirements. If your STARS report indicates that additional courses are required, your advisor will discuss with you a Course Plan that will show how to complete your degree requirements.

Commencement information will be posted on the USC Commencement web page (https://commencement.usc.edu) and on the Viterbi School of Engineering web page (http://viterbiundergrad.usc.edu/commencement). Printed material will be available in RTH 110 approximately two months prior to Commencement.

BEYOND GRADUATION

Career Services

The search for full-time employment as an engineer should begin at least two semesters prior to graduation. The Viterbi School of Engineering Career Services Office offers resume and interview preparation workshops, career fairs, company information sessions, and scheduling of on-campus interviews. A calendar of events may be found at the Career Services web site (https://viterbicareers.usc.edu/students). From time to time, the Epstein ISE Department receives notices of available positions from our network of alumni and friends. These notices are distributed to students via messages from the isedept@usc.edu e-mail address.

Progressive Degree Program

ISE students have the opportunity to simultaneously complete the requirements for the BS and MS degrees in five years. Students are eligible to apply after completing at least 64 units toward their BS with a GPA of 3.2 or higher. Applications must be submitted before you complete 96 units toward the BS degree. Applicants are not required to take the Graduate Record Exam (GRE). All requirements for both the MS and BS must be met. Up to six units of course work will be counted towards both programs.

Application information may be obtained from the Viterbi School of Engineering Office of Admissions and Student Affairs (http://viterbiundergrad.usc.edu/future/pdp). Students should see their departmental advisors for assistance with course selection.

ACADEMIC HONORS

Alpha Pi Mu

Alpha Pi Mu is the industrial engineering honors society. Its purpose is to recognize high academic achievement by juniors, seniors, and graduate students in industrial engineering. Membership is by invitation only.

Omega Rho

Omega Rho is the operations research honors society. Its purpose is to recognize high academic achievement by undergraduate and graduate students in operations research. Membership is by invitation only.

Academic Awards

The Department and the School of Engineering may, from time to time, nominate students for awards and scholarships. If you feel you may qualify for any award or recognition based on academic performance, leadership, extra-curricular activities, or any combination of the above, please let the Department know. We are always happy to give you the recognition you deserve and would not want anyone to miss out because of our oversight.

STUDENT ORGANIZATIONS

To build character and leadership skills, and to acknowledge academic achievement, the Epstein ISE Department supports the activities of three student organizations: the Student Chapter of Institute of Industrial Engineers; American Society for Quality Student Branch; and Engineering Management Society. ISE Department students are also leaders in the Information Systems Association, a student organization sponsored by the Data Sciences and Operations Department of the Marshall School of Business. These organizations are run by ISE students to further academic and professional goals. Each organization has an ISE faculty member as an advisor. The quality of each of these organizations is directly affected by the quality of its student members, and particularly its officers. Your active participation is, therefore, encouraged. Interested students should contact the organization's student officers or faculty advisor for more information. Contact information may be found on the USC Student Organizations web site (https://campusactivities.usc.edu/organizations).

Student Chapter of the Institute of Industrial and Systems Engineers

The Institute of Industrial Engineers is the professional organization for industrial engineers. Its mission is to promote and foster industrial engineering as a profession. Reduced membership dues are available to student members. The student officers are listed in the display case located outside the Epstein ISE Department Office (GER 240). The organization's website is https://usciise.wordpress.com/

DISCLAIMER

This handbook is produced by the USC Industrial and Systems Engineering Department as an unofficial guide to undergraduate studies in the department. The source for much of the information in this booklet is the *USC Catalogue,* the document of authority for all students of the University of Southern California. Degree requirements listed in the *USC Catalogue* supersede any information which may be contained in any bulletin of any school or department. The *USC Catalogue* is updated and published annually by the University of Southern California. Other sources for information contained in this booklet are the *School of Engineering Bulletin, the General Education Addendum, the Schedule of Classes,* and the *SCampus.* The student is referred to these publications for the definitive answers to any questions whether or not they are covered in this booklet. Matters of department policy not covered in the above publications may be referred to the ISE Educational Services Coordinator or to the ISE Faculty.

Although the University of Southern California, the Viterbi School of Engineering, and the Epstein Department of Industrial and Systems Engineering have many resources to help each student achieve his/her desired education and training goals, it is ultimately the student's responsibility to see that all requirements for graduation are satisfied.

Students are expected to be familiar with university policies and to monitor their own academic progress. They should keep all records of official grades earned, degree requirements met, transfer credits accepted and actions taken on requests for substitutions or exceptions to university policies and regulations.

USC Catalogue

FOR MORE INFORMATION ON USC OR THE ISE DEPARTMENT VISIT
https://ise.usc.edu

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APPENDIX: TWO-YEAR STUDY PLANS

Students who transfer into the Epstein ISE department from another program after completing four or more semesters of courses will need to follow a study plan that is different from the four-year plans shown earlier in this handbook. The study plans on the following pages show how to complete the required ISE courses in two years (four semesters). It is not possible to complete all of the required ISE courses in less than four semesters.

The study plans shown below assume that you have already completed all math (MATH 125, MATH 126, MATH 225, and MATH 226), computer programming (ISE 150), chemistry (MASC 110 or CHEM 105a), and physics (PHYS 151 and PHYS 152) courses. You should also have completed the first writing course (WRIT 150) and at least three General Education courses.

Two-Year Study Plan for BSISE with Operations Focus Group

First Year, Fall Semester		
ISE 220	Probability Concepts in Engineering	3
ISE 330	Introduction to Operations Research: Deterministic Models	3
ISE 460	Engineering Economy	3
ISE 232	*Manufacturing Processes, or*	*3*
ACCT 410x	*Foundations of Accounting*	*4*
Biology Elective		4
		16 or 17
First Year, Spring Semester		
ISE 225	Engineering Statistics	3
ISE 335L	Supply Chain Design	3
ISE 331	Introduction to Operations Research: Stochastic Models	3
ISE 382	Database Systems: Concepts, Design and Implementation	4
General education	Category A,B,C,G, or H	4
		17
Second Year. Fall Semester		
ISE 315	Engineering Project Management	3
ISE 327	*Six Sigma and Lean Operations, or*	
ISE 350	*Principles of Systems Engineering*	*3*
ISE 370L	Human Factors in Work Design	4
ISE 375L	Facilities Design	3
ISE 435	Discrete Systems Simulation	3
ISE 495ax	Senior Design Project	2
		18
Second Year, Spring Semester		
ISE 410	Planning and Scheduling	3
ISE 426	Statistical Quality Control	3
ISE 440	Work, Technology, and Organization	3
ISE 495bx	Senior Design Project	2
WRIT 340	Advanced Writing	3
General education	Category A,B,C,G, or H	4
		18

Two-Year Study Plan for BSISE with Information Systems Focus Group

First Year, Fall Semester		
ISE 220	Probability Concepts in Engineering	3
ISE 330	Introduction to Operations Research: Deterministic Models	3
ISE 460	Engineering Economy	3
ITP 320	Enterprise Wide Information Systems	4
DSO 435	Enterprise Data Architecture (Fall only)	4
		17
First Year, Spring Semester		
ISE 225	Engineering Statistics	3
ISE 331	Introduction to Operations Research: Stochastic Models	3
ISE 470	Human/Computer Interface Design (Spring only)	3
DSO 433	*Business Process Design (Spring only)*	*4*
Biology Elective		4
		17
Second Year. Fall Semester		
ISE 315	Engineering Project Management	3
ISE 435	Discrete Systems Simulation	3
ISE 495ax	Senior Design Project	2
ISE 350	*Principles of Systems Engineering, or*	
ITP 482	*Engineering Database Applications (Fall only)*	*3*
General education	Category A,B,C,G, or H	4
		15
Second Year, Spring Semester		
ISE 410	Planning and Scheduling	3
ISE 440	Work, Technology, and Organization	3
ISE 495bx	Senior Design Project	2
ITP 487	*Data Warehouses and Business Intelligence*	*3*
WRIT 340	Advanced Writing	3
General education	Category A,B,C,G, or H	4
		18