

# CIVIL ENGINEERING, B.S.E.

The civil engineering curriculum emphasizes practicality and design, supported by a strong background in scientific and mathematical concepts. The undergraduate program provides a broad background in all aspects of civil engineering, providing our graduates with the flexibility to practice in any of the specialties or to pursue an advanced degree. The program provides an opportunity to get hands-on experience with classes in surveying as well as laboratories in fluid mechanics, hydraulics, soil mechanics, mechanics of materials, structures, steel, and reinforced concrete design. Engineering design experiences are integrated throughout the curriculum beginning with the first-year engineering courses and extending through the last semester of the senior year. Design courses provide working experience with computer software used in the profession. Group and team projects prepare the student for real world engineering experiences. A number of electives provide the student with the opportunity to specialize in the following tracks (areas of concentration):

- Structures
- Water Resources
- Environmental
- Geotechnical

All of the areas of specialization share a common focus on sustainability.

## Accreditation

The Civil Engineering undergraduate program is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org> (<https://www.abet.org/>), under the commission's General Criteria and Program Criteria for Civil Engineering and Similarly Named Engineering Programs.

## Program Educational Objectives

The Civil Engineering undergraduate program has established the following program educational objectives that are consistent with the mission of the University and that describe the expected accomplishments of graduates during the first several years following graduation. Civil Engineering program graduates will:

1. Be productive in the civil engineering profession and/or other professional fields;
2. Uphold the code of ethics of the profession and be cognizant of social equity and sustainability issues;
3. Further develop their professional and/or technical qualifications through activities such as, but not limited to, graduate studies, continuing education, licensing, and/or certifications;
4. Be involved with professional organizations in civil engineering and/or other related fields; and
5. Exhibit leadership in civil engineering and/or other related fields.

To accomplish these program educational objectives, analysis and design courses in the fields of environmental, geotechnical, hydraulic, structural, and water resources engineering are offered in addition to preparatory courses in oral and written communications, mathematics, sciences, and basic mechanics. A broad base of theory and design is provided along with discussion of current issues and practices of the profession. Through class assignments, students will become proficient in the use of computers and pertinent software, spreadsheets, presentations, drawing,

and geographical information system (GIS) programs. Integrated with these courses is the University Core curriculum.

## Civil Engineering Curriculum

### Transfer Requirements

Students who are currently enrolled in another major at LMU, but are interested in changing their major to CIVL, must complete CHEM 111 General Chemistry I Lab, CHEM 114 General Chemistry for Engineers or CHEM 110 General Chemistry I; ENGR 2001 Statics; MATH 131 Calculus I, MATH 132 Calculus II; and PHYS 1100 Introduction to Mechanics with a minimum grade of C (2.0) in each course before being considered. Final approval of the transfer request resides with the Chair of the Civil and Environmental Engineering Department.

### Graduation Requirements for the Civil Engineering B.S.E.

Department criteria for graduation include

1. completion of at least 126 semester hours covering all requirements
2. a minimum of 30 semester hours of science and math and 45 hours of engineering topics
3. a minimum grade point average of C (2.0) in all lower division courses (excluding core),
4. a minimum grade point average of C for all upper division courses (excluding University core),
5. take the Fundamentals of Engineering exam at an approved NCEES testing center, and
6. all upper division CIVL and ENVS courses must be completed in residence.

Lower division CIVL and ENGR courses (ENGR 100, ENGR 190, ENGR 1200, ENGR 1300, ENGR 2001, CIVL 2500, CIVL 2200, CIVL 2300) not taken at LMU must be completed in person (online or distance learning courses will not count towards the Civil Engineering B.S.E. Exceptions may be considered if exams are taken in person or at an approved proctoring center).

## Student Outcomes

Graduates of the LMU Civil Engineering Program will have:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. 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 concerns
3. An ability to communicate effectively with a range of audiences
4. 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
5. An ability to function effectively on a team whose members come together to provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

## Major Requirements

(126 semester hours required)

The program shown below is the recommended sequence for a major in civil engineering. Students will focus in at least one area of civil engineering by selecting electives in a particular track of specialization. Students can choose from elective tracks in Environmental, Geotechnical, Structural, and Water Resources Engineering. Required elective courses will be offered during each academic year.

Code	Title	Semester Hours
<b>Lower Division Requirements</b>		
BIOL 214	Environmental Biology	3
CHEM 111	General Chemistry I Lab	1
CHEM 114	General Chemistry for Engineers	3
CIVL 2500	Surveying and Mapping	4
CIVL 2200	Engineering Thermodynamics	2
CIVL 2300	Mechanics of Materials	4
ENGR 100	Introduction to Engineering	3
ENGR 190	Engineering Seminar	1
ENGR 1200	Computational Engineering	2
ENGR 1300	Engineering Visualization	2
ENGR 2001	Statics	2
MATH 131	Calculus I	4
MATH 132	Calculus II	4
MATH 234	Calculus III	4
MATH 246	Differential Equations and Linear Algebra	4
PHYS 1100	Introduction to Mechanics	4
PHYS 2100	Introduction to Electricity and Magnetism	4
<b>Subtotal</b>		51
<b>Upper Division Requirements</b>		
CIVL 395	Engineering Economics and Decision Theory	3
CIVL 3100	Fluid Mechanics	4
CIVL 3150	Hydrology and Water Resources Engineering	4
CIVL 3200	Introduction to Sustainability & Environmental Engineering	4
CIVL 3350	Structural Analysis and Design	4
CIVL 3360	Structural Dynamics and Seismic Systems	4
CIVL 3040	Probability and Statistics in Civil and Environmental Engineering	2-4
or MATH 361	Probability and Mathematical Statistics	
CIVL 3410	Introduction to Geotechnical Engineering	4
CIVL 4001	Civil Engineering Design, Practice, and Ethics	4
CIVL 4900	Fundamentals of Engineering Exam Review	0
Civil Track Electives		15
<b>Subtotal</b>		48-50
<b>Total Semester Hours</b>		<b>99-101</b>

## Electives/Areas of Concentration

Students, in consultation with their advisor, select an elective track based on their interests. Each track has two required courses. Additional

elective courses are selected based on the student's interests to reach the minimum required 15 semester hours of CIVL Track Electives. CIVL Track Elective course requirements are as follows:

Code	Title	Semester Hours
<b>Environmental Engineering Track Course Requirements</b>		
CIVL 517	Water Treatment Processes	3
Minimum of one of the following:		
CIVL 505	Aquatic Chemistry	
ENVS 506	Applied Environmental Microbiology	
<b>Geotechnical Engineering Track Course Requirements</b>		
CIVL 530	Design of Concrete Structures	3
CIVL 542	Design of Foundations and Earth Structures	3
<b>Structural Engineering Track Course Requirements</b>		
CIVL 530	Design of Concrete Structures	3
CIVL 542	Design of Foundations and Earth Structures	3
<b>Water Resources Engineering Track Course Requirements</b>		
Choose a minimum of 2 out of the following:		
CIVL 526	Surface Water Hydrology	
CIVL 527	Urban Water Systems and Stormwater Management	
CIVL 528	Groundwater Hydrology and Sustainable Management	
Below is a list of potential electives that could satisfy the remaining CIVL Track Elective requirements.		
Code	Title	Semester Hours
CIVL 505	Aquatic Chemistry	3
CIVL 508	Contaminant Fate, Transport & Remediation	3
CIVL 517	Water Treatment Processes	3
CIVL 518	Water Reuse and Desalination	3
CIVL 519	Advanced Integrated Water Treatment Systems	3
CIVL 526	Surface Water Hydrology	3
CIVL 527	Urban Water Systems and Stormwater Management	3
CIVL 528	Groundwater Hydrology and Sustainable Management	3
CIVL 529	Groundwater Contaminant Transport and Remediation	3
CIVL 530	Design of Concrete Structures	3
CIVL 532	Structural Steel Design	3
CIVL 533	Design of Wood Structures	3
CIVL 536	Nonlinear Structural Analysis	3
CIVL 537	Building Information Modeling	3
CIVL 538	Construction Management and Sustainability	3
CIVL 539	Design of Masonry Structures	3
CIVL 542	Design of Foundations and Earth Structures	3
CIVL 546	Geotechnical Earthquake Engineering	3
CIVL 547	Dams and Levees	3
CIVL 551	Remote Sensing with Civil Engineering and Environmental Science Applications	3

CIVL 553	Modeling Environmental and Water Resources Systems	3
CIVL 555	Computational Fluid Dynamics	3
CIVL 557	Finite Element Methods	3
CIVL 571	Air Quality, Control, and Management	3
CIVL 572	Sustainable Waste Management	3
CIVL 573	Economics of Water and the Environment	3
CIVL 574	Sustainable Engineering	3
CIVL 575	Renewable Energy Systems	3
CIVL 577	Transportation Engineering	3
CIVL 578	Research in Civil Engineering & Environmental Science	3
CIVL 598	Special Studies	1-4
ENVS 506	Applied Environmental Microbiology	3
ENVS 507	Environmental Engineering and Science Lab	3
ENVS 580	Engineering Geology	3
ENVS 581	Ecosystem Services in Urban Landscapes	3
ENVS 582	Urban Coasts: Habitats, Stressors, and Resilience	3
ENVS 583	Environmental Toxicology and Health Risk	3
ENVS 584	Climate Change and Impacts	3
ENVS 586	Climate Change Mitigation	3
ENVS 587	Climate Change Adaptation and Resilience	3
ENVS 588	Environmental Health	3
ENVS 589	Sustainability, Health, and Equity	3

## Civil Engineering Four-Year Plan

Course	Title	Semester Hours
<b>First Year</b>		
<b>Fall</b>		
ENGR 100	Introduction to Engineering	3
ENGR 190	Engineering Seminar	1
CHEM 111	General Chemistry I Lab	1
CHEM 114	General Chemistry for Engineers	3
MATH 131	Calculus I	4
FFYS 1000	First Year Seminar	4
ORNT 1000	First Year Forum	0
<b>Semester Hours</b>		<b>16</b>
<b>Spring</b>		
ENGR 1200	Computational Engineering	2
ENGR 1300	Engineering Visualization	2
MATH 132	Calculus II	4
PHYS 1100	Introduction to Mechanics	4
RHET 1000	Rhetorical Arts	3-4
<b>Semester Hours</b>		<b>15-16</b>
<b>Sophomore Year</b>		
<b>Fall</b>		
ENGR 2001	Statics	2
CIVL 2500	Surveying and Mapping	4
MATH 234	Calculus III	4
PHYS 2100	Introduction to Electricity and Magnetism	4
University Core		4
<b>Semester Hours</b>		<b>18</b>
<b>Spring</b>		
CIVL 2200	Engineering Thermodynamics	2
CIVL 2300	Mechanics of Materials	4
MATH 246	Differential Equations and Linear Algebra	4

BIOL 214	Environmental Biology	3
University Core		4
<b>Semester Hours</b>		<b>17</b>
<b>Junior Year</b>		
<b>Fall</b>		
CIVL 3100	Fluid Mechanics	4
CIVL 3200	Introduction to Sustainability & Environmental Engineering	4
CIVL 3350	Structural Analysis and Design	4
CIVL 3040	Probability and Statistics in Civil and Environmental Engineering	2
University Core		4
<b>Semester Hours</b>		<b>18</b>
<b>Spring</b>		
CIVL 395	Engineering Economics and Decision Theory	3
CIVL 3150	Hydrology and Water Resources Engineering	4
CIVL 3360	Structural Dynamics and Seismic Systems	4
CIVL 3410	Introduction to Geotechnical Engineering	4
<b>Semester Hours</b>		<b>15</b>
<b>Senior Year</b>		
<b>Fall</b>		
Civil Track Elective		3
Civil Track Elective		3
Civil Track Elective		3
University Core		4
<b>Semester Hours</b>		<b>13</b>
<b>Spring</b>		
CIVL 4001	Civil Engineering Design, Practice, and Ethics	4
CIVL 4900	Fundamentals of Engineering Exam Review	0
Civil Track Elective		3
Civil Track Elective		3
University Core		4
<b>Semester Hours</b>		<b>14</b>
<b>Minimum Semester Hours</b>		<b>126-127</b>