

OXNARD COLLEGE

Associate in Science Degree, Engineering

Item 1. Program Goals and Objectives

Upon completion of the Associate in Science in Engineering program students will have obtained the skills and preparation necessary to transfer into an Engineering program at a four-year University, and ultimately seek employment as an Engineer. Some graduates may also pursue entry-level positions in the engineering field. The main goal of the program will be to prepare students for successful transfer into an Engineering program with the focus of their choice. Students completing the program will be knowledgeable in aspects of engineering employed in the many different fields of engineering along with a strong foundation in mathematics and physics; Structural analysis, circuitry, CAD, programming, material composition, and general systems and applications of engineering in the modern world. Through group projects and laboratory assignments, students will also develop collaboration skills as well as practical hands on skills widely used in the fields of engineering such as, but not limited to; the use of oscilloscopes, electrical motor design and production, circuit building, structural design, strength testing, and generally analyzing the pertinent physical properties of a given system.

Students completing this associate degree program will be prepared for the following **career opportunities** in engineering; Acoustic Engineering, Aerospace Engineering, Agricultural Engineering, Applied Engineering, Architectural Engineering, Audio Engineering, Automotive Engineering, Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Environmental Engineering, Industrial Engineering, Marine Engineering, Materials Science Engineering, Mechanical Engineering, Mechatronic Engineering, Mining and Geological Engineering, Molecular Engineering, Nano-Engineering, Nuclear Engineering, Petroleum Engineering, Software Engineering, Structural Engineering, Telecommunications Engineering, Thermal Engineering, Transport Engineering, and Vehicle Engineering. With the increasingly high demand for qualified engineers in the workforce, this program allows those in the local community the opportunity to fill a vital role. Our local naval base employs thousands of engineers and there are also many local companies that are in constant need of qualified personnel such as Haas and Northrop Grumman. This program ensures that our community, and society, can keep up with the advancing pace of technology and its development by providing quality instruction and preparation.

Among the **competencies** successful students are expected to acquire is knowledge of engineering practices, processes, and procedures. Understanding the different technical equipment and the generally accepted techniques regarding their use, as well as the theoretical aspects that underlie their utilization is of great importance. The process of developing new designs and/or technologies along with the knowledge of the different roles needed to produce these items is also knowledge that is required to function properly as an engineer.

Item 2. Catalog Description

The Associate in Science in Engineering Program introduces students to the high demand fields of Engineering including, but not limited to Aerospace, Chemical, Civil, Electrical, Manufacturing, Mechanical, and Structural Engineering.

Engineers are significant and valuable members of our society that are relied upon to generally produce solutions through the utilization, design, and development of a plethora of technologies. With the increasingly high demand for qualified engineers in the workforce, this program allows those in the local community the opportunity to fill a vital role. Completion of the Associate in Science in Engineering will prepare students for transfer into an Engineering program at a four year university as well as entry level engineering positions for those seeking immediate employment.

Oxnard College's A.S. in Engineering is structured to allow students to complete core requirements found in the majority of Engineering majors within the UC and CSU systems while also customizing their major, through the choice of restricted electives and support courses, to align with their specific Engineering field at the particular universities to which they are applying. Completion of the A.S. degree also requires students to complete a general education pattern. Students can choose from the Oxnard College General Education pattern, CSU GE-Breadth, or IGETC, whichever best aligns with their educational goals and/or transfer destination.

Engineering majors are highly selective and impacted at most universities and students are advised to make themselves as competitive as possible when applying for admission both in GPA and course preparation. Students should consult with an Oxnard College Counselor, assist.org, university websites, and the admission office at their intended transfer destination to make sure they are adequately prepared for transfer.

PROGRAM STUDENT LEARNING OUTCOMES

Upon successful completion of the Engineering program students will be able to:

- Explain the principles of engineering and their application to the design and manufacturing of products.
- Critically evaluate a given system through observations, measurements, and accepted engineering analyses.
- Apply physical laws, engineering concepts and formulas to analyze engineering problems and to produce proper solutions qualitatively and quantitatively.
- Communicate engineering design ideas and solutions to problems through engineering drawings, oral presentations, and technical writing.

Item 3. Program Requirements

Associate in Science, Engineering

Requirements	Dept. Name/#	Name	Units	Sequence
Required Core	ENGR R101	Introduction to Engineering	2	Year 1, Fall
	MATH R120	Calculus with Analytic Geometry I	5	Year 1, Fall
	MATH R121	Calculus with Analytic Geometry II	5	Year 1, Spring
	MATH R122	Calculus with Analytic Geometry III	5	Year 2, Fall
	MATH R143	Differential Equations	3	Year 2, Spring
	PHYS R131	Physics for Scientists and Engineers 1	5	Year 1, Spring
	PHYS R132	Physics for Scientists and Engineers 2	5	Year 2, Fall
Choose a minimum of one course from the following support courses as appropriate for the intended transfer institution.	CHEM R120	General Chemistry I	5	Year 1
	CHEM R122	General Chemistry II	5	Year 1
	CHEM R130	Organic Chemistry I	5	Year 2
	CHEM R132	Organic Chemistry II	5	Year 2
	MATH R134	Linear Algebra	3	Year 2, Spring
	PHYS R133	Physics for Scientists and Engineers III	5	Year 2, Spring
Choose a minimum of four Engineering courses as appropriate for the intended transfer institution. (8-12 units)	ENGR R130	Engineering Statics	3	Year 2, Fall
	ENGR R135	Dynamics	3	Year 2, Spring
	ENGR R140	Materials Science and Engineering	3	Year 2, Spring
	ENGR R140L	Materials Science and Engineering Lab	1	Year 2, Spring
	ENGR R148	Programming and Problem-Solving in MATLAB	3	Year 1, Spring
	ENGR R150	Engineering Graphics and Design	3	Year 2, Spring
	ENGR R160	Electronic Circuits and Devices	3	Year 2, Spring
	ENGR R160L	Electronic Circuits and Devices Lab	1	Year 2, Spring

Required Major Total 41-47 units

CSU GE-Breadth or IGETC 37-39 units

or

Oxnard College General Education 29 units

Double counted units 6 units

Total Units 64-80 units

General Education requirements: Students will be allowed to choose the general education pattern that best aligns with their educational goals and transfer destination from those offered by Oxnard College including the Oxnard College General Education pattern, CSU GE-Breadth, or IGETC.

Item 4. Master Planning

Oxnard College Mission

Oxnard College is a learning-centered institution that embraces academic excellence by providing multiple pathways to student success.

As an academic program, the Engineering program supports the college's mission to provide multiple pathways to success by offering economically vibrant occupational education programs that help stimulate local economic development as well as an overall contribution to the betterment of our society.

Currently, there are approximately 75 new students per year that are Engineering track majors attending Oxnard College. While these students are taking the Physics and Math courses at Oxnard College, they must travel to other institutions in order to take most of the Engineering courses which they need for the major. This is both a hardship and deterrent for many students currently due to the distances they must travel to do so as well as the fact that it is an impacted major. The entire Engineering curriculum needed to award the A.S. degree in Engineering has been developed and the courses are planned to be offered starting in the fall of 2019. With this, the establishment of a full Engineering program necessitates that the degree also be offered to our students. Within the current approved budget a full-time Engineering Instructor is to be hired as well as the numerous supplies and equipment to be purchased to run the program successfully.

Item 5. Enrollment and Completer Projections

The Engineering program is projecting 50 completers per year.

With the high demand for Engineers there have been many opportunities regarding grants that Oxnard College has been, and continues to be involved with. Currently, Oxnard College is a partner with UCSB in the NSF ESTEEM Scholars Grant which is specifically designed for high quality, low income engineering students on track to transfer. There have also been various STEM Grants that have had a positive impact on many Oxnard College students that are on engineering pathways. With engineering programs being highly competitive due to the need for growth, it is imperative that programs are both expanded and developed to further allow for the growing void of engineers in the United States to be filled.

Item 6. Place of Program in Curriculum/Similar Programs

- a) Do any active inventory records need to be made inactive or changed in connection with the approval of the proposed program? If yes, please specify. **No**
- b) Does the program replace any existing program(s) on the college's inventory? Provide relevant details if this program is related to the termination or scaling down of another program(s). **No**
- c) What related programs are offered by the college? **Chemistry, Mathematics, and Physics**

Item 7. Similar Programs at Other Colleges in Service Area

The high demand for Engineering will allow Oxnard College to fill courses and graduate students in the Engineering major, regardless of other local colleges also offering Engineering majors.

Community Colleges:

Ventura College offers an A.S. in Engineering

Moorpark College offers an A.S. in Engineering

Santa Barbara City College offers an A.S. in Engineering

Local Universities offering Bachelor's degrees in Engineering:

California State University, Channel Islands (CSUCI)

B.S. in Mechatronics (*impacted upon its first admission cycle, it may not be able to admit any transfer students for several years*)

California State University, Northridge (CSUN)

B.S. in Civil Engineering

B.S. in Electrical Engineering

B.S. in Engineering Management

B.S. in Manufacturing Systems Engineering

B.S. in Mechanical Engineering

University of California, Santa Barbara (UCSB)

B.S. in Chemical Engineering

B.S. in Electrical Engineering

B.S. in Mechanical Engineering

Cal Poly San Luis Obispo (CPSLO)

B.S. in Aerospace Engineering,

B.S. in Architectural Engineering,

B.S. in Civil Engineering,

B.S. in Electrical Engineering,

B.S. in Environmental Engineering

B.S. in General Engineering,

B.S. in Industrial Engineering,

B.S. in Manufacturing Engineering,

B.S. in Materials Engineering,

B.S. in Mechanical Engineering

Engineering majors are offered at 14 CSU campuses and 8 UC campuses.

8. Transfer Preparation Information

Requirements vary widely between the CSU and UC systems and within each system between the many campuses, and then again within specific Engineering majors. Oxnard College's A.S. in Engineering is unique in that while the core of the program is aligned with the Model Curriculum in Engineering (because those are the standard courses required by nearly all engineering programs), the restricted electives in the major are structured so that students can choose only those courses in Engineering and support courses that apply to the particular major and university where they intend to transfer.

All Engineering and support courses are aligned with C-ID descriptors as available (see chart below).

OC Course ID #	OC Title	C-ID	C-ID Status
ENGR R101	Introduction to Engineering	ENGR 110	Approved
ENGR R130	Engineering Statics	ENGR 130	Approved
ENGR R135	Dynamics	ENGR 230	Approved
ENGR R140	Materials Science and Engineering	ENGR 140	Approved
ENGR R140L	Materials Science and Engineering Lab	ENGR 140L	Approved
ENGR R148	Programming and Problem-Solving in MATLAB	ENGR 220	Approved
ENGR R150	Engineering Graphics and Design	ENGR 150	Approved
ENGR R160	Electronic Circuits and Devices	ENGR 260	Approved
ENGR R160L	Electronic Circuits and Devices Lab	ENGR 260L	Approved
MATH R120	Calculus with Analytic Geometry I	MATH 210	Approved
MATH R121	Calculus with Analytic Geometry II	MATH 220	Approved
MATH R120 + R121	Calculus with Analytic Geometry I and Calculus with Analytic Geometry II	MATH 900S	Approved
MATH R122	Calculus with Analytic Geometry III	MATH 230	Approved
MATH R134	Linear Algebra	MATH 250	Approved
MATH R143	Differential Equations	MATH 240	Approved
MATH R134 + R143	Linear Algebra and Differential Equations	MATH 910S	Approved
PHYS R131	Physics for Scientists and Engineers I	PHYS 205	Approved
PHYS R132	Physics for Scientists and Engineers II	PHYS 210	Approved
PHYS R133	Physics for Scientists and Engineers III	PHYS 215	Approved
CHEM R120	General Chemistry I	CHEM 110	Approved
CHEM R120 + R122	General Chemistry I and General Chemistry II	CHEM 120S	Approved
CHEM R130	Organic Chemistry I	CHEM 150	Approved
CHEM R130 + R132	Organic Chemistry I and Organic Chemistry II	CHEM 160S	Approved

The majority of Oxnard's courses in the discipline of Engineering have only recently received approval and become effective fall 2019. Therefore, while CSU articulation has been secured with some universities, pursuit of UC articulation cannot begin until after UC TCA approval is obtained and Oxnard's annual submission window is June 2019. Once the UC approves the ENGR courses for transfer credit, articulation requests will be sent to all UCs.

Attached transfer documentation includes articulation agreements by major with CSUN, the closest CSU to Oxnard College that offers a variety of engineering majors. These agreements and the chart below demonstrate that the majority of the required courses in Oxnard's Engineering program are also required and articulated within the Engineering majors at CSUN.

Oxnard's Engineering Major Required Core Courses	CSUN's B.S. in Civil Engineering	CSUN's B.S. in Electrical Engineering	CSUN's B.S. in Manufacturing Systems Engineering	CSUN's B.S. in Mechanical Engineering
ENGR R101	Not required	Not required	Not required	Not required
MATH R120	Required	Required	Required	Required
MATH R121	Required	Required	Required	Required
MATH R122	Required	Required	Required	Required
MATH R143	Required	Required	Required	Required
PHYS R131	Required	Required	Required	Required
PHYS R132	Required	Required	Required	Required

Oxnard's Engineering Major Requires students to choose one Support course from the following	CSUN's B.S. in Civil Engineering	CSUN's B.S. in Electrical Engineering	CSUN's B.S. in Manufacturing Systems Engineering	CSUN's B.S. in Mechanical Engineering
CHEM R120	Required	Required	Required	Required
CHEM R122				
CHEM R130				
CHEM R132				
MATH R134				
PHYS R133				

Oxnard's Engineering Major Requires students to Choose four Engineering courses from the following	CSUN's B.S. in Civil Engineering	CSUN's B.S. in Electrical Engineering	CSUN's B.S. in Manufacturing Systems Engineering	CSUN's B.S. in Mechanical Engineering
ENGR R130	Required	Required	Required	Required
ENGR R135				
ENGR R140	Required	Required	Required	Required
ENGR R140L				
ENGR R148				Required
ENGR R150				
ENGR R160	Required	Required	Required	Required
ENGR R160L		Required	Required	Required

Oxnard College's major gives students planning to transfer to another CSU or to a UC options within the support courses and restricted electives. A thorough study of engineering majors across these two systems revealed that most UCs as well as Cal Poly SLO, Cal Poly Pomona, SDSU, and SJSU also require Linear Algebra (OC's MATH R134) and a third semester of Physics (OC's PHYS R133) in most or all of their engineering majors. Additional Chemistry courses (those listed as options in the support courses) were also more likely to be required within the UC and/or within Chemical, Environmental, and Nuclear Engineering majors.

Specific Engineering courses vary from major to major, even within CSU or UC campuses, which is why Oxnard chose to allow students to choose from a minimum of four courses, but they could choose more as necessary for their particular preparation. As additional Engineering courses are developed to articulate where necessary to fulfill requirements, they will be added to this section of restricted electives.