STUDENT GUIDE:

ENGINEERING PREPARATION AT THE UNIVERSITY OF OREGON
Contacts for Engineering Preparation Information

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Engineering Preparation Advisor:
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Lane Community College (Lane)
Eugene, OR 97405
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Diedre Lyons  162L Building 16  (541) 463-3800
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Regional Undergraduate Engineering Programs:

College of Engineering, Oregon State University (OSU)
Corvallis, Oregon 97331-2409
Undergraduate Advising Site:  http://engineering.oregonstate.edu/advising

College of Engineering and Computer Science, Portland State University
Portland, OR 97207
Undergraduate Advising Site:  https://www.pdx.edu/cecs/academic-advising

College of Engineering, University of Washington
Seattle, WA 98195-2180
Undergraduate Advising Site:  https://www.engr.washington.edu/current/academic

College of Engineering and Architecture, Washington State University
Pullman, WA 99164-2714
Undergraduate Advising Site:  https://vcea.wsu.edu/advising/
ENGINEERING PREPARATION AT THE UNIVERSITY OF OREGON

1. GENERAL INFORMATION

Graduates with baccalaureate degrees in engineering and applied sciences are needed in our technological society to solve practical problems by the application of physical science principles and mathematics. While it is sometimes difficult to define the difference in outlook between a career in one of the physical sciences, and a career in engineering, engineering solutions to problems are usually much more influenced by practical and economic considerations.

A student with a major in a field of engineering or applied science has a number of career opportunities. He or she may choose to work for private industry or for government. An engineer or applied scientist may work in research and development, design, production, operations, or sales. Engineers or applied scientists with sufficient experience and background may advance to management or consulting positions. Another option is to continue studies in graduate school leading to careers in university teaching and advanced research.

At engineering schools there are typically two academic phases in earning a baccalaureate degree in an engineering field: (1) engineering preparation, consisting of at least two years of course work, before admission to a professional engineering program; (2) professional engineering, consisting of at least two years of course work at a school of engineering, leading to a Bachelor of Arts or a Bachelor of Science degree in engineering. Engineering graduates may become licensed professional engineers after four years of employment in their field of specialization and successful completion of state license examinations. At some institutions who award engineering degrees the overall pattern of courses will be similar; however, this two-phase structure may not necessarily be used.

**UO does not offer a degree in engineering**, but does provide students opportunities to complete the first phase of the engineering degree. Options for students include an engineering transfer program or continuation to a physics or chemistry baccalaureate before entering a graduate-level program such as UO’s Masters Industrial Internship Program. Students in the engineering transfer program transfer to another institution after completing the courses that correspond to the first two years of engineering school. **Typically, these courses are calculus, physics with calculus, general chemistry and associated lab courses, but can also include courses in pre-engineering at Lane Community College and/or computer programming.**

2. ENGINEERING PREPARATION OPTIONS

The selection of the best path to an engineering degree depends on many factors. The options offered by the University of Oregon are best for students that want a broader science and liberal arts background than would normally be offered in conjunction with an engineering degree. UO offers courses in physics, chemistry and mathematics that are basic to the academic preparation of either a scientist, applied scientist or an engineer. Students who pursue engineering preparation at UO should be aware that the broader course background involves more credit hours than would be the case at an engineering transfer program at a community college. The UO program may also be of interest to students who are unsure of their career direction and wish to begin their preparation at the UO where a variety of academic options are readily available. Since the engineering preparation programs in specialized engineering schools are crowded and competitive; some students will benefit from a less directed beginning to their university studies, allowing them to experiment with career choices.

Students interested in obtaining an engineering degree in the shortest possible time
should consider an engineering transfer program at a community college such as Lane Community College (Lane), or by directly enrolling at an engineering school. These programs are highly structured and allow the students to complete their requirements in a minimum amount of time. In those instances where a student is very close to completing an Associate of Arts Oregon Transfer Degree (AAOT) or a UO Bachelor’s degree in a subject other than physics, the quickest path to completing a degree at an undergraduate engineering program may be to finish the AAOT or Bachelor’s degree before entering there.

3. HIGH SCHOOL PREPARATION

High school students interested in an engineering or applied sciences career are urged to complete as much mathematics and science as possible in high school. Students with insufficient mathematics preparation encounter serious delays in college. Four years of high school mathematics (including advanced algebra, trigonometry, and elementary functions/pre-calculus) should be completed in order to begin calculus and physics the freshman year at the University. If possible, AP or IB calculus and chemistry courses should be taken in high school.

The UO Mathematics department administers a placement test to all students without prior college calculus or AP calculus credit and adheres to the results of the test rigorously. High school science courses in physics and chemistry are recommended. Reading, writing and speaking skills are highly valued in engineering and a foreign language is always recommended. Students entering the UO are encouraged to practice with on-line math problems before sitting the actual placement exam.

4. ENGINEERING PREPARATION REQUIREMENTS

The requirements below are designed generally for students planning to transfer to an undergraduate program in engineering at another institution. For more detailed information, students should obtain an advising guide from the schools of interest.
5. A WORD OF CAUTION

Completion of suggested curricula listed in this advising manual does not guarantee admission to a professional engineering program elsewhere. Students completing the courses listed below before admission may still need to take several introductory engineering courses at that institution before they can be admitted to the professional program. Once admitted to the professional engineering program, there may be additional prerequisites, which are taught at neither UO nor LANE Community College, that prevent students from taking the upper level engineering courses in the optimal order. In general, your GPA in the UO pre-engineering program should be at least 3.0 if you are to successfully transfer.

6. THE COOPERATIVE UO-Lane ENGINEERING PREPARATION PROGRAM

Lane began their engineering preparation program in 1979 and UO began theirs in 1983. Both Lane and UO offer programs which can lead a student to successful admission at any engineering college in the U.S. But there are some gaps in the detailed offerings at both institutions. The cooperative program allows students at one institution to take courses at the other.

Lane provides Statics, Dynamics and Strength of materials sequence ENGR 211-13, Engineering Orientation GE 101, Engineering Orientation II GE 102, Engineering Graphics GE 115 and Electrical Fundamentals, ENGR 221. UO makes available courses such as Foundations of Physics I (PHYS 251, 252, 253) and Foundations of Physics II (PHYS 351). Students who are full-time pre-engineering students at one institution are currently permitted to register in any of the approved courses (see list below) at the other institution with no additional fee. Note that these course offerings do not include certain prerequisites for upper level engineering courses normally taken in the engineering preparation stage at an engineer degree-granting institution. For example at Oregon State University, upper level courses in Mechanical Engineering require ENG 248 (Solid Works), upper level courses in Electrical Computer Engineering require ECE 272 (Digital Design Lab), ENG 202,203 (Electrical Fundamentals, 2nd and 3rd term) and upper level courses in Bioengineering require BIOE 211 and BIOE 212.

Approved Courses

<table>
<thead>
<tr>
<th>Lane</th>
<th>UO</th>
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<tbody>
<tr>
<td>Engineering Graphics ENG 115</td>
<td>Foundations of Physics I,</td>
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<tr>
<td>Engineering Orientation ENG 101</td>
<td>PHYS 251,252 ,253</td>
</tr>
<tr>
<td>Statics, Dynamics &amp; Strength of Materials</td>
<td>Foundations of Physics II, PHYS 351</td>
</tr>
<tr>
<td>ENGR 211, 212, 213</td>
<td>Introductory Physics Laboratory</td>
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<td></td>
<td>PHYS 290</td>
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<tr>
<td>Electrical Fundamentals ENGR 221</td>
<td>Differential Equations, MATH 256</td>
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<td></td>
<td>Calculus III, MATH 253</td>
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<tr>
<td>General Physics with Calculus PHYS 211, 212, 213</td>
<td>Linear Algebra, Math 341, 342</td>
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<tr>
<td></td>
<td>Vector Calculus, MATH 281, 282</td>
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7. **PROCESS FOR ENROLLING IN LANE COMMUNITY COLLEGE COURSES UNDER JOINT UO-LANE PREENGINEERING PROGRAM**

1. Discuss course work plans with the engineering preparation advisor, UO Physics Department.

2. Enroll for at least 12 Credit hours at the UO.

3. Obtain the Lane Community College/University of Oregon Pre-Engineering Program Certification of Registration Eligibility form and have it signed by the UO Registrar. (Contact UO Office of the Registrar, second floor Oregon Hall and ask for Brian Lowrey 346-7344.)

4. Look for courses in the Lane class schedule (http://www.lanecc.edu). Apply for admission to Lane and register using ExpressLane for the Lane engineering class. If you use a UO course for a Lane prerequisite, it may be necessary to contact the department concerned to have the UO prerequisite approved.

5. After the registration, submit the completed eligibility form (described in #3 above) to Enrollment Services, Building 1 (Lane) or mail it to PO Box 7100, Eugene, Or, 97401-0025.

6. Attend first day of Lane class whether or not you have completed the LANE CC registration (Lane classes may start as much as a week earlier than the UO). See time schedule for the first day of classes. (Lane books are at the Lane Bookstore, Center Building.)

7. The tuition for the Lane course will be waived, but this will not happen until after the refund drop period has ended. Students are responsible for all fees i.e., student activity fee, transportation fee, technology fee. Students can access their account summary and pay their fees using ExpressLane before the term ends.
8. SAMPLE TRANSFER PROGRAM

The following sample program is for students prepared to begin calculus in their freshman year. Courses marked with an asterisk (*) are required by most the engineering departments. Make sure you study this list and plan a program before talking to an advisor about this. Be prepared.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Foundations of Physics I (PHYS 251, 252, 253)</td>
<td>12</td>
</tr>
<tr>
<td>Introductory Physics Laboratory (PHYS 290)</td>
<td>3</td>
</tr>
<tr>
<td>Calculus (MATH 251, 252, 253)</td>
<td>12</td>
</tr>
<tr>
<td>Concepts of Computing: Algorithms and Programming (CIS 122)</td>
<td>4</td>
</tr>
<tr>
<td>General Chemistry¹ (CH 221,222)</td>
<td>8</td>
</tr>
<tr>
<td>General Chemistry Lab (CH 227,228)</td>
<td>4</td>
</tr>
<tr>
<td>College Composition I (WR 121)</td>
<td>4</td>
</tr>
<tr>
<td>Arts &amp; Letters or Social Sciences</td>
<td>4</td>
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**Sophomore Year**

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Foundations of Physics II (PHYS 351,352,353)</td>
<td>12</td>
</tr>
<tr>
<td>Introduction Differential Equations (MATH 256)</td>
<td>4</td>
</tr>
<tr>
<td>Several-Variable Calculus² (MATH 281,282)</td>
<td>8</td>
</tr>
<tr>
<td>Elementary Linear Algebra³ (MATH 341,342)</td>
<td>8</td>
</tr>
<tr>
<td>Statics, Dynamics (ENGR 211,212)</td>
<td>8</td>
</tr>
<tr>
<td>Strength of Materials or Electrical Fundamentals⁴ (ENG 221 or 213)</td>
<td>4</td>
</tr>
<tr>
<td>Arts &amp; Letters or Social Sciences</td>
<td>4</td>
</tr>
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¹(Three terms of Chemistry are required for some engineering programs.)
²(UO Vector Calculus MATH 281, 282 is equivalent to Oregon HECC MATH 254, 255.)
³(UO MATH 253 and 341 will substitute for Oregon HECC MATH 306, MATH 342 is recommended, but not required.)
⁴ (Depends on engineering department, some require both.)

Note that all required engineering preparation courses should be completed with a grade of C or better for admission to an undergraduate engineering program. There is considerable variation in engineering preparation requirements between engineering departments. For example, students can consult the requirements for different programs at Oregon State University (OSU) found here: http://engineering.oregonstate.edu/academics. In addition to the requirements for admission to the professional program, there may be additional prerequisites for taking courses in the professional program. For example, in Mechanical Engineering, a graphics course that involves the program “Solid Works” is required. Unfortunately, such a course is not presently available at either Lane or UO. For Electrical and Computer Engineering, Discrete Math (UO Math 231) is required as are three terms of Electrical Fundamentals (ENGR 201-203). Only one term of Electrical Fundamentals (Lane ENGR 221) is available at LANE.

Other UO courses include a technical writing course such as UO WR 320, a biological science course which includes a laboratory such as UO BI 120 (Reproduction and Development) or UO BI 121 (Human Physiology), and a statistics course such as UO MATH 425. All of these courses should be selected in consultation with an adviser in the engineering program to which you plan to transfer. Different fields of engineering require specific courses to fulfill these requirements.
9. DESCRIPTIONS OF UO AND LANE COURSE OFFERINGS

UO PHYSICS COURSES

PHYS 251, 252, 253 Foundations of Physics I (4,4,4)
(First year sequence for physics majors. Mechanics; work and energy; momentum and collisions are covered in 251; vibrations; waves; oscillations; wave mechanics; and introductory optics in 252; electricity & magnetism; charge & electric fields; electric potential; circuits; magnetic fields; inductance in 253. Lectures and tutorials. Coreq: MATH 251, 252, 253 or equivalent. Prereq: Physics major status or instructor’s permission.

PHYS 290 Introductory Physics Laboratory (1R)
Introduction to laboratory measurements, reports, instrumentation, and experimental techniques. Coreq: PHYS 251, 252, 253. Repeatable thrice for a maximum of 3 credits.

PHYS 351, 352, 353 Foundations of Physics II (4,4,4)
Second year sequence for physics majors. Introduction to special relativity and quantum physics; equations of state, laws of thermodynamics, phase changes, entropy, kinetic theory, collisions, transport; statistical physics. Coreq: MATH 256, 281, 282. Prereq: Physics major status or instructor’s permission.

UO MATHEMATICS COURSES

MATH 111 College Algebra (4)
Algebra needed for calculus including graph sketching, algebra of functions, polynomial functions, rational functions, exponential and logarithmic functions, linear and nonlinear functions. Prereq: MATH 95 or satisfactory placement test score.

MATH 112 Elementary Functions (4)
Exponential, logarithmic, and trigonometric functions; mathematical induction. Intended as preparation for MATH 251. Prereq: MATH 111 or satisfactory placement test score.

MATH 251 Calculus I (4)
Differential calculus and applications. First term of the standard sequence for students of physical, biological, and social sciences, and of mathematics. Students cannot receive credit for both MATH 241 and MATH 251. Prereq: MATH 112 or satisfactory placement test score.

MATH 252 Calculus II (4)
Integral calculus. Second term of the standard sequence for students of physical, biological, and social sciences, and of mathematics. Students cannot receive credit for both MATH 242 and MATH 252. Prereq: MATH 251 or satisfactory placement test score.

MATH 253 Calculus III (4)
Introduction to improper integrals, infinite sequences and series, Taylor series and differential equations. Third term of the standard sequence for students of physical, biological, and social sciences, and of mathematics. Prereq: MATH 252 or satisfactory placement test score.
MATH 256 Introduction to Differential Equations (4)
Introduction to differential equations and applications. Linear algebra is introduced as needed. Prereq: MATH 253 or instructor’s consent.

MATH 281, 282 Several-Variable Calculus I,II (4,4)
Introduction to calculus of functions of several variables including partial differentiation; gradient, divergence, and curl; line and surface integrals; Green’s and Stokes’s theorems. Linear algebra introduced as needed. Prereq for MATH 281 is MATH 256 or instructor’s consent.

MATH 341,342 Elementary Linear Algebra (4,4)
Vector and matrix algebra; n-dimensional vector spaces; systems of linear equations; linear independence and dimension; linear transformations; rank and nullity; determinants; eigenvalues; inner product spaces; theory of a single linear transformation. Prereq: MATH 252. MATH 253 is recommended.

UO CHEMISTRY COURSES

CH 221, 222, 223 General Chemistry (4,4,4)
First-year university chemistry: components of matter, quantitative relationships, atomic structure, thermochemistry, and major classes of chemical reactions of the elements; molecular structure, chemical bonding, gases and kinetic molecular theory, intermolecular forces, solutions and kinetics; thermodynamics, equilibrium, electrochemistry, nuclear chemistry; Lectures. Prereq: high school chemistry; MATH 095; coreq: MATH 111, 112 or equivalents.

CH 227, 228, 229 General Chemistry Laboratory (2,2,2)
Teaches laboratory skills through chemical reactions and writing equations, phase diagrams, equilibrium constants, acid-base titrations, volumetric analyses, voltaic cells, exercises in kinetics and inorganic chemistry. Lecture, laboratory. Pre- or coreq: CH 211, 212, 213 or CH 221, 222, 223 or instructor’s consent.

LANE ENGINEERING PREPARATION COURSES

ENGR 101 Engineering Orientation (3)
Coreq: MTH 251 An introduction to engineering, its evolution, ethics, and methods. An overview of various engineering disciplines and curriculum requirements, an introduction to a variety of modeling and analysis methods, written and oral communication activities, discussion of professional ethics and social implications of engineering work. The course includes visits by guest speakers, possible field trips, introductory activities on measurement methods, data collection, use of electronic spreadsheets and the internet, possible group projects and/or oral and written reports.

ENGR 103 Engineering Graphics (3)
Coreq: MTH 112. An introduction to graphic communication, including visualization, multiview and pictorial projections, sections auxiliary views, and ASME dimensioning and tolerancing standards. Graphic concepts are applied using freehand sketching and CAD.
ENGR 211 Statics (4)
Fall term (4 lecture hrs/wk). Prereq: MATH 252; Coreq: MATH 253; General Physics with Calculus PHYS 211 (UO PHYS 251) recommended or consent of instructor. Principles of statics of particles and rigid bodies are studied with a vectorial approach. Particular attention will be given to the composition, resolution, and equilibrium of coplanar and non-coplanar force systems; two dimensional trusses and frames; centroids, and moments of inertia of plane areas; coulombic friction; and the distribution of shear and bending moments in simple beams.

ENGR 212 Dynamics (4)
Spring term (4 lecture hrs/wk). Prereq: Statics ENGR 211 (LANE CC); MATH 254 (UO MATH 281); General physics with Calculus PHYS 211 (UO PHYS 251) recommended. Fundamental dynamics course of particles and rigid bodies. Topics include kinematics and kinetics of particles and kinematics of rigid bodies; Newton’s second law of motion; rectilinear and curvilinear motion; linear and angular momentum; principles of work and energy; impulse and momentum and D’Alembert’s Principle.

ENGR 213 Strength of Materials (4)
Winter term (4 lecture hrs/wk). Prereq: Statics ENGR 211, MATH 253. General physics with Calculus PHYS 211 (UO PHYS 251). Theory of stress and strain, shear, bending, torsion, and combined stresses; temperature induced stresses, and elements of intermediate analysis. Additional topics include axially loaded members, thin walled pressure vessels, torsional and flexural loading, failure theory and column buckling.

ENGR 221 Electrical Fundamentals 1 (4)
Winter term (3 lecture, 3 lab hrs/wk) Prereq: General Physics with Calculus PHYS 212 (UO PHYS 252). This is an electrical foundation course and is part of the Second Year of the engineering program. It will familiarize the student with principles of circuit analysis, circuit components, phasors, and steady state responses, and the use of electrical measuring equipment.

AFFIRMATIVE ACTION

The University of Oregon affirms and actively promotes the right of all individuals to equal opportunity in education and employment at this institution without regard to race, color, sex, national origin, age, religion, marital status, disability, veteran status, sexual orientation, gender identity, gender expression or any other extraneous consideration not directly and substantively related to effective performance. Direct related inquires to Penelope Daugherty, Director, Office of Affirmative Action, 474 Oregon Hall, University of Oregon, Eugene, OR 97403; Telephone (541) 346-3123; TTY (541) 346-2971.

STUDENTS WITH DISABILITIES

The University of Oregon is committed to responding to the needs of students with disabilities as outlined in both the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990. The University does not discriminate on the basis of disability in admission or access to, treatment of, or employment in its programs or activities. For more information consult Molly Sirois, 164 Oregon Hall; Telephone (541) 346-1155; TTY (541) 346-1083.
The advising manual offers information about the academic programs and support services of the University of Oregon. The manual is as accurate as the editor is able to make it, but the information may not remain. Circumstances can and do prompt changes in courses, course content, credits fees, rules, term calendar, curriculum, and other university matters. Such changes duly authorized by University officials apply both to prospective students and to those previously enrolled, unless the latter are specifically exempted. The manual does not constitute a contract by the University of Oregon with its students or with applicants for admission. Engineering preparation students are also advised to heed the cautionary note on page 3 of this manual.