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INTRODUCTION

Welcome to the Mechanical Engineering Department at Portland State University. The purpose of this handbook is to assist you. We have attempted to anticipate your needs and questions, and have provided the information and answers. Use this handbook as a guide, refer to it before you seek answers in person. That relieves us of responding to the routine requests. Then, when you need our personal help, we will have the time and will gladly assist you. We sincerely hope that you find your experience here a rewarding one.

Background

This Mechanical Engineering Department consists of 12 faculty members, another 5-10 adjunct faculty and lecturers, 3 staff members, about 150 undergraduate students, and 30 or so graduate students.

The undergraduate curriculum is accredited by the Accreditation Board for Engineering and Technology (ABET), which requires that our curriculum meet the standards set for engineering education. There are several references to ABET requirements throughout the *Portland State University Bulletin* and this handbook; now you know why.

By national standards, our department is small: we graduate fewer than fifty engineers per year. This small size allows us to work more closely together, with each student receiving personal attention during projects and advising. Small size is not without drawbacks; we usually cannot offer multiple sections of a given course, requiring students to carefully schedule their courses. There are limits to the availability of equipment, laboratories, and personal assistance. Being aware of these limitations will make it easier for you to complete your education, on time and on budget.

Message to Juniors

Please take time to do the following: 1) read and understand the *PSU Bulletin* for such things as continuation criteria, prerequisites, University, School and Departmental policies; 2) read the ME Handbook; and 3) see your advisor. Your advisor can help with class selection and career planning. Faculty should be available during office hours beginning the first week of classes. Questions on transfer credits and other details may be answered by the faculty or department chair.

Words of caution.... Many required mechanical engineering courses form a sequence and are offered only once per year. If you have problems with a course or drop out of a sequence, you may be delayed for one year. Students who have been admitted conditionally must fulfill the conditions of their admit letter by the date specified.

Message to Seniors

Please see your advisor for general advising information. Please be aware of the multitude of graduation requirements published in the *PSU Bulletin* (e.g. GPA as calculated within the Mechanical Engineering major must be above 2.0). Please make an appointment with your advisor if you have additional questions about completing your degree.

ADMISSIONS

Admission to the Mechanical Engineering Department at Portland State University requires several steps. None of these steps are particularly difficult, but they must all be completed. The following sections will briefly describe each step; their interactions are highlighted on the flow-chart in *A Mechanical Engineering Education at Portland State University* at the beginning of the appendix.

University

Admission to mechanical engineering (lower division, upper division, graduate) requires concomitant admission to PSU. Procedures for applying for admission to PSU are covered in detail in the *PSU Bulletin*.

Obtaining a Mechanical Engineering Degree at Portland State University

Entry Option A

This is the "classic route" to a BSME degree. You apply to PSU after completing high school, or in your senior year in high school. You proceed to take the classes to fulfill the Lower Division requirements. During the last Quarter of your Lower Division classes you apply for admission to the Mechanical Engineering program. Deadlines for application are in the *PSU Bulletin*.

Entry Option B

This route to a BSME degree is typical of many of our students who take some of the Lower Division classes at another institution such as one of the community colleges in Oregon. It is equivalent to transferring to PSU during your freshman or sophomore years. After you have been admitted to PSU you will receive a Transfer Evaluation (see note 1). Before you begin your first Quarter at PSU you should meet with a Lower Division Adviser (cf. Advising, below). If you are finished, or nearly finished with your Lower Division Requirements when you enroll in PSU, ask the Lower Division Adviser about applying simultaneously to the Mechanical Engineering program. Otherwise, during the last Quarter of your Lower Division classes you apply for admission to the Mechanical Engineering program. Deadlines for application are in the *PSU Bulletin*.

Upper and Lower Division

The conventional, four-year education toward a Bachelor of Science at Portland State occurs in two stages, during which a student is either in Upper or Lower Division. Lower Division students are those students currently working toward meeting the freshman and sophomore year requirements for the BSME degree (cf. current *PSU Bulletin*, Mechanical Engineering Undergraduate Program). If a student is attending school part-time, it will take more than two years to complete Lower Division Requirements.

During the last Quarter of your Lower Division classes you apply for admission to the Mechanical Engineering program. If you are accepted into the program you become an Upper Division Student. You must be an Upper Division student before you can take any 300 or 400 level ME courses.

Lower Division

Students may declare mechanical engineering as their major at any time during their first or second year. They may register for any 100 or 200 level engineering course without restriction, except for prerequisite requirements. They should, however, consult with the academic adviser, located in the Dean's Office, Fourth Avenue Building, Suite 20, to assure that the courses they select are appropriate for the program. Appointments can be made by calling (503) 725-4631 or email advising @eas.pdx.edu. For General Education of University Studies Classes, you can consult the Information and Academic Support Center (IASC, 725-4005) located in Smith Memorial Center. Upper Division Students must be formally admitted to the Mechanical Engineering Department in order to register for any upper division engineering courses or to pursue their degree in ME. The procedures and criteria for admission to the upper division program are detailed in the *PSU Bulletin*, and in the *Eligibility, Selective Admission, and Continuation Policies* which accompanies the application form, which is available from the Mechanical Engineering Department (Room 118, Science Building II). In summary, the eligibility requirements include completion of a set of specific math and science courses (with no grade lower than "C"), completion of a set of specific engineering courses (with no grade lower than "C"), completion of a specific writing course and a speech course, completion of at least 90 credits, and acceptable grades. The minimal acceptable grades are 2.00 in math and science and 2.25 in engineering. The actual acceptable grades are based on selective admission requirements. Since more students wish to study mechanical engineering than can typically be accommodated, program admission is competitive and based on a combined GPA. The combined GPA weighs grades in engineering twice as heavily as math and science grades.

The minimum GPA requirement of 2.25 for engineering courses includes ALL of these courses, including any upper division courses taken at other institutions.

Admission to the upper division program is maintained as long as the student satisfies the continuation criteria listed in the *PSU Bulletin*. In summary, these criteria include maintaining acceptable grades and completing a minimum number of engineering credits per year. Students should be aware of these criteria.

Students who fail to meet the continuation criteria are placed on probation, which may lead to suspension. They may meet with their faculty adviser to discuss the possibility of being readmitted. Any students who have been suspended from the program will be considered for readmission only if they can develop, in coordination with their adviser, a revised program of study that would likely lead to satisfaction of the continuation criteria. If the adviser approves such a plan in writing, then the department chair will consider readmission.

Non-Admitted

Students who have not been formally admitted to PSU or to a degree program in mechanical engineering are still eligible to take select classes. Non-admitted students may take up to 8 credits per term without being admitted to the university. Students may register for upper division and graduate courses in engineering ONLY if they receive a signed, special permission slip from the department chair. Special permission is typically granted if (1) the student has the proper preparation and prerequisites to complete the course, (2) there is class space available, and (3) the course serves the student's educational objectives. Students qualified for and seeking admission

should apply as soon as possible to avoid the necessity of requesting special permission for upper division courses.

Transfer Students

Students transferring from other institutions who want to be formally admitted to a specific degree program in the School of Engineering and Applied Science must:

1. Meet all eligibility requirements
2. Apply for admission to PSU
3. Apply for program admission to the School of Engineering and Applied Science
4. Have one copy of latest official transcripts sent to the PSU Admissions Office.

Application deadlines for admission to a degree program are:

Term	Deadline
Fall	June 15
Winter	November 1
Spring	February 1

After your application is processed, you will receive a letter of acceptance or a letter of denial from the Mechanical Engineering Department. In the case of denial, the deficiencies which led to the denial will be explained. Please feel free to call the Mechanical Engineering Department office if you have questions regarding the stated deficiencies.

Note that if your are accepted for a particular term and do not take classes that term or do not communicate with the ME Department, you will have to reapply for admission.

Notes

1. The Transfer Evaluation is the official process by which the classes you took at other institutions are compared to similar classes at PSU. Most of your classes will be transferable, but you should expect that some credits will be "lost". Furthermore, although some course credits are transferable, these credits might not be applicable toward your degree requirement. For example, courses taken in Biology, Political Science, or Business Administration cannot substitute for Mechanical Engineering technical courses. Such courses can only be applied to meet the General Education Requirement (cf. General University Requirements, current PSU catalog). Students who have taken classes at "Technology Institutes", e.g., Oregon Institute of Technology, should be forewarned that their "technology" classes *do not*, in general, satisfy engineering requirements. Transfer Evaluation usually takes six to eight weeks after you have been accepted to PSU. Unless you applied very early you will not receive the results of the transfer evaluation until after you have to register for your first term at PSU. It is a good idea, therefore, to meet with a Lower Division Adviser to discuss your class schedule for your first quarter at PSU.

2. After you have been accepted to the Mechanical Engineering program you must confirm your enrollment in the program by taking Upper Division classes in the Quarter immediately following your acceptance. If you do not confirm your enrollment you will have to reapply to the program.

For questions on probation or suspension, refer to the Continuation Criteria for the School of Engineering and Applied Science as listed in the current *PSU Bulletin*.

REGISTRATION

Students must register for each class that they wish to attend, even if they wish to audit the course. Registration is handled by the Registrar's Office located in the Neuberger Hall Lobby, but the Mechanical Engineering Department must be consulted for permission to register for some courses.

The classes to be offered each term are listed in the *PSU Bulletin Schedule of Classes*, available about one month prior to the beginning of classes. The *PSU Bulletin Schedule of Classes* can also be accessed from the PSU Homepage at http://www.pdx.edu/adm/schedule/. In addition, the *Fall Quarter Schedule of Classes* lists the projected class offerings for fall, winter, and spring quarters. This list of projected classes should be consulted to develop the program of study.

Advance Registration (Period I)

Advance registration is done by telephone using the Touch-tone Telephone-Voice Response (TTVR) Registration System. Information on when and how to register is printed in the *PSU Bulletin Schedule of Classes*. Particular attention should be paid to the Priority Registration Schedule, which are listed by student level. Students who are unable to complete the registration process should contact either the Registrar's Office or the Mechanical Engineering Department for assistance. You will be unable to register in advance for any upper-division Mechanical Engineering courses unless you have been admitted into the ME program. You will not be able to register for courses with time conflicts, so make sure that everything fits. You should not register for courses for which you have not completed the necessary prerequisites. Other than these restrictions, the computer should enroll you in classes that are not filled. One advantage to telephone registration is that you will know immediately whether or not you are registered for a class. You are able to make changes to your schedule after you have advanced registered. A schedule confirmation, showing class times and locations, will be mailed to you shortly after the advance registration period has ended.

Continuous Registration and Adjustments (Period II)

As long as a class is open, all eligible students will be able to register by phone until the deadline for adding a class. If a class is closed, or a student is otherwise unable to complete their registration by phone, they should contact the Mechanical Engineering Department and ask about a Special Registration Form. Student schedules and bills are not routinely mailed during this period, but courses and account balance is available. You are encouraged to pay your fees at your earliest convenience during this period in order to avoid waiting in line after classes begin.

Late Registration and Adjustments (Period III)

Processing is essentially a continuation of previous TTVR procedures. Classes may be added the first two weeks of the quarter via Touch-tone. The late payment fee begins after the second week. This period also includes in-person processing of Special Registration Forms for various special permissions.

Special Permission
You may register for a course without satisfying the requirements above if you receive special permission to do so. This permission is granted in consultation with the department chair. When special permission is granted, you will receive a Special Registration Form stamped by the department. This form, when taken to the Registrar's Office, will enable you to register.

By-Arrangement
Courses that are not specifically listed in the class schedule can be taken by special arrangement between the student and the instructor. This format is usually used for ME 401, 405, 406, 501, 503, 505. The student should work with the instructor to define the scope and objectives of the course in advance. Once an agreement is made, the student and instructor complete a *By-Arrangement Request* form, available in the Mechanical Engineering Department. The faculty member must sign this form to show their approval. The form is then processed by the staff in the Mechanical Engineering Department and forwarded to the Registrar's Office. Once the Registrar's Office has processed the *By-Arrangement Request*, the student will be sent confirmation and a revised bill (if necessary).

Changes
During any given quarter, you may make changes in your registration. The time limits for making these changes are university policy and cannot be overridden by the Mechanical Engineering Department. The deadlines for each change for each quarter are listed on the back of the current *Schedule of Classes*. In general, the following are the possible changes and the time available from the beginning of the quarter in which you can make them:

Change	Time Duration
Add a class, including by arrangement	2 weeks
Drop a class without instructor approval	4 weeks
Change the grading option	4 weeks
Drop a class with instructor's approval	8 weeks

Evening Mechanical Engineering Classes
Starting in Fall Quarter of 1998, the Mechanical Engineering Department began offering evening sections of undergraduate classes. These sections make degree completion easier for students who work full time and cannot easily attend regular day classes. For further information about this program, go to http://www.eas.pdx.edu and click on Night Degree Program. After reading the general information, click on the desired engineering program in the list on the left side of the page.

ADVISING

Advising services are offered to students during their entire term of enrollment at PSU. In

addition to taking advantage of advising offered to all University students, Mechanical Engineering students are encouraged to meet with their Lower and Upper Division advisers, as appropriate. Advising for Lower and Upper Division students is handled separately. Lower Division advising is provided in the Engineering Dean's Office, Suite 20, Fourth Avenue Building (FAB), telephone # (503) 725-4631.

When you are accepted into the Mechanical Engineering program, you are assigned a ME professor who is your Upper Division adviser. You are required to meet with this person at least once during your first year in the Mechanical Engineering program.

Several resources are available to assist you in developing your program. You should utilize these resources to avoid mistakes that may affect your graduation.

Non-Admitted Students
All students who have not been formally admitted to the mechanical engineering program should seek advice from the Academic Adviser in the SEAS Dean's Office. The Academic Adviser is available to answer questions concerning lower division courses and programs of study, and to assist in evaluating which courses will transfer from other institutions to Portland State University. Appointments can be made at (503) 725-4631 or email advising@eas.pdx.edu.

Admitted Students
Students who have been formally admitted to the mechanical engineering program will have an assigned faculty adviser; the adviser is specified in the acceptance letter. If you don't know who your adviser is, ask at the Mechanical Engineering Department.

Students are required to meet with their faculty adviser soon after admission to design their program of study.

When meeting with their faculty adviser, a student should be prepared with all necessary background information: the reverse side of the "blue sheet" as complete as possible, transfer evaluation form, current grade reports, and transcripts.

Degree Requirements
Students will be graduated according to the requirements of the PSU catalog in force when they enroll at PSU or any other accredited post-secondary institution, subject to the seven-year rule (see below). Once admitted and enrolled, students may graduate under the guidelines of any catalog issued after their first admission and enrollment, whether or not the student was enrolled during the year in which said catalog was in effect. This requirement applies to all PSU students regardless of whether or not they are transfer students.

Seven-Year Rule: No catalog is valid for longer than the summer term following the seventh academic year after issuance of the catalog. The 1999-2000 catalog will expire at the end of summer term, 2006. A student must meet the requirements of a catalog for which the student is eligible and which is valid at the time of the student’s graduation. This applies to a first bachelor’s degree, to a second bachelor’s degree, and to certificates which may be earned by undergraduates and by postbaccalaureate students.

Graduation Audit
One to two terms prior to anticipated graduation, each student must undergo a graduation audit (grad check) to assure that all university, school, and departmental degree requirements will be met. You must go to the Degree Requirements window in the lobby of Neuberger Hall to apply for graduation. In addition to the usual information on name, address, and social security number, you must state which term you plan to graduate and which catalog (year) that you wish to be used to evaluate your degree requirements. You may select any catalog year within seven years of your graduation date. (e.g. You plan to graduate during Spring Quarter, 2000; you may use the 1993-94, 94-95, 95-96, 96-97, 97-98, or 98-99 catalog to specify the requirements.)

When the Registrar's Office has completed their analysis, they will forward the application to the Mechanical Engineering Department. Upon its receipt, your name will be added to the list on the memo posted outside of the Mechanical Engineering Department. When your name appears on this list, you must make an appointment to meet with the department chair to review outstanding program requirements. Prior to your meeting, you should prepare a blue sheet which clearly indicates which courses have been completed, which courses are being taken for design topics, and which courses are being taken for engineering electives. Also, you must be prepared to commit to which courses you plan to take to complete your degree. Any courses that you plan to take, or are currently taking but have not completed, will be listed on the grad check form. When these have all been completed, the Registrar's Office will subsequently award your degree. Any deviation from the list of courses on the grad check form *must be approved in writing by the department chair*. A minimum GPA for graduation is 2.0 in all residence work and 2.0 in mechanical engineering. Please consult the *PSU Bulletin* for more details.

Lower Division Curriculum Students wishing to enter the mechanical engineering program should consult the *PSU Bulletin* to determine which courses are required. In general, the first two years of study concentrate on mathematics through differential equations, college chemistry, calculus-based physics, and fundamental engineering courses. Most, if not all, of these courses may be taken at another institution such as a junior college and subsequently transferred for credit. If you have any questions regarding the transfer credits, consult the academic adviser.

Upper Division Curriculum
Students who have been formally admitted to the mechanical engineering program are required to take a set of required courses in conjunction with electives to meet the degree requirements. During the Junior year, all students complete a common set of courses covering the fundamentals of engineering science. During the senior year, these fundamental concepts are applied in courses that emphasize design, synthesis, and applications. Table 1 lists all required courses, and approved ME electives.

TABLE I
Mechanical Engineering Curriculum
1999-2000 Bulletin

Junior Year		**Credit (Design Content)**
ME 313	Analysis of Mechanical Components	4
ME 314	Analysis and Design of Machine Elements	4
ME 321	Engineering Thermodynamics	4
ME 322	Applied Fluid Mechanics and Thermodynamics	4
ME 323	Heat Transfer	4
ME 351	Vibrations and System Dynamics	4
ME 352	Numerical Methods in Engineering	4
EAS 361	Fluid Mechanics	4
Stat 460	Applied Statistics for Engineers and Scientists	3
Ph 381	Physical Metallurgy for Engineers	3
University Studies		8
Senior Year		
ME 411	Engineering Measurement and Instrumentation Systems	4
ME 420 ***or*** 437 Systems Design		4
ME 488	Design of Experiments	2
ME 491	Design Process	2
ME 492	Conceptual Design Project	4
ME 493	Detailed Design Project	4
Approved Mechanical Engineering Electives		16
Private and Public investment in Professions Cluters		4
University Studies		4
Approved Mechanical Engineering Electives		
ME 410	Selected Topics	Variable
ME 413	Engineering Material Science	Variable
ME 415	Advanced Topics in Energy Conversion	4
ME 416	Internal Combustion Engines	4
ME 417	Gas Turbines	4
ME 418	Analysis of Powerplant Cycles	4
ME 420	Thermal Systems Design	4
ME 421	Heating, Ventilating and Air Conditioning Design Fundamentals	4
ME 422	Building Energy Use Analysis and Design	4
ME 423	Fundamentals of Building Design	4
ME 424	HVAC System Design and Controls	4
ME 425	Advanced Topics in Building Science	4
ME 431	Pneumatic and Hydraulic Systems	4
ME 437	Mechanical Systems Design	4
ME 441	Advanced Fluid Mechanics	4
ME 442	Advanced Heat Transfer	4
ME 443	Advanced Engineering Thermodynamics	4
ME 444	Combustion	4

Approved Mechanical Engineering Electives, cont.		**Credit (Design Content)**
ME 445	Advanced Topics in Thermal and Fluid Sciences	4
ME 446	Compressible Flow	4
ME 447	Transfer and Rate Processes	4
ME 448	Applied Computational Fluid Dynamics	4
ME 452	Control Engineering I	4
ME 453	Control Engineering II	4
ME 455	Finite Element Modeling and Analysis	4
ME 457	Introduction to Robotics	4
ME 458	Principles of CNC Machining	4
ME 481	Mechanical Tolerancing	4
ME 512	Advanced Vibrations	4
ME 532	Turbomachinery	4
ME 551	Engineering Analysis	4
ME 554	Integrated Computer-Aided Design	4
ME 562	Engineering Numerical Methods	4
ME 563	Advanced Topics in Control Engineering	4
ME 565	Advanced Finite Element Applications	4
ME 571	Process Measurement and Control	4
ME 587	Statistical Process Control	4
ME 588	Design of Industrial Experiments	4
ME 596	Design Optimization	4
ME 401*	Research	Variable
ME 404*	Cooperative Education/Internship	Variable
ME 405*	Reading and Conference	Variable
ME 406*	Special Projects	Variable
EAS 461*	Reliability Engineering	4
CE 324*	Elementary Structural Analysis	4
CE 325*	Indeterminate Structures	4
CE 362*	Hydraulics	4
CE 364*	Water Resources Engineering	4
CE 464*	Hydrologic and Hydraulic Modeling	4
CE 467*	Hydrologic and Hydraulic Design	4
CE 474*	Unit Operations of Environmental Engineering	4
CE 484*	Engineering Project Management	4
CE 561*	Water Resource Systems Analysis	4
Requires written permission of academic advisor or department chair		

Department Chair
The department chair of Mechanical Engineering is available to provide advice on program, curricular, and operational matters when a student's faculty adviser is unavailable or unable to solve a particular problem. The faculty adviser should be consulted first. An appointment may be made to consult with the chair by calling (503) 725-4290 or by making a request via electronic mail (email address: medept@eas.pdx.edu). Consult with the departmental staff concerning the chair's availability.

Design
The Mechanical Engineering Department at PSU has gained an excellent reputation for our design emphasis. Design is important for two reasons: responding to the requirements of the accreditation board (ABET) and responding to industry's need for ME graduates with design experience.

Design generally involves the solution of broader problems and encompasses components of analysis and synthesis. Engineering design courses should include the following:

- Development of student creativity
- Use of open-ended problems
- Formation of problem statements
- Formation of problem specifications
- Consideration of alternative solutions
- Feasibility considerations
- Detailed system descriptions
- Realistic constraints, e.g. economic factors, safety, reliability, aesthetics, ethics, social impact

Design courses should be "capstone", building on the foundation of mathematics, basic science, and engineering science.

Communication skills are especially important in design courses. Competency in oral and written communication in the English language is considered by ABET to be essential for the engineering graduate. The development of communicative skills should be demonstrated by student work in engineering courses.

Most courses are not 100% design. The design content for Mechanical Engineering courses is established by the Mechanical Engineering faculty to assure its coverage across the curriculum.

Portland State University

Mechanical Engineering Blue Sheet

FRESHMAN			SOPHOMORE			JUNIOR			SENIOR		
FALL	WINTER	SPRING	FALL	WINTER	SPRING	FALL	WINTER	SPRING	FALL	WINTER	SPRING
CALCULUS			**CALC IV**	**DIF EQ I**			STATS STAT 460				
MTH 251	**MTH 252**	**MTH 253**	**MTH 254**	**MTH 256**							
CHEM	CHEM	CHEM	**PHYSICS**					PHYS METAL			
			PH	**PH**	**PH**			PH 381			
CH 221	CH 222	CH 223	**PH 214**	**PH 215**	**PH216**						
CH 227	CH 228										
ENGR PROB SOLV EAS 101		ENGR GRAPH EAS 115	**STATIC EAS 211**	STREN OF MAT EAS 212	**DYNAM EAS 215**	ENGR THERM ME 321	THERM FLUIDS ME 322	HEAT TRANS ME 323	DES ME 491 / DOE ME 488	DES PROJECT I ME 492	DES PROJECT II ME 493
			PROP OF MAT EAS 213	**ELECT CIRC ECE 221**	MFG PROC ME 241	FLUID MECH EAS 361	MECH ANAL ME 313	DESIGN MACH ME 314	SYSTS DESIGN ME 420 / ME 437	ENGR MEAS ME 411	ME Elective
				ECE 201		NUM METH ME 352	SYS DY MODEL ME 351		ME Elective	ME Elective	ME Elective
FRESHMAN INQUIRY			SOPHOMORE INQUIRY			PRIV PUBLIC INVEST EC399U		UNST UP DIV CLUST			UNST UP DIV CLUST
UNST 101	**UNST 102**	**UNST 103**	UNST 299	UNST 299	UNST 299						

EXPLANATION

CREDIT HOURS

1
2
3
4

MUST TAKE EITHER ME 420 OR ME 437
ME 491 & 492 FULFILL UNST CAPSTONE

SHADED AREA - CORE REQUIREMENTS
FRESHMAN INQUIRY IS SATISIFIED BY SP 100
AND WR 121 FOR TRANSFER STUDENTS

1999-0

General Education Requirements
Engineering Programs
Portland State University

The General Education requirements for engineering students can be met in one of the following ways:

1. Students who complete their entire program at Portland State University meet the requirement by taking 39 credits of University Studies. (15 credits Freshmen Inquiry, 12 credits Sophomore Inquiry and 12 credits Upper Division Cluster).

2. Transfer students meet the requirement by having WR 121, Sp 100 and 33 credits as a combination of University Studies courses and Liberal Arts/Social Science transfer credits. (At a minimum the 12 credit junior/senior cluster must be taken at PSU).

3. Students transferring from community colleges having co-admission agreements with PSU (currently Clackamas Community College and Mount Hood Community College) may be able to complete Freshman and Sophomore Inquiry at their community college before transferring to PSU. If so, they may follow #1.

All engineering students must complete EC 399U Private and Public Investment. Students *may* be able to use EC 399U as a University Studies Upper Division Cluster course in the Community Studies Cluster; the Knowledge, Rationality, and Understanding Cluster; or the Professions in Society Cluster. If not, the student must take an additional upper division cluster course.

NOTE: Additional information regarding General University Requirements may be obtained from the PSU Bulletin.

ME 491, 492, 493 and ME 406

ME 491, 492, 493 are a series of courses which form the Senior Design Sequence. These courses involve two major components: design methodology and an original design project. The senior design project in ME 491, 492, 493 is characterized by the following factors: student group effort, emphasis on design methodology, interaction with industry, frequent progress meetings with class members, faculty, and industrial advisers for six months. The design projects are not limited to machine design topics, but can include thermal-fluid systems, process development and systems level problems. During the Fall term of your senior year, you will be asked to help develop projects by:

1. Identifying other students with whom you would like to work in a group;
2. Defining your areas of interest or specialization; and,
3. Helping faculty make contacts with industry to find appropriate design problems.

Other projects, less design methods oriented, can be conducted for elective credit using the ME 406 course. The ME 406 project is characterized by the following factors: individual or two-student teams, interaction with a single faculty or industrial adviser, a short-term project that can encompass analysis, testing, inventorship or design. In summary, ME 406 emphasizes individual student-faculty cooperation on a problem of special interest to a faculty or industrial adviser. See the EAS web page for more information on design courses.

Prerequisites

The *PSU Bulletin* shows prerequisites for all courses. These prerequisites are intended to require students to enter higher level courses with an adequate background. A poorly prepared student short-changes his own education and is a hindrance to his fellow students and their progress. Considerable planning goes into deciding on what courses should be prerequisites and what courses can be co-requisites. Stated more directly, a prerequisite is not a co-requisite.

Students should be aware that most prerequisite classes are offered once per year. If you fail to complete a prerequisite, you will not be allowed to take the following course. Stated more directly, failing a course that is a prerequisite for another course may delay your graduation by one year. Please refer to the *PSU Bulletin* for more details.

FINANCIAL AID

The Student Financial Aid Office provides qualified students with financial aid in the form of loans, grants, and employment. For complete information and the application process, consult the PSU Financial Aid Office web pages at http://www.ess.pdx.edu/fao/index.htm. You can also fill out the application forms directly on the web at http://www.FAFSA.ed.gov. If you choose this method, use the PSU school code, 003216.

Note that in order to be eligible to receive state or federal financial aid, students must remain in good academic standing as defined in the University Scholastic Standards Policy, and enroll for the minimum credits specified by the Award Nomination Letter.

Washington-Oregon tuition reciprocity
Under a reciprocity agreement between the state of Oregon and Washington, a limited number of Washington residents may be eligible to pay Oregon resident tuition and fees while attending Portland State University.

To qualify for reciprocity, you must:
- Be a legal resident of the state of Washington
- Be an admitted PSU student
- Have completed at least 90 quarter hours or have earned an approved Associate of Arts degree

Selection Criteria
Priority will be given to students who have paid non-resident tuition and fees for at least one term prior to applying for reciprocity (note: this alone does not guarantee initial acceptance or continuation of a position in the program). Selection for the program is based on academic merit, as determined by each applicant's GPA at the time of admission to PSU.

Applications are accepted for each term, based on the following time periods:
For Fall Term: File between April 1 and June 1
For Winter Term: File between June 1 and October 1
For Spring Term: File between October 1 and February 1

Applications received after each respective deadline will be considered only after all timely applications for that term have been reviewed, and only in the event program space is available.

If you are accepted to participate in the tuition reciprocity program, you will be eligible to pay Oregon resident tuition for one academic year (fall, winter and spring terms). You will need to reapply each year since renewal from one year to the next is not automatic.

In order to maintain your eligibility during your program year, you must register for and receive a passing grade in at least 9 credit hours of classes each term. Audited classes do not count. If at the end of any term you have not satisfied program requirements, you will lose your eligibility for Oregon resident tuition. However, you may reapply for reciprocity at a later date. Graduate applicants receiving assistantships are not eligible for reciprocity.

For more information, contact:
PSU Office of Admissions
Reciprocity Desk
PO Box 751-ADM
Portland, OR 97207-0751

Scholarships
Many scholarships are available through the University. For information about these scholarships, check the web page at **http://www.ess.pdx.edu/fao/schola/htm** or obtain a copy of the Scholarship Handbook from the PSU Office of Academic Affairs, Cramer Hall 349.

Also, several scholarships are awarded annually to deserving engineering students through the School of Engineering and Applied Science and the Department of Mechanical Engineering, and through professional societies. Note that academic performance is only one selection criterion. Award criteria vary, but generally include: being admitted and/or have applied to PSU by specified term, merit, financial need, service to community and/or university, potential for success, and declared major with full-time student status in engineering.

For more information about SEAS and ME Department scholarships, consult the SEAS web page at **http://www.eas.pdx.edu**, or stop by the SEAS office at 1900 S.W. Fourth Avenue, Suite 20. The next application deadline is February 15, 2000. Award notifications will be mailed by April 15, 2000.

Grading Opportunities
The department routinely employs students to assist faculty members in grading homework assignments. Applications are available through the office. Students who qualify for work-study (FWSP) are given top priority.

Project Assistants
Faculty members often need students to assist them in conducting special projects. The duties may include design, assembly of test equipment, conducting experiments, performing literature searches, writing and modifying computer codes, performing surveys, and the like. The availability of these positions is sporadic, so students should keep their eyes open for announcements. Typically, faculty members will announce these in class, post a job announcement on the departmental bulletin board, or speak with students individually.

Internships
The department commonly arranges for a few summer internships each year. The nature of the job varies from one company to another, but typical roles include engineering aide, project assistant, and drafter. These internships are full-time summer employment, usually requiring a student to have completed the junior year to qualify. Announcements of internships are posted or announced in classes.

MULTIPLE ENGINEERING COOPERATIVE PROGRAM (MECOP)

The Multiple Engineering Cooperative Program (MECOP) is a partnership among students, industry, Oregon State University and Portland State University's School of Engineering and Applied Science.

At Portland State University, MECOP is available to students in disciplines related to the manufacturing industry that include Computer Science, Electrical and Computer Engineering, and Mechanical Engineering. The program works closely with Northwest industry to offer engineering students paid, six-month internships, which provides students with the opportunity to gain high-quality industrial experience and related academic activities while pursuing a degree.

Much discussion has evolved around the inability of major universities to provide an adequate education in engineering in a four-year program. Our goal is to supply the Northwest with the

best engineers with the necessary tools to be true contributors in their chosen fields. With this in mind, we feel MECOP provides the best of both worlds; the university for the technical/theoretical background, and selected industries for the practical, state-of-the-art applications.

MECOP Advisory Board
Each company appoints a representative to serve on the MECOP Advisory Board. The board serves a vital role for the program. Board members develop, help manage and actively participate in all program activities. These activities include student selection, development of internship sites, and placement of students into internships.

Student Selection
Students are selected into the program through two screening processes. First, they are screened academically in their sophomore year. This is to ensure that students are academically qualified to take upper-division courses. A second screening takes place through an interview process during which company representatives interview the students applying for the program. The goal of the screening is to make every effort to ensure that the students are qualified and ready for future internship placement. Selection is competitive, and about 50 percent of the applicants are admitted to the program. The bases for selection include academic performance, written and oral communication, and motivation.

Intern Placement
Representatives from each company offering internships for students in the program participate in placing the students into internships. Each student is interviewed by a group of company representatives who ask questions and clarify the student's needs and expectations regarding an internship. The purpose is to successfully match students and companies, achieving mutual benefits for everyone involved.

Internships
Interns are paid approximately $13.50-$15.50 per hour. This means students can earn more than $30,000 over the two six-month internships. The program's objective is to develop students through a variety of high quality engineering internships at firms that employ a wide range of engineering disciplines. To insure this, the students are required to intern at two different companies. This allows both the universities and the students a more representative view of today's diverse engineering opportunities. Every effort is made to ensure that students receive diverse and relevant experiences.

Why Participate in MECOP?
- Gain valuable, professional work experience
- Two six-month internships
- Opportunity to experience two professional work environments, industries, management styles, etc.
- Learn early in your career what an engineer really is and really does.
- Learn from experience your academic and personal strengths and weaknesses.
- Make more informed course selections.

- Have motivation or reason to academically apply yourself
- Finance all or a major part of your education.
- Develop the ability to understand and grasp course content upon return to the University.
- Develop maturity and confidence.
- Become highly marketable after graduation.
- Make contacts in industry that last a lifetime.

HOMEWORK AND EXAM POLICIES

Exams

1. Faculty is not obligated to give make-up exams. The gravity of the student's problems, i.e., illness, death in the family, childbirth, does not alter this policy.

2. Students are responsible for bringing their own test materials: straight edge, graph paper, engineering paper, extra pencils, extra batteries for calculators. The instructor will not disturb other students to help a student who requires assistance.

3. Beeping watches and calculators should be avoided so as not to disturb other test-takers.

4. Exams may be open book, open notes, or closed book and notes. The instructor shall announce the type of exam beforehand.

5. Exams cover material presented in class, in the text, and in reference materials. The student should expect questions from any of these sources. Exam questions are not restricted to material explicitly stated in class by the instructor or to problems that look exactly like homework problems.

6. Students' experience with past exams should not be considered as a guide for future exams. The format, breadth, and depth of test material is at the discretion of the instructor.

7. Cheating in any form is unacceptable and will be handled with the most severe measures allowed by the University and the State of Oregon. Honest students should be concerned about cheating and should actively assist faculty. Honest students are affected in two important ways:

    a. exam scores are generally graded on a curve, the honest student's letter grade will be lowered by cheating;
    b. students who have relied on cheating to attain their degree will undoubtedly, do poorly in the working environment and will consequently lower the reputation and worth of a Mechanical Engineering degree from PSU.

8. There is no university rule at PSU regarding the number of final exams that a student has to take in one day. Faculty is not obligated to offer a make-up exam.

Homework

1. Homework is due on the date stated by the instructor. Late homework will not be accepted under any circumstances. The gravity of the student's excuse does not change this policy.

2. Homework solutions, when posted, are located in the south display case on the fourth floor of Science Building II.

3. Homework should be submitted at the beginning of class on the appropriate due date. Do not submit homework at the end of class, in the instructor's mailbox, or under the instructor's door, unless stated otherwise by the instructor.

Unless the instructor provides the student with special requirements, the format for homework is given in the **Homework and Calculations Specifications**.

Format for Homework Problems

Presentation

The following is the accepted standard in engineering offices.

1. Use engineering computation paper-grid (squares) printed on back-5 sq./in.

2. Do computations (homework) in pencil (drafting quality or micro-lead); please do not use the #2 pencil for this purpose.

3. Letter (print) using engineering style lettering, rather than script or longhand writing. This may be upper or lower case lettering style. (Do not crowd work. Indent to help clarify.)

4. Sketches and Free Body Diagrams
   Use or develop wherever possible, apart from the sketch copied from the problem statement:
   a. to help you solve the problem
   b. to clarify solution for reader.

   Use a straight edge for all line work, both the sketch itself and dimensions, and also for underscoring. Include all letter designations of points, dimensions, and other labels on each sketch.

5. Use only the one side (non-grid) of the paper.

6. Obtain and use a good-quality eraser-preferably a "plastic" eraser rather than a rubber eraser.

7. Write down the equation in symbol form in each case before you substitute numbers into the equation.

8. Keep the equation in symbol form as long as possible, especially in relating equations (in systems of equations) before inserting numerical values.

9. Accuracy of final answers should be based on accuracy of given data. Usually only three significant figures are desired.

10. Underline or box final answers.

11. Do not fold your paper unless your instructor specifies otherwise; staple in upper left-hand corner.

Overall Procedure

1. Present a statement of the problem, the data available, and the results to be calculated. Utilize sketches whenever possible to help visualize and define the problem. Show all the given information on the sketch, including the items to be determined. Where sketches are appropriate, problems will not be accepted without them.

2. Outline your calculation procedure, logic and assumptions before presenting calculations (in a manner such that you could give the information to someone else to do the calculations). State all required assumptions as needed.

3. Present your calculations neatly, include all units, explain your calculation steps briefly, and identify all variables. Always write out any equations into which you plug numbers. Never plug numbers into differential equations.

4. Reference your sources of data and equations. A proper reference citation should include the author, article title, book or journal title, publisher, date, and pages where information is found [e.g., Holman, J. P., Engineering Thermodynamics, 3rd ed. (McGraw-Hill, 1986), p. 169.].

5. At the end of the problem, summarize all the results and assumptions in a table (box your answers).

6. The computations must be systematic, neat, and understandable by others. Messy problems that cannot be easily understood will not be accepted. Remember, the neatness and organization of your work is a direct reflection of your abilities as an engineer.

7. Present answers or calculations with three significant figures of precision, unless otherwise indicated (see Significant Digits). This is accepted engineering practice since most input data is only known to such precision. Do not show all the significant figures shown on your calculator.

8. In doing your homework problems, you may discuss the problem solution with fellow students. However, you are required to write up the problem by yourself, in your own words. Copying solutions from other students is not allowed and is strictly forbidden.

The reason for the above mandatory requirements is that most difficult (but solvable) engineering problems can be solved in a fairly straightforward manner if the problem is clearly defined and systematically approached. Thus, by developing the above problem-solving approach, you can set up the problem and procedure and give it to another person (technician or engineer) to solve. The

problem solution involving the calculations should be presented in such a manner that a supervising engineer could easily check the computations.

See the Homework Format Sample in the Appendix.

Significant Digits

Measurements cannot be assumed to be exact. Errors are always present regardless of the precautions we take. Keep in mind that we are not speaking of mistakes in data collection or processing; we are referring to data that are correctly collected and processed but are still not exact. Quantities determined by analytical means are not always exact either. Often assumptions are necessary in order to derive methods that can be practically applied.

Sometimes we don't understand the phenomenon well enough to get exact answers. Thus, it is clear that we need a way of expressing our results so that our readers will know how "good" we believe these answers to be. Use of significant digits gives us this capability to a limited degree without resorting to the more rigorous approach of stating the estimated percentage error in the result.

A *significant digit,* or *figure,* is defined as any digit used in writing a number, *except* those zeros that are used only for location of the decimal point or those zeros that do not have any non-zero digit on their left. When you read the number 0.00015, only the digits 1 and 5 are significant, since the three zeros have no non-zero digit to their left. We would say then that this number has two significant figures. If the number is written 0.00150, it contains three significant figures; the rightward zero is significant.

Numbers 10 or larger that are written in scientific notation and that are not counts (integers) can cause difficulties in interpretation when zeros are present. For example, 2000 could contain one, two, three, or four significant digits; it is not clear which. If you write the number in scientific notation as 2.000×10^3, then clearly four significant digits are intended. If you want to show only two significant digits, you would write 2.0×10^3. It is our recommendation that, if uncertainty results from using standard decimal notation, you switch to scientific notation so your reader can clearly understand your intent.

You may find yourself as the user of values where the writer was not careful to properly show significant figures. What then? Assuming that the number is not a count or a known exact value, about all you can do is establish a reasonable number of significant figures based on the context of the value and on your experience. Once you have decided on a reasonable number of significant digits, you can then use the number in any calculations that are required.

As a guide to deciding how many significant figures to use, remember that a number containing three significant figures implies a maximum error range of about 1 percent. To explain, the quantity 101 means a number between 100.5 and 101.5. Thus the error range is 1 (± 0.5) which represents about 1 percent of 101. The quantity 999, also containing three significant figures, has an error range of ± 0.5, which is about 0.1 percent of 999. Therefore, we use the guideline that a number with three significant figures has a maximum error range of 1 percent. Likewise, a

number containing four significant figures has a maximum error range of 0.1 percent. Only in exceptional cases will precision better than 0.1 percent be necessary.

PROJECTS, REPORTS, CITING REFERENCES

Many of your courses will require term project reports. For example, the senior design courses will involve student projects. Your progress on this project will be documented in an appropriate report; the main product of your project will be a final report. Your instructor should give you specific information on format, but the following can be used as a general guideline. Please keep in mind that when you are writing a final report on a project, you are not writing a research paper or a lab report.

Organization of Papers

Each paper should be organized in the following order:

Title Page
Abstract
Table of Contents
Nomenclature
Main Body of Paper
Acknowledgments
Figures (possibly as a separate section)
References
Bibliography
Appendices

Abstract

The abstract should be short, 100 to 200 words, and give the reader an overview of most of the major ideas and findings in the report. An alternative to an abstract is a summary, which is also about the same length. In a summary, selected sections of the report may be emphasized, such as recommendations, relative to other sections. Your instructors should make clear whether they prefer an abstract or a summary, or whether the decision may be up to you as the writer.

Nomenclature

Nomenclature abbreviations should follow the United States of American Standards Institute recommendations as far as possible.

The nomenclature list should be in alphabetical order with Greek symbols following the alphabetical listing. Subscripts and Superscripts follow Greek symbols and should be identified with a heading. Symbols that cannot be typed should be entered in black ink.

To indicate units, use shilling fractions to conserve space, e.g. k=thermal conductivity (Btu/ft-hr-F), r=density (lb/ft^3).

Periods are not used after abbreviations except in the case of in. for inch. The sign ° for degree is used only in tabular matter or where the abbreviation deg is cumbersome. Wherever feasible, the degree in a temperature scale may be omitted, e.g. 460 K.

Headings
Major headings are typed in capital letters and aligned flush with the left-hand margin. One line of space is left between the heading and the text above and below it.

Subheadings are underlined, typed with the initial letter of each work capitalized, and placed flush left. A space is left above the subheading, and the text begins on the next line below it.

Sub-subheadings: are indented, underlined, and followed by a period, 2 spaces, and the beginning of the text. A space is left above the sub-subheading.

If your paper is divided into two or three completely different parts, and you feel that three levels of headings are not enough to organize your material properly, you may use a higher level of heading, typed in capital letters, underlined, and centered in the column, before each major part.

Footnotes
Footnotes are designated by superscript numerals, and numbered in consecutive order starting with one.

References
Under the major heading REFERENCES, list and number all bibliographic references at the end of the paper. When referring to them in the text, type the corresponding reference number in parentheses, proceeding the period if it falls at the end of a sentence. References should be in sequence throughout the paper.

If numbered equations appear in your paper, underline the reference numbers in the text to distinguish them from equation numbers.

References should be complete. In listing them, please follow the style recommended by the Engineers Joint council and illustrated below (do not use separate headings for journals, books, etc. as shown).

Examples:

Journal Articles

1. Del Sasso, L.A., Bey, L.G., and Renzel, D., "Low-Scale C-Flight Ballistics Measurements of Guided Missiles," Journal of Aeronautical Sciences, Vol. 15, No. 10, Oct. 1958, pp. 605-608.

Books

1. Turner, M.J., Martin, H.C., and Leible, R.C., "Further Development and Applications of Stiffness Method," Matrix Methods of Structural Analysis, 1st ed., Vol. 1, Macmillan, New York, 1964, pp. 203-266.

2. Segre, E., ed., Experimental Nuclear Physics, 1st ed., Vol. 1, Wiley, New York, 1953, pp. 6-10.

Reports

1. Book, E., and Bratman, H., "Using Compilers to Build Compilers," SP-176, Aug. 1960, Systems Development Corp., Santa Monica, CA.

Transactions or Proceedings

1. Soo, S.L., "Boundary Layer Motion of a Gas-Solid Suspension,' Proceedings of the Symposium on Interaction Between Fluids and Particles, Institute of Chemical Engineers, Vol. 1, 1962, pp. 50-63.

Bibliography

A bibliography is a list of material that you read to learn more about the problem or to get ideas about solutions. A reference section gives a citation of materials, such as analytic techniques or experimental results that you directly used in your report, but are not originally yours. References are a must; you may choose not to have a bibliography section.

Equations

Equations should be typed if possible, otherwise they should be hand lettered carefully in black ink.

Number the equations in sequence from equation (1) to the end of the paper, including appendices, if any. Enclose the equation numbers in parentheses and place them flush with the right-hand margin. Variables at some power that appear in the text should use subscript notation. For example, for feet-squared, use ft^2, not ft**2 or any other ad-hoc style. If you use spreadsheets, equations are implied for the relationship among columns. Either these relationships should be obvious, or should be explained in the text or on the spreadsheet itself.

Figures

Figure numbers, captions, and any explanatory legend should be below the figure and follow this form:

Fig. 2 Schematic for experimental apparatus
(1) Inlet section
(2) Exit section

The next line of text should follow after a vertical double space. If a full width figure is used, the caption should be properly centered.

All graphs and line drawings should be in black ink on white. High contrast, glossy black-and-white prints of figures, graphs or illustrations are also acceptable.

Be sure to use heavy enough lines to that they remain legible after reduction. Do not submit graphs on small-grid paper. Lettering should be large enough to remain legible.

All figures must have a caption and have been cited in text. As a rough rule of thumb, a caption should be sufficiently complete such that if the figure fell out of the report, the figure and caption should make sense all by themselves.

Style
Please write a document that is concise, well coordinated, and focused. The report should be typed, either single or double-spaced; your instructor should make clear which spacing is preferred. Try putting yourself in the position of the reader; aim for somebody like an intelligent lay person.

Writing style varies depending on who is the writer and who is the intended reader. In any case, some general points should be followed:

1) diversity of sentence structure is desirable to stimulate reader's interest, but should not unnecessarily add to the length or should not confuse the reader;

2) written reports should emphasize the concise documentation of a technical, complex engineering activity;

3) lack of needed information cannot be covered up by confusing statements; 4) use active sentences; DO NOT use nouns such as: I, we, them, it, this, etc. Look at this write-up; which sentences are active, which aren't? It should be obvious to the most casual observer!

Many projects will be performed in groups of 2 to 3 students, which means that the report will have multiple authors. This situation does not mitigate the requirement that the overall report should be coordinated, and one section should lead to another, with a solid introduction and conclusion that covers the whole project. Naturally, the writing style from one section to another will differ if written by different authors. Most readers of engineering reports recognize that some tasks will be performed by the team as a whole, while individual members will perform other tasks. In any case, the report should be a clear, concise flow of information.

Main Body and Appendices
The body should carry the main message, while the appendices contain supporting information that may be of importance to some readers who require additional details. The appendices contain additional background information; data backing up your claims in the body; and detailed calculations. If the appendix does not contribute to the overall document, don't put it in. All appendices should have some kind of introduction and wrap-up. You, as the writer, have to make the decision on what should be included.

The contents of the main body will differ for each project, but a general outline might include:

Introduction or Background
Problem recognition
Problem Statement
Clear statement of problem or Goals of project
Constraints or Scope of project
Approach to Solution
Relevant alternative solution discussion
Evaluation criteria
Summary of analysis procedures

Maybe leave details for appendices

Solution

Detailed description of design including drawings

Conclusion (maybe)

Impact of Project

Recommendations (**definitely**)

Figures and drawings can be placed: 1) in the text, if small; 2) as the next page after citation, if large, or 3) in a separate, figure section. Figures for the body should not appear in an appendix. Figures in appendices would be included in their respective appendix with a different numbering scheme, e.g. Figure A2-5 for the fifth figure in appendix two. Consult your instructor for their suggestion on placement of figures.

GRADING

Grading Criteria

Consult your instructor for details, but in general two important components will be considered in grading a project report: 1) report organization, effective communication, grammar, and 2) technical aspects, including well-founded assumptions and claims and all necessary analytics. For many projects, you have only one opportunity to demonstrate how much effort you put into doing a good job, and that one opportunity is the project report. Project reports require considerable time to read and grade; as a consequence, due dates must be strictly enforced. Late material will be severely graded down.

Letter Designation

Evaluation of a student's performance is determined by the following grades:

A	=	4.0	B-	=	2.67	D+	=	1.33
A-	=	3.67	C+	=	2.33	D	=	1.0
B+	=	3.33	C	=	2.0	D-	=	0.67
B	=	3.0	C-	=	1.67	F	=	0.0

For Undergraduates:

A	=	Excellent	D	=	Inferior	I	=	Incomplete	Au	=	Withdrawal
B	=	Superior	F	=	Failure	W	=	Withdrawal	X	=	No basis for grade
C	=	Average	P	=	Pass	NP	=	No Pass			

Incomplete

A student may be assigned an "I" mark by an instructor when all of the following four criteria are met:

1. Quality of work in the course up to that point is "C" level or above.

2. Essential work remains to be done. "Essential" means that a grade for the course could not be assigned without dropping one or more grade points below the level achievable upon completion of the work.

3. Reasons for assigning an "I" must be acceptable to the instructor. The student does not have the right to demand an "I". The circumstances must be unforeseen or be beyond the control of the student. An instructor is entitled to insist on appropriate medical or other documentation.

4. Consultation must have occurred and a formal agreement must be reached between instructor and student.

Both instructor and student should keep a written record of the remaining work and its completion date. The instructor may specify the highest grade that may be earned. This should not exceed the level of achievement displayed during the normal course period.

The deadline for completion of an Incomplete can be no longer than one year. The instructor may set a shorter deadline, which shall be binding. An agreement to a longer period must be approved by petition to the Scholastic Standards Committee.

An Incomplete mark becomes part of the permanent transcript record after the deadline expires. Deadline extensions may be petitioned to the Scholastic Standards Committee. To remove an "I", an instructor must file a supplementary grade report. In no case is an "incomplete grade" given to enable a student to do additional work to raise a deficient grade.

An "X" Grade

If a student, to the best of the instructor's knowledge, has never attended class, the name on the Grading Register may be assigned an "X" grade. An auditor may also be assigned an "X" for insufficient attendance only.

A student who has participated in a course but who has failed to complete essential work or attend examinations, and who has not communicated with the instructor, will be assigned an F, D, or whatever grade the work has earned.

Withdrawals

The student must initiate withdrawal from a course. It is the student's responsibility to withdraw properly by the deadline dates published in the *Schedule of Classes*.

A student may withdraw with no record on the transcript up to the end of the fourth week of the term. As a courtesy, students are advised to notify the instructor of the intended or completed withdrawal.

A student may withdraw for any reason before the end of the fourth week, but withdrawal between then and the end of the eighth week requires instructor approval. A student withdrawing after the end of the fourth week shall have a "W" recorded on the transcript.

A student wishing to withdraw after the eighth week must petition the Deadline Appeals Committee or Graduate Council. A "W" is recorded if the petition is allowed. Reasons for withdrawal beyond the eighth week must be beyond the student's control, and medical reasons must be documented. Instructor's comments are required on the petition.

Weeks elapsed are measured from the first day of classes. Date of withdrawal is the date the Registrar's Office receives the signed form. Eight-week Summer Session classes will use three- and six-week deadlines instead of four- and eight-weeks.

Posting of Grades
Instructors cannot, under any circumstances, post grades of students. Scores will be given when exams are returned to student. The course grade is mailed to the student approximately one-two weeks after final exams. The instructor should not be asked to provide student grades.

Absences
Instructors will have individual policies on absences from class. Some faculty may formally take role and include attendance in course grades, while other instructors may not. Absences from exams are inexcusable under any circumstances including illness, death in the family, and childbirth. Arrangements must be made with the instructor before the exam, but the instructor is not obligated to give a make-up exam.

DEPARTMENTAL RESOURCES

The Mechanical Engineering Department uses a collection of classrooms, offices, laboratories, and other facilities to support teaching and research. Most of these facilities are located in Science Building II; a few are at other sites around campus. Most of the facilities are available for student use in one form or another. However, procedures and policies must be followed to assure that all have equal access, and that privileges are not abused. The facilities and procedures for each of the main facilities are listed below.

Main Office
The Mechanical Engineering Department is located in Room 118, Science Building II. All operations of the department are managed to some extent by the staff of this office. It is the starting point for obtaining information.

Located in the main office are two staff members and the department chair. The departmental staff is available to provide routine information concerning course schedules and room assignments, admission requirements, and departmental operations. They can also furnish application forms for employment, scholarships, admissions, etc. They cannot provide advising information, information on grades or grading, or access to files. They are also not the timekeepers for the faculty; they can give information concerning the office hours for any particular faculty member, but not where they happen to be at any given moment nor when they are expected to return.

The department chair is available, on an appointment basis, to answer non-routine questions that may require interpretation. Advising matters may also end up with the department chair. Appointments can be scheduled in the main office, by email, or calling (503) 725-4290.

Within the main office are the faculty mailboxes. Messages for faculty members can be left with the staff who will place them in their appropriate faculty member's mailbox, or messages can be sent via email.

The main office contains several facilities, such as telephones, computers and software, typewriters, copy machines, etc. These devices are for the use of faculty and staff only. The office also has a variety of audio-visual equipment that may be used by students, with the consent of the instructor, for class purposes. Check these items out from the departmental staff.

Outside the office are bulletin boards. Only official notices are posted on these boards. Announcements for employment, seminars, graduate schools, field trips, and so forth are routinely posted there. The department also posts on these bulletin boards the official lists of students whose grad checks are ready. You should check these bulletin boards occasionally.

Machine Shop

The department maintains a machine shop in Room 149, Science Building II, which is staffed by an Instrument Technologist. The shop is used to build instruments and apparatuses for the teaching and research labs. It is also used by instructors to demonstrate manufacturing processes to their students. In general, however, it is not a student shop and students are not allowed to use the facility. A faculty project adviser and the department chair must approve any special arrangements. Students are never allowed to use the Machine Shop unsupervised.

Catalog Library

A library of catalogs describing a wide variety of equipment and components is maintained in Room 149, Science Building II. Students may use these catalogs to determine component sizes, performance specifications, and prices as needed for their design projects. Consult with the Instrument Technologist in Room 149 to learn how to use the library.

Laboratories

The department maintains several laboratories for research, instruction, and student projects. Each laboratory has been designed for a specific type of application and contains different equipment and facilities. Any student project that is to be assembled and conducted in one of these laboratories must be coordinated with, and supervised by, a faculty member.

Special equipment and instruments are available for laboratory projects; their use must be approved just the same as lab space must be. Acquisition of all equipment must be arranged through the Instrument Technologist in room 149, SB II. Materials and supplies for the experiment can also be obtained from the department, purchased, or scrounged. Speak with the Instrument Technologist about these acquisition procedures.

All laboratory exercises are intended to supplement the overall learning experience. At the same time, certain procedures are required for safe and effective operation of the labs. Specific lab procedures are discussed in the Appendix.

LABORATORY PROCEDURES

Safety

Safety in the laboratory cannot be stressed enough. Eye protection includes safety glasses, goggles, or full-face masks. Eye protection must be worn **at all times** in the laboratories. You may not be doing something to cause an eye hazard but your neighbor might. Appropriate clothing must be worn. What's appropriate depends on the lab. Shorts and open-toed sandals may be fine for the computer lab but are unsatisfactory in a shop working with hot metals. Loose clothing should never be worn around rotating machinery. Shirt tails tucked in and sleeves down and buttoned will prevent accidents. Jewelry may not be worn around machinery. Rings, watches, bracelets and necklaces all present a hazard to the wearer. The expression 'snatch you bald headed' may well have originated in a safety poster. Long hair must be tied back or contained in a cap or net. The MOST important thing you can bring with you to the labs is your common sense. Think before you do. If unsure, ask! *Any injury, no matter how small, must be reported!!*

Equipment

The university will furnish most of the equipment you will need. This ranges from hand held digital voltmeters up through computer controlled lathes. This equipment may be used for school authorized projects only. Please do not ask to work on your car, etc. **NO repairs or alterations are to be made to any university owned equipment. If the equipment will not do what you need to do, then ask. If alterations are needed, we will make them.** If an item is broken or malfunctions in any way, report it to your Teaching Assistant or Faculty Adviser. We cannot fix it if we don't know that it is broken. Do Not operate any equipment that you have not been trained to operate safely. Do not operate any equipment that is in an unsafe condition. Check to be sure all ground wires and safety shields are in place and functioning.

Each lab should contain all the tools that are needed. If your lab does not have a tool you need, you may be doing something you shouldn't. See your TA or adviser for any tools or equipment you need that are not in the lab. If you know of any broken or missing tools, tell the TA so it can be replaced.

Tools and/or equipment should never leave the lab. Sometimes it is necessary to temporarily move things from one lab to another. When this happens, insure the TA knows about it so we don't think the equipment is missing. When necessary, equipment may be used off campus. This is because the job cannot be brought to the equipment, NOT because you don't want to come in to the campus. If you think the equipment must be used off campus, see your adviser.

Some equipment you need may not be in the lab where you work. This does not mean we don't have it! Ask your adviser, the TA for that lab, or the department lab technologist. If we have what you need, the technologist will have the necessary forms for you to check out the equipment. If we do not have what you need, then see the section on **Purchases**.

Lab Access
Generally speaking, laboratories will be used during posted hours only. If you are scheduled for Thursday morning from 9:00 to 11:00, don't come in at 3:00 and try to work. Students working on special projects may be assigned a lab to use for the project. The times you work on the special project are not to conflict with regularly scheduled laboratory classes. You are cautioned not to work alone. If you are alone and get injured, you may be without assistance. Students working on special projects may be given a key to the assigned lab. See your faculty adviser if you think you need a key and/or an after hours pass. Students without a key who need to get into a lab to pick up some forgotten item, should contact the TA or the professor for the class.

Mechanical Computer-Aided Engineering Laboratory (MCAE)
A computer laboratory has been established to support instruction and research in MCAE. Housed in Room 443, Science Building II, this laboratory contains 20 fully configured Pentium-based workstations with enhanced graphics. A laser printer is connected as well. Access to this room is limited to those students who are taking manufacturing engineering courses or working on specific manufacturing projects. Permission to access this facility is granted by Professor Hormoz Zareh.

SEAS Computer Systems - Electronic Mail & Communications
As an admitted student, you are eligible for an account on our Novell file server, which will give you an electronic mail (email) address and Internet access. You can use email to communicate with faculty and fellow students. Important notices regarding advising, class and lab schedule changes, and departmental policy may be sent by email or posted on respective web sites.

You are encouraged to activate your account as soon as possible. To activate your SEAS account, bring picture ID (student ID, driver's license, or passport) to FAB 60-02, PCAT-160, SB2-139, or SB2-169. Tell the duty person that you want to validate your account. You will be asked for your ID and your ten-digit student ID number. To complete validation, the duty person will hand you a printout with your username, initial password, e-mail address, basic SEAS/PSU system guidelines, some brief information on SEAS computer labs, and how to contact the support staff. ***Important:*** Keep the validation sheet. It is the only record of your password. Your account will be active in 1-2 business days after validation. You will not be able to log into our systems until the account is active.

You can log in with your SEAS account at the following locations:		Login type
FAB 50-17	SEAS Intel Microcomputer Lab	NT
FAB 60-10	ECE Circuits Lab	ECE UNIX
FAB 60-19	ECE Sun Lab	ECE UNIX
PCAT 160	CS Computer Lab	CS UNIX and NT
SB2 139	SEAS Microcomputer Lab	NT
SB2 169	SEAS Cadlab	NT

Where to get help: See the help-desk person at the following locations:

FAB 60-02	SB2 139
FAB 55-17	SB2 169

PCAT 160

How to pay for printing: Black-and-white laser printing costs $0.05/page; color printing costs $0.20/page. If you are a new user, you get a one-time $5.00 credit. Once that is used up, purchase more print credits from the Department of Mechanical Engineering office located in room 118 SB2.

The following documents are available on paper from Clean Copy at 1704 SW Broadway and on-line at www.cat.pdx.edu.
NT Survival Guide
UNIX Survival Guide
"The Whole Schmear" (NT & UNIX)

You are encouraged to access the Mechanical Engineering Department's WWW Page at http://www.me.pdx.edu for messages from the Mechanical Engineering Department chair, faculty, and staff.

STUDENT ORGANIZATIONS

American Society of Mechanical Engineers (ASME)

The purpose of the student section of the American Society of Mechanical Engineers, (ASME) is to promote the interaction of engineering students with other students and with the professional community, and to keep students informed of recent developments in the field of mechanical engineering. This is done through regular meetings and field trips to local engineering firms and industries.

The student ASME group also participates in the student-meet-industry day sponsored by the Oregon ASME section. In November of each year, several local firms invite selected ASME student group members to tour their facilities and attend the monthly ASME dinner meeting as their guest. This is an excellent opportunity to meet possible employers in a social atmosphere and to learn more about the engineering options available.

In February, the ASME student section sponsors contests as part of the School of Engineering's annual Design Competitions Day. Students from area high schools are invited to compete in the contests in order to promote an interest in engineering.

The yearly project of the ASME student section is to design and build a human-powered vehicle and race it in a regional competition with other engineering schools. A team of students works on this project for the entire year. The Project can be used for design credit as well as being a great way to meet and compete with students from other colleges and universities.

ASME can be contacted by leaving a message for the club at the Mechanical Engineering Department.

Tau Beta Pi

Tau Beta Pi is the national engineering honor society and consists of more than 400,000 members, students and alumni across the United States, more than 200 chapters, and over 900 members in the Portland area. Tau Beta Pi recognizes engineering students of exemplary character who attain a distinguished scholastic record. Scholastically eligibility is based on the top GPA of all engineering students: 1/8 for juniors, 1/5 for seniors, 1/5 for graduate students. The PSU Chapter of Tau Beta Pi, designated as *Oregon Beta*, also considers a minimum number of credits at PSU and the potential of a student to be an active member in its nomination process.

Oregon Beta projects include an Initiation Banquet with an invited speaker, Engineering Week contests, participation in national and regional TBP activities, professional seminars such as leadership, problem solving, intellectual property, and science and engineering outreach programs for younger students.

Current Advisors:	Dr. Herman Migliore (herm@eas.pdx.edu)	ME Department
	Dr. Douglas Hall (dough@ee.pdx.edu)	EE Department
	Dr. Michael A. Driscoll (driscoll@ee.pdx.edu)	Associate Dean
	Dr. Scott Wells (scott@eas.pdx.edu)	CE Department

The Society of Automotive Engineers (SAE)

The Society of Automotive Engineers is an international society dedicated to the advancement of mobility (land, sea, air, and space). SAE offers student members many benefits, such as discounted membership, a monthly magazine, discounts on SAE journals and papers, and discounted registration for SAE conferences. SAE also sponsors many student design competitions, including the Mini Baja, Remote Controlled Cargo Plane, Formula SAE, and Supermileage.

Portland State has an on-campus student chapter of SAE. The main purpose of this chapter is to promote interaction between engineering students and the professional sector. This keeps students informed on the latest technical developments and career opportunities. To achieve this, the student chapter holds regular meetings (often with guest speakers) and organizes field trips to local industry.

PSU SAE members have access to the technical library that is shared with ASME. Members can often receive help with engineering problems by dropping in during the office hours. SAE also provides students an opportunity to gain valuable organizational and leadership experience by becoming an officer of the student chapter.

The Society of Women Engineers (SWE)

The Society of Women Engineers is a non-profit, educational service organization of graduate engineers, women and men, dedicated to the advancement of women in the engineering profession. It is a national organization numbering in the thousands with international membership.

At Portland State University, SWE sponsors a design contest for the annual engineering design competition. The Society has information on several annual scholarships, most of which are

targeted for women in engineering. Please call the Mechanical Engineering Department for more information.

ANNUAL EVENTS

There are several annual events that are scheduled to inform, entertain, or otherwise involve students. These events are open to all students, although some may be focused more specifically at either graduate or undergraduate students.

In addition to these regular events, several other special programs are sponsored for student participation. For example, several seminars featuring guest speakers are scheduled each year. Announcements of these events are routinely posted on bulletin boards throughout the department.

Student-Meet-Industry Day

Fall term. ASME sponsors a daylong exchange of Mechanical Engineering students and engineers from industry. Students from PSU, OSU, and UP participate. While open for juniors, seniors, or graduate students, seniors receive top priority and typically fill all available positions. During this exchange, the student spends the day with the engineering staff of the sponsoring industry, learning more about on-the-job requirements and the company itself. It is definitely a two-way exchange, bordering on a daylong interview. The day culminates in a group banquet.

Student Design Competition

Winter term. This event is sponsored by the School of Engineering and Applied Science and involves students, staff, and faculty from Civil, Electrical, and Mechanical Engineering and Computer Science. Its objective is to introduce PSU Engineering and Computer Science to the community and to instill interest in engineering and computer science among high school students. The various contests are run by the student sections of the professional societies. Contests such as mousetrap powered car races, windmill races, egg drop, and truss strength are held.

ASME Student Paper Competition

Spring term. ASME sponsors a student paper competition where students each give an oral presentation describing one of their engineering projects. One or two students, usually seniors, are selected to represent PSU in this competition. The first stage is held for representatives from institutions in Oregon (UP, PSU, OSU, OIT); students are ranked, but there is no elimination. The second stage brings together competitors from all schools in ASME Region VIII. The winner from that competition advances to the national competition, the Old Guard Competition held at the ASME Winter Annual Meeting.

ASME Graduate Student Conference

Spring term. ASME sponsors a research meeting for graduate students from institutions in Region VIII. PSU students present their current ongoing or completed work to an audience of students and faculty from other institutions. The site rotates through the institutions. This is not a competition, but an opportunity for graduate students to rehearse their research seminars before going to professional meetings, and a chance to meet and talk with graduate students from other schools.

SAE Mini-Baja

Spring term. The Mini-Baja West competition is a project that offers an opportunity for undergraduate engineering students at PSU to compete with other engineering students from North America. The purpose of this competition is to enable the students to work as a Design Team on a meaningful project. The concept is a simulation of a workplace situation: a manufacturing firm's engineering Design Team has been given a project to produce a prototype vehicle for evaluation as a production item. The engineering challenge to the Design Team is to design and fabricate a prototype that best meets specific design and monetary criteria. The vehicle's performance is then judged in a series of events designed to evaluate the vehicle's ability to accelerate, stop, turn, climb and endure.

ASME Human Powered Vehicle Competition

Spring term. The Human Powered Vehicle (HPV) Competition, an event held annually in California in the spring. ASME sponsors the competition. Teams from the west coast and other parts of the United States are invited to compete against each other. Each team must design and build its own vehicle for the competition. The competition consists of three events that include Static Judging, the Sprint Race and the Road Race. During the Static Judging event, each vehicle is evaluated for design innovation, analysis and testing performed on the design, safety features, and aesthetics of the vehicle. The Sprint Race is a high-speed run through a short time trap to determine the maximum sustainable speed. The Road Race is an endurance event during which several different riders must alternately ride the vehicle.

FUNDAMENTALS OF ENGINEERING (FE) EXAMINATION

(Spring and Fall terms.) Every state, the District of Columbia, and the U.S. territories have laws regulating the practice of engineering. These laws insure that those receiving licenses to practice have met certain requirements of competence, ability, experience, and character. While not all engineers find registration mandatory for their chosen career paths, the **PE** initials after their names can provide many advantages. Engineering students may take the Fundamentals of Engineering (**FE**) examination, the first step to obtaining a **PE**, in their senior year. Generally, employers in all disciplines indicate that they prefer hiring new engineering graduates who plan to obtain a **PE**.

Regardless of the career path you choose to take, there are a number of practical considerations concerning registration of which you should be aware:

- Registration is a legal requirement for those who are in responsible charge of work;
- Many federal, state and municipal agencies require that certain governmental engineering positions, particularly those considered higher level and responsible positions, only be filled by **PE**'s;
- Many states require that those individuals teaching engineering must be registered;
- Most construction engineers must be registered to practice engineering;
- In industry, the **PE** has recently taken on increased meaning with heightened public attention concerning product safety, environmental issues, and design defects;
- Employers have found it advantageous to identify to the courts and the public that they have met at least a minimum level of competence.

Mechanical Engineering Faculty 1999-2000

Pah Chen, a Fellow of ASME (American Society of Mechanical Engineers), received his BS degree from National Cheng Kung University, Taiwan, and his MS and Ph.D. degrees from Virginia Polytechnic Institute and State University. His academic training included civil as well as mechanical engineering fields. Professor Chen's major teaching responsibilities include fluid mechanics, thermodynamics, industrial fluid power, reliability and other mechanical design related courses. His publications are mainly in the areas of fluid power, thermal power, reliability engineering and robust design. He is the co-author of a book entitled "Design of Pneumatic and Fluidic Control Systems." He actively serves technical societies such as the Oregon Fluid Power Association and was a chairman of the ASME Oregon Section. Dr. Chen is a registered Professional Engineer in Oregon. He has assisted local firms and industries as an engineering consultant and as an expert witness in legal cases. He enjoys the outdoors and is a seasoned worldwide traveler. Additional information on Dr. Chen's research and teaching can be found at http://www.me.pdx.edu/~chenp.

Faryar Etesami received his BS degree in mechanical engineering from Arya-Mehr University, and his MS and Ph.D. degrees in mechanical engineering from the University of Wisconsin-Madison. His teaching specialty has been in Mechanical Design, Computer-Aided Design, Mechanical Tolerancing and Statistical Process Improvement. His research interests include computational geometry, dimensional inspection using vision systems, and mechanical tolerancing theories.

Dr. Etesami is a PE and a member of ASME, SME, ASQC and Sigma Xi. Additional information on Dr. Etesami's research and teaching can be found at http://www.me.pdx.edu/~far.

Herm Migliore received his Bachelor of Mechanical Engineering in 1968 and his Masters of Engineering in 1969 at the University of Detroit. From 1966 to 1968, he was a co-op student at the Ford Motor Company. From 1969 to 1972, he worked for a Navy lab conducting ocean-related analysis, design and testing. He received his Doctor of Engineering from the University of Detroit in 1975. His doctoral research was sponsored by the Chrysler Corporation and involved computational approaches for determining residual stress in automotive sheet metal structures.

Dr. Migliore has been at Portland State University since 1977. At the undergraduate level, he coordinates the senior design sequence, teaches classes in design methods, and supervises student projects. Dr. Migliore is a member of Tau Beta Pi, Sigma Xi, and is a Professional Engineer. Dr. Migliore also coordinates interdisciplinary programs for the School as Director of Systems Engineering. Additional information on Dr. Migliore's research and teaching can be found at http://www.me.pdx.edu/~hermm.

Gerald Recktenwald received a BSME from Cornell University, and MSME and Ph.D. Degrees from the University of Minnesota. He joined the PSU Mechanical Engineering Department in 1989. He teaches classes in numerical methods, fluid mechanics, and heat transfer. His current research interests involve numerical simulation of and experimental measurement of heat transfer in electronic equipment, and the development of personal computer programs for teaching fluid

dynamics. He is a member of the American Society of Mechanical Engineers, the Society for Industrial and Applied Mathematics, and Tau Beta Pi. Outside of PSU he enjoys spending time with his family, hiking, telemark skiing, kayaking, gardening and cooking. Additional information on Dr. Recktenwald's research and teaching can be found at http://www.me.pdx.edu/~gerry.

William Savery, Professor of Mechanical Engineering, joined the Portland State University faculty in 1980. He was a member of the Mechanical Engineering faculty at Drexel University for the preceding ten years. He received his BS from University of Illinois, MS from the University of Washington and Ph.D. from the University of Wisconsin. Prior to undertaking his Ph.D. program, he spent six years working in research and development on auxiliary space power and nuclear power plant safety at a corporate development center. His academic career included visiting terms at European universities and recently at Battelle Pacific Northwest Laboratory, as well as consulting for engineer-architect firms and utilities. He manages technology transfer activities for Portland State University.

Dr. Savery's research activity is in the areas of combustion, multiphase flow and controls. The research applications include diesel combustion, control of energy systems, and hazardous waste processing. Currently he works on HVAC controls. He teaches courses in combustion, digital controls, HVAC controls, engineering analysis, and thermodynamics. He is a registered Professional Engineer in Oregon and Pennsylvania and is a member of ASHRAE, ASME, AUTM, SAE and Tau Beta Pi. His avocational interests include hiking and skiing. He serves on the board of Friends of Chamber Music. Additional information on Dr. Savery's research and teaching can be found at http://www.me.pdx.edu/~savery.

Graig Spolek is both Professor and Chair of the Mechanical Engineering Department. His educational background includes BS and MS degrees from the University of Washington and a Ph.D. degree from Washington State University, all in mechanical engineering. Prior to coming to Portland State University, Dr. Spolek conducted biomechanics research. Since coming to PSU in 1980, he has taught courses in thermodynamics, heat transfer, instrumentation, senior design, and thermal systems design. His research spans both computer simulation and experimentation in the areas of fundamental heat and mass transfer, HVAC systems design and control, industrial drying, and industrial energy utilization.

Dr. Spolek is a member of ASME, and is a nationally active member of ASHRAE. He is also a registered professional engineer, and owns a consulting company that has worked with several industrial and governmental agencies.

Dr. Spolek's personal interests include fly-fishing, bird hunting and playing squash. Additional information on Dr. Spolek's research and teaching can be found at http://www.me.pdx.edu/~graig.

George Tsongas is a professor of Mechanical Engineering. He is a registered professional engineer and has four engineering degrees from Stanford University, including a Ph.D. Previously, he was an assistant professor at the Air force Institute of Technology. He teaches courses in the thermal-fluid sciences area and coordinates the building science program. In 1990 he was awarded a Burlington Northern Faculty Achievement Award for outstanding university

teaching among PSU professors. In 1995, he also was awarded the American Lung Association of Oregon's Clean Air Award in recognition of his efforts and exceptional achievements promoting healthy indoor air.

He is pursuing building science related research, design, and analysis both as a university professor and as a private consultant. His areas of specialization include: moisture problems in buildings (including field assessments and computer modeling), residential indoor air quality, carbon monoxide from home combustion appliances, energy efficient building design, space heating system effectiveness, and building science technology transfer. Dr. Tsongas is on a number of national and regional advisory committees and task forces in these areas. In addition, he is actively involved in presenting workshops and seminars on moisture, indoor air quality, carbon monoxide in homes, and energy-related topics throughout the country. He regularly acts as an expert witness in legal cases involving moisture, indoor air quality, and carbon monoxide from combustion appliances. He was a member of the Oregon Energy Conservation Board and the Solar/Conservation Task Force of the Alternative Energy Development Commission. In addition, he was on the Board of Directors of the Solar Energy Association of Oregon. Presently, he is a member of the Portland Sustainability (energy and environment) Commission.

Dr. Tsongas enjoys spending time with his family and is an avid downhill skier, enjoys jazz-rock music, and loves to cook and eat ethnic food. He also loves driving with the top down in his convertible. Additional information on Dr. Tsongas' research and teaching can be found at http://www.me.pdx.edu/.

David Turcic attended Penn State University where he received his BS degree in 1977, MS degree in 1979 and his Ph.D. in 1982, all in Mechanical Engineering. After graduating he spent one year at Penn State as a Visiting Assistant Professor, two years at Drexel University in Philadelphia as an Assistant Professor and five years at the University of Wisconsin-Madison as an Assistant and then Associate Professor. His areas of research include Analysis and Design of High Speed Mechanical Systems, System Design, Motion Synthesis for Manufacturing and Material Handling Processes, Design for Manufacturing, Robotics, Computer Aided Design and Computer Aided Manufacturing, Geometric Modeling, Automatic Controls, and Experimental Methods.

Dr. Turcic is a member of ASME, SAE, Pi Tau Sigma and Tau Beta Pi.

Apart from his academic interests he enjoys windsurfing in the Columbia River Gorge, snowboarding and long distance running. Additional information on Dr. Turcic's research and teaching can be found at http://www.me.pdx.edu/.

Chien Wern obtained his BS degree in 1990, his MS degree in 1991, and Ph.D degree in 1995, all in Mechanical Engineering from the University of Washington. His current research interests include optimization of traditional and non-traditional machining processes, surface characterization and strength of machined product, and fatigue testing of gears.

His current teaching interests are in manufacturing processes, mechanics of materials, experimental mechanics, and advanced machining processes. He is also currently PSU's ASME student section faculty advisor.

Dr. Wern is a member of ASME, SEM, SME, NAMRI/SME, Sigma Xi, Tau Beta Pi, and Pi Tau Sigma. Additional information on Dr. Wern's research and teaching can be found at http://www.me.pdx.edu/~wernc.

Hormoz Zareh received his BS in 1980, his MS degree in 1982, and his Ph.D. in 1986 in Mechanical Engineering from the University of Texas at Arlington. He had lectured undergraduate classes in Manufacturing Processes, Kinematics and Dynamics of Machinery and Engineering Design at UTA since 1981. In April of 1986, he received the Carl W. Files Outstanding Teaching Award from the Mechanical Engineering Department of UTA. Since joining PSU in September 1987, he has taught undergraduate courses in mechanics, manufacturing processes and design, as well as graduate courses in finite element analysis, design optimization, and expert systems applications in design and manufacturing.

His research interests are in the areas of design optimization, finite element analysis, and expert systems.

Dr. Zareh is a member of Tau Beta Pi and Pi Tau Sigma. He is assistant editor of the Journal of Computer and Software Engineering and a member of the Academic Committee of the American Gear Manufacturers Association (AGMA). Additional information on Dr. Zareh's research and teaching can be found at http://www.me.pdx.edu/~hormoz.

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