UNIVERSITY OF UTAH

DEPARTMENT OF MECHANICAL ENGINEERING

UNDERGRADUATE ADVISING GUIDE

www.mech.utah.edu

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I. MECHANICAL ENGINEERING PROGRAM OVERVIEW

A. WELCOME TO THE DEPARTMENT OF MECHANICAL ENGINEERING UNDERGRADUATE PROGRAM

The **Director of Undergraduate Studies** and the **Undergraduate Academic Advisors** are here to assist you in all aspects of your undergraduate program. We have offices in **Room 2220 MEB** (Merrill Engineering Building).

This handbook outlines the academic program leading to the Bachelor of Science degree in Mechanical Engineering. It is intended to supplement the information in the University of Utah General Catalog (www.ugs.utah.edu/catalog), which remains the official document of the required program for the BSME. An electronic version of the handbook is available at www.mech.utah.edu.

B. WHAT IS MECHANICAL ENGINEERING?

Mechanical Engineers play a significant role in the design and manufacturing of all products and systems essential to everyday modern life—from home appliances, bikes, recreational equipment and automobiles, to satellites, wheelchairs, airplanes, robots, industrial equipment and environmental systems. They design and build the mechanical, thermal and fluid-flow related aspects of all such systems, including the computer controls of complex systems. Mechanical engineers play a role in the design and manufacturing of most of the things that people use on a regular basis—look around you and you will see their contributions everywhere.

C. MISSION STATEMENT

The mission of the Department of Mechanical Engineering is to cultivate an environment through teaching, research and service that fosters the technical, critical thinking, and communication skills necessary for students and faculty to contribute to the engineering profession and to the well-being of society.

D. EDUCATIONAL OBJECTIVES

The Department of Mechanical Engineering at the University of Utah will produce Bachelor of Science graduates who will:

1. Establish successful engineering careers and, if desired, gain admission to graduate and professional programs.
2. Apply acquired knowledge and skills appropriately to solve a broad range of engineering problems.
3. Work effectively and professionally, both as individuals and in teams.
4. Consider the economic, social, and ethical consequences of their work.
5. Communicate ideas and technical information effectively.
6. Continue to develop professionally and remain current in their field.

E. PROGRAM OUTCOMES

Prior to graduation, each student in the University of Utah Mechanical Engineering Bachelor of Science Program will demonstrate:

1. A background and depth in mathematical, scientific and engineering principles sufficient to apply this knowledge to mechanical engineering problems.
2. The ability to design and conduct experiments, and subsequently analyze, the resulting data, for design or other engineering purposes.
3. The ability to design a thermal and/or mechanical system, component, or process for achievement of a desired goal.
4. The use of multidisciplinary teamwork in pursuit of a goal.
5. An ability to identify, formulate, and solve mechanical engineering problems
6. An understanding of the professional and ethical responsibilities of an engineer.
7. The ability to effectively communicate technical information in written reports and memos.
8. The ability to effectively communicate technical information in oral presentations.
9. The broad education to understand the impact of mechanical engineering solutions in a global and societal context.
10. An understanding of the need for, and the ability to remain current in, engineering practices through lifelong learning.
11. Knowledge of contemporary issues impacting engineering.
12. Competency in the application of techniques and skills necessary for mechanical engineering practices.
13. Competency in the application of modern computer-based design tools for solving engineering problems.
14. Participation in a capstone design project and optional participation in faculty-directed research, cooperative internships, industrial design projects, and independent study projects.

II. ADMISSION AND ENROLLMENT

Admission standards to ensure student quality and control enrollments have been developed to provide the best possible education to the best qualified students. The sole purpose of the enrollment limitation program described below is to achieve that end result.

A. ADMISSION POLICY

It is the policy of the Department of Mechanical Engineering that every student who aspires to become an engineer should have an opportunity to attempt to achieve that goal. Consequently, anyone admitted to the University of Utah may designate Mechanical Engineering as a major and begin a program under the **Pre-Mechanical Engineering** classification.

Students must apply and be approved for **Intermediate Status** in order to take sophomore level courses (2000-2999) in the College of Engineering.

Students must apply and be approved for **Upper Division Status** to be eligible to take junior and senior level courses (3000 and above) in Mechanical Engineering.

Students must be accepted to the University of Utah before applying for either Intermediate or Upper Division status. Students transferring from other schools will be considered for status on the same basis as students who have completed all of their coursework at the University of Utah.

Students must maintain a cumulative University of Utah GPA of 2.3 or higher to remain in the BMSE program.

B. INTERMEDIATE STATUS

Students must apply and be approved for Intermediate Status in order to take sophomore level engineering courses (2000-2999).

Admission to Intermediate Status is based on performance in the freshman-level coursework listed below. An application form for Intermediate Status can be downloaded at http://mech.utah.edu/undergrad/academicprogram/status.html. The admission requirements for Intermediate Status are:

1. The student must have completed all of the following courses:

MATH 1210 and 1220	(Calculus I & II)
CHEM 1210 and 1215	(General Chemistry and Lab)
PHYS 2210	(Physics for Engineers I)
ME EN 1000	(First Year Design)
ME EN 1300	(Statics/Strengths)
WRTG 2010	(Intermediate Writing)

2. The student may also have completed the following courses:

PHYS 2210	(Physics for Engineers I)
CS 1000	(Engineering Computing)

3. The **calculated Grade Point Average** for the courses completed from the above lists **must be 2.5* or higher, with no individual grade below C-.**

All courses must be completed with letter grades.

Courses may be repeated only once.** The second grade will replace the previous grade.

Withdrawal from a course with a grade of "W" is considered as having completed the class once with an unsatisfactory grade.

* Contact the Undergraduate Student Services Office for the current entry GPA requirement.

** This rule will only be waived in exceptional circumstances. You must meet with the Undergraduate Advisor BEFORE enrolling in any class for the third time.

C. UPPER DIVISION STATUS

Students must apply and be approved for Upper Division Status to be eligible to take junior and senior level courses (3000 and above) in Mechanical Engineering.

Admission to Upper Division Status is based on performance in the courses listed below. An application form for Upper Division Status can be downloaded at http://mech.utah.edu/undergrad/academicprogram/status.html. The admission requirements for Upper Division Status are:

1. The student must have completed all of the following courses:

   MATH 1210, 1220, 2210 and 2250

   CHEM 1210 and 1215

   PHYS 2210 and 2220

   ME EN 1000 and 1300

   CS 1000

   WRTG 2010

2. The student must have completed at least three of the following courses:

   ME EN 2080, 2300, 2450, 2650, and 2655

   MSE 2160

   ECE 2210

3. The **calculated Grade Point Average** for the courses completed from the above lists **must be 2.5* or higher, with no individual grade below C-.**

   All courses must be completed with letter grades.

   Courses may be repeated only once.** The second grade will replace the previous grade.

   Withdrawal from a course with a grade of “W” is considered as having completed the class once with an unsatisfactory grade.

   * Contact the Undergraduate Student Services Office for the current entry GPA requirement.

   ** This rule will only be waived in exceptional circumstances. You must meet with the Undergraduate Advisor BEFORE enrolling in any class for the third time.

D. TRANSFER STUDENTS

Students who transfer from schools with ABET-accredited Mechanical Engineering programs, or schools with pre-engineering programs articulated through the Utah System of Higher Education (USHE) Board of Regents, and meet the minimum requirements with a GPA at or above the specified GPA, will be admitted to Intermediate or Upper Division status accordingly.

Students who transfer from schools without an ABET-accredited Mechanical Engineering program will be evaluated individually. If such students meet both the course and GPA requirements and show sufficient promise after evaluation, they will be admitted to Intermediate or Upper Division status, as appropriate.

E. DECLASSIFICATION POLICY

The Department of Mechanical Engineering attempts to bring all students to successful graduation. **Students who do not perform satisfactorily may be dropped from the program. "Satisfactory performance" must be evaluated individually,** but generally consists of meeting the standards of professional and ethical conduct that are expected of engineers (hence, engineering students), and maintaining satisfactory academic progress. While it is impossible to give an exhaustive list of actions that could cause us to revoke your Upper Division status, examples include:

- Abuse of faculty or teaching assistants
- Cheating or plagiarizing
- Other serious violations of the University of Utah's Student Code (http://www.regulations.utah.edu/academics/guides/students/)
- Receiving 2 or more "Ds" or "Es" after receiving Upper Division status
- Allowing cumulative University of Utah GPA to drop below 2.3

Complete information regarding University of Utah scholastic standards can be found at www.sa.utah.edu/advise/ss.shtml.

The policies related to repeated courses at the University of Utah are available at http://www.sa.utah.edu/regist/handbook/repeat.htm.

Probationary (or declassified) students must reapply for admission to status after completing 15 credit hours of appropriate technical classes with letter grades at the University of Utah. They will be accepted if they have met the specified GPA. Students who are not accepted at this point will not be permitted to continue taking Upper Division (3000 and above) Mechanical Engineering courses.

III. DEGREE REQUIREMENTS

Students must meet University and Departmental requirements for graduation.

A. UNIVERSITY REQUIREMENTS

Complete details on University graduation requirements can be found in the Undergraduate Bulletin (http://www.ugs.utah.edu/bulletin/). You may also refer to the General Education Requirements worksheet on page 17 of this handbook.

1. Students must complete a minimum of 122 semester credit hours. At least 40 of these hours must be upper-division hours (3000 or above).
2. At least 30 total hours and 20 of the final 30 credit hours must be completed in residence at the University of Utah.
3. Students must register for at least one course at the University of Utah during the year of graduation.
4. Students must meet all University of Utah General Education and Bachelor's Degree requirements as specified in the Undergraduate Bulletin (http://www.ugs.utah.edu/bulletin/).

B. DEPARTMENT REQUIREMENTS

1. **Complete the courses listed below**. All required courses must be completed with a letter grade. Courses may be repeated only once. No individual grade may be below C-.

   MATH 1210, 1220, 2210, 2250, and 3150

   CHEM 1210 and 1215

   PHYS 2210 and 2220

   CS 1000, MSE 2160, ECE 2210

   ME EN 1000 and 1300

   ME EN 2080, 2300, 2450, 2650, and 2655

   ME EN 3200, 3210, 3600, 3650, 3700, and 3910

   ME EN 4000, 4010, and 4050

2. **Complete twelve credit hours of technical electives.** Six hours of these must be Mechanical Engineering courses. All technical elective courses must be completed with a letter grade. Courses may be repeated only once. No individual grade may be below C-.

3. **Complete the ME EN 3900 Professionalism and Ethics seminar** (CR/NC)**.**

4. **Earn a C (2.0) average or higher** in the courses associated with the four basic areas listed below, and **receive no grade below a C-** in any of these courses.

Physics/Mechatronics:	PHYS 2210, 2220; ECE 2210 ; ME EN 3200, 3210
Mathematics:	MATH 1210, 1220, 2210, 2250, 3150; MEEN 2450
Solid Mechanics:	ME EN 1300, 2080, 3300
Thermal/Fluids:	ME EN 2300, 3600, 3650, 3700

5. **Pass the nationally-composed and administered Fundamentals of Engineering (FE) Exam.** The FE exam is offered in April and October each year, and should be taken at the earliest opportunity in the student's senior year. Registration is completed online at the Engineering and Land Surveying Examination Services (ELSES) website: http://www.els-examreg.org/.

6. **Complete department General Education "Depth and Breadth" requirements:**

   One **upper division** General Education course (satisfied by the University Upper Division International Requirement)

   One **sequence** of General Education courses (in which the second course builds on material developed in the first)

   One additional **upper division** course **or** one additional **sequence**; also satisfied automatically by an Associate of Arts or Associate of Science degree.

7. **Maintain a cumulative University of Utah GPA of 2.3 or higher.**

C. FUNDAMENTALS OF ENGINEERING EXAM

TAKE THE EXAM EARLY! We suggest that you take the FE exam in the fall of your final year of study. Students who wait to take the exam during their final (spring) semester of study risk disrupting their lives and career plans if they do not pass.

An application to take the FE exam must be submitted to ELSES by the February or August deadline for the spring or fall exam, respectively. The exact registration and testing dates vary each year. Check the ELSES website for current dates.

Upon completion of the FE EXAM, each student is required to present the original letter from ELSES indicating successful completion of the exam to the Undergraduate Student Services Office. If an electronic notification is received from ELSES, the student must forward the email notice and the attachment directly to Dona Holm (Academic Advisor) at dholm@eng.utah.edu.

D. TECHNICAL ELECTIVE REQUIREMENTS

Technical electives are the final phase of undergraduate education in the Mechanical Engineering Program. Therefore, the selection of technical electives is very important and the quality of a student's education depends to a large extent on how well this selection is accomplished. Upon being admitted to Upper Division status, each student will choose a faculty advisor to assist in the selection of the student's program of technical electives.

The **objectives of the elective courses are two-fold**: (a) **to synthesize** the student's understanding of required ME EN courses and (b) **to broaden** the student's knowledge in other related technical areas.

A total of 12 credit hours of acceptable technical elective courses are required. No individual grade below C- will be accepted for technical elective credit.

All technical electives must be upper division courses. Six of the twelve technical elective hours must be taken within the Department of Mechanical Engineering. Beyond this, considerable latitude is allowed in the selection of technical electives.

All 5000-level courses in the College of Engineering are acceptable. Acceptable courses in Mathematics and Physics are listed on the following pages.

Other upper division courses from the College of Science and the College of Mines and Earth Science must be petitioned before classes are taken.

Technical Writing is not an acceptable technical elective course.

Courses numbered higher than 5999 are not acceptable for undergraduate credit.

Some ME EN 5000-level courses are taught on an alternating year basis. Plan the scheduling of these electives carefully.

E. SUGGESTED TECHNICAL ELECTIVE PROGRAMS

Students may choose to specialize in particular areas of mechanical engineering. The areas and courses listed below are suggestions:

Aerospace Engineering:	ME EN 5710, 5830, 5400, 5410, 5510, 5200, 5300
Automatic Control and Robotics:	ME EN 5200, 5210, 5220, 5410 CS 5320 ECE 5570
Biomechanical Engineering:	ME EN 5100, 5200, 5210, 5300, 5410 BIOEN 5001, 5101, 5201, 5301
Ergonomics and Safety:	ME EN 5100, 5110, 5120, 5130, 5030, 5040, 5000
Energy Systems Engineering:	ME EN 5800, 5200 CVEEN 5700, 5710 PHYS 5110
Mechanical Design and Manufacturing:	ME EN 5010, 5020, 5030, 5040, 5110, 5300, 5400, 5410, 5520
Microscale Engineering:	ME EN 5620, 5050, 5055
Solid Mechanics:	ME EN 5300, 5400, 5410, 5500, 5510, 5520, 5530
Thermal Systems and Design:	ME EN 5600, 5800, 5810, 5820, 5710, 5830

Students interested in graduate work may prepare themselves with additional advanced mathematics courses. Courses from other non-engineering programs or departments that are appropriate for ME EN students are:

MATH:	4200, 4750, 5010, 5040, 5050, 5080, 5090, 5250, 5410, 5420, 5440, 5600*, 5610, 5620, 5710, 5720, 5740
PHYSICS:	3610, 3620, 3740, 3760, 5010, 5110, 5450, 5460

* If MATH 5600 is used to fulfill the Numerical Techniques (ME EN 2450) requirement, it may not be counted as a technical elective.

F. ADDITIONAL TECHNICAL ELECTIVE OPTIONS

Students may receive technical elective credit for:

ME EN 4999 Honors Thesis/Project

ME EN 5920 Design Project

ME EN 5930 Undergraduate Thesis

ME EN 5950 Independent Study

These courses allow the student to have experiences not normally available in regularly scheduled classes.

To initiate a project under one of these course numbers, the student must:

Contact a faculty member with related interests who is willing to act as an advisor

Complete all information on the required registration form (available in the Undergraduate Student Services Office)

Obtain approval from the Director of Undergraduate Studies

Register for the desired number of credit hours (set by the faculty advisor)

ME EN 5910 Cooperative Education (or Co-Op) is an additional technical elective option.

To enroll in ME EN 5910, the student must:

Contact the Mechanical Engineering Career Counselor at Career Services (Student Services Building Room 350) to obtain a syllabus and discuss Co-Op requirements

Complete all information on the required registration form (available in the Undergraduate Student Services Office)

Submit a job description and obtain approval from the Director of Undergraduate Studies

Register for the desired number of credit hours (approved by the Director of Undergraduate Studies)

A maximum of three (3) credit hours of ME EN 5910 Cooperative Education may be counted for technical elective credit.

A maximum of six (6) total credit hours from any combination of ME EN 5910, 5920, 5930, and 5950 may be counted for technical elective credit.

All necessary forms required for enrollment in ME EN 4999, 5910, 5920, 5930, and 5950 are available in the Undergraduate Student Services Office.

IV. BSME PROGRAM SCHEDULING

A suggested program of study for the BSME degree is outlined on page 13. This same program is presented as a flowchart at the end of this handbook. On the flowchart, the diagonal and horizontal lines indicate prerequisites, while vertical lines indicate co-requisites.

If you are unable to adhere to the suggested program of study, please create your own tentative schedule with assistance from a Mechanical Engineering Academic Advisor to ensure that you can sequence through the program successfully.

A. ACADEMIC ADVISING

All undergraduate Mechanical Engineering students are required to meet with an Academic Advisor a minimum of once per year, but students are strongly encouraged to schedule an advising appointment once per semester.

Assisting students is the primary function of the Undergraduate Student Services Office. The Department of Mechanical Engineering faculty and staff want your academic experience and education in the department to be enjoyable, productive and rewarding. **Please do not hesitate to come in to the Student Services Office if you need assistance or advice.** The Mechanical Engineering Department and the University of Utah seek to provide equal access to programs, services, and activities to all students, regardless of nationality, race, gender or disabilities.

B. PROGRAM PLANNING

Remember the six P's: **Proper Prior Planning Prevents Poor Performance!**

Most 3000 and 4000 level ME EN classes are taught only once a year.

Some 5000 level ME EN courses are offered only every other year.

Plan ahead to ensure that the required/elective courses you need/want will be offered during the term you wish to enroll in them. The Mechanical Engineering Academic Advisors are available to help you with scheduling (after you have made a first attempt).

C. RECOMMENDED CREDIT HOUR LOAD

If you are employed, you should consider taking a reduced credit hour load. You have about 60 productive hours a week to use for work, classes, and study. The remaining time is used for eating, sleeping, breathing, etc. **Plan on two hours of school preparation outside of class for each credit hour you are taking**. **A representative formula to calculate an appropriate credit hour load is:**

$$\#\ \textbf{credit hours} = \frac{60 - (\text{hours of work})}{3}$$

For example, if you work 20 hours a week on your job, you should keep your school load at about 13 credit hours. ([60-20]÷3 = 13.3)

D. SUGGESTED PROGRAM OF STUDY

For students working less than 20 Hrs. / week.

Year One	**Fall Semester**	
Course	NAME	Cr. Hr.
MATH 1210	Calculus I	**4**
CHEM 1210	Chemistry I	**4**
CHEM 1215	Chemistry I Lab	**1**
ME EN 1000	1st Yr. Design w/Lab	**3**
	Intellectual Exploration* or ELEAP SEMINAR	**3**
	Total Credit Hrs.	**15**

Year One	**Spring Semester**	
Course	NAME	Cr. Hr.
MATH 1220	Calculus II	**4**
PHYS 2210	Physics I	**4**
ME EN 1300	Statics/Strength	**4**
WRTG 2010	Writing	**3**
	OR 2ND ELEAP SEMINAR	
CS 1010	Intro to Unix	**0.5**
	Total Credit Hrs.	**15.5**

Year Two	**Fall Semester**	
Course	NAME	Cr. Hr.
MATH 2250	ODEs/Linear Algebra	**4**
PHYS 2220	Physics II	**4**
ME EN 2080	Dynamics	**4**
MSE 2160	Materials Science	**3**
CS 1000	Computing C++ & MATLAB	**3**
.		
	Total Credit Hrs.	**18**

Year Two	**Spring Semester**	
Course	NAME	Cr. Hr.
MATH 2210	Calculus III	**3**
ME EN 2300	Thermodynamics I	**2**
ME EN 2450	Numerical Techniques	**2**
ME EN 2650	Concurrent Eng. Lecture	**3**
ME EN 2655	Manufacturing Lab	**1**
ECE 2210	Electrical Eng. W/Lab	**3**
	American Institutions*	**3**
	Total Credit Hrs.	**17**

Year Three	**Fall Semester**	
Course	NAME	Cr. Hr.
ME EN 3200	Mechatronics I w/Lab	**4**
ME EN 3600	Thermodynamics II w/Lab	**3**
ME EN 3700	Fluids w/ Lab	**4**
ME EN 3300	Strength II w/Lab	**4**
ME EN 3900	Prof. & Ethics Seminar	**0.5**
	Total Credit Hrs.	**15.5**

Year Three	**Spring Semester**	
Course	NAME	Cr. Hr.
MATH 3150	PDEs	**2**
ME EN 3210	Mechatronics II w/Lab	**4**
ME EN 3650	Heat Transfer w/Lab	**4**
ME EN 3910	Design Methodology	**3**
	Technical Elective*	**3**
	Total Credit Hrs.	**16**

Year Four	**Fall Semester**	
Course	NAME	Cr. Hr.
ME EN 4000	4th Yr. Design	**3**
	1 Technical Elective*	**3**
	3 Intellectual Exploration*	**9**
	Total Credit Hrs.	**15**
	Overall Total Credit Hrs.	129

Year Four	**Spring Semester**	
Course	NAME	Cr. Hr.
ME EN 4010	4th Yr. Design II	**3**
ME EN 4050	Concurrent Eng. II	**2**
	2 Technical Electives*	**6**
	2 Intellectual Exploration*	**6**
	Total Credit Hrs.	**17**

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*** Intellectual Exploration, American Institutions and Technical Elective courses may be taken in any sequence.**

E. GRADUATION PROCEDURES

Students **must apply** for graduation to receive a degree. Application deadlines can be found at http://www.sa.utah.edu/regist/graduation/applying.htm. Students can **submit an Application for Graduation to the University Graduation Office** in the Student Services Building **up to one year prior to graduation**.

A departmental graduation check should be scheduled with a Mechanical Engineering Academic Advisor **two or more semesters before graduation is anticipated. The purpose of this meeting is** to ensure that all graduation requirements will be completed by the projected graduation date.

Students can monitor their own progress in the Program by accessing their Degree Audit Reporting System (DARS) report through the Campus Information System. The DARS report shows a student's progress towards completion of both University and Department graduation requirements. Students can also refer to the BSME Graduation Checklist on page 15, and the General Education Requirements worksheet on page 16 of this handbook.

If you are completing a **Mechatronics Certificate**, the approved certificate, signed by both Professor Meek and Professor Minor must be submitted to the Academic Advisor at the time of your graduation review.

If you are earning a minor, the Academic Advisor in the department offering the minor must also meet with you. Schedule your appointment to coincide with the Mechanical Engineering advisor meeting.

F. BSME GRADUATION CHECKLIST

STUDENT _____ uNID#:_____

SPECIFIC COURSE REQUIREMENTS:

Subject/ Catalog #	Cr. Hrs.	Semester	Grade
MATH 1210	(4)		
MATH 1220	(4)		
MATH 2250	(4)		
MATH 2210	(3)		
MATH 3150	(2)		
CS 1000	(3)		
CHEM 1210	(4)		
CHEM 1215	(1)		
PHYS 2210	(4)		
PHYS 2220	(4)		
ECE 2210	(3)		
MSE 2160	(3)		
ME EN 1000	(3)		
ME EN 1300	(4)		
ME EN 2080	(4)		
ME EN 2300	(2)		
ME EN 2450	(2)		
ME EN 2650	(3)		
ME EN 2655	(1)		
ME EN 3200	(4)		
ME EN 3210	(4)		
ME EN 3300	(4)		
ME EN 3600	(3)		
ME EN 3650	(4)		
ME EN 3700	(4)		
ME EN 3910	(3)		
ME EN 4000	(3)		
ME EN 4010	(3)		
ME EN 4050	(2)		
ME EN 3900 Seminar	(0.5)		

FE Exam:	**Date**	**Score**

TECHNICAL ELECTIVES:
(12 Cr. Hrs. required & 6 Cr. Hrs. must be ME EN courses)

Course	Cr. Hrs.	Semester	Grade
_____	( )		
_____	( )		
_____	( )		
_____	( )		

Total TE Credit Hrs: ___

2.0 (C) average GPA in each of the following groups; min. individual grade C-

Physics/Mechatronics:
PHYS 2210, 2220; ECE 2210;
ME EN 3200, 3210 ____

Math:
MATH 1210, 1220, 2210, 2250, 3150;
ME EN 2450 ____

Solid Mechanics:
ME EN 1300 2400, 3300 ____

Thermal-Fluids:
ME EN 2300, 3600, 3650, 3700 ____

2.3 cumulative U. of Utah GPA ____

Projected Graduation Date: _____

G. GENERAL EDUCATION REQUIREMENTS

For advice on University General Education/Bachelor's Degree requirements, contact University College, Student Services Building Room 450, 801-581-8146.

1. UNIVERSITY REQUIREMENTS

	Cr. Hr.	Semester	Grade
a) Writing 2010	(3)	_____	_____
b) American Institutions (CANNOT be taken CR/NC) [ ] Economics 1740, or [ ] History 1700, or [ ] Political Science 1100, or [ ] _____	( )	_____	_____
c) Intellectual Exploration Courses (1) Fine Arts (FF)			
_____	( )	_____	_____
_____	( )	_____	_____
(2) Humanities (HF)			
_____	( )	_____	_____
_____	( )	_____	_____
(3) Social & Behavioral Science (BF)			
_____	( )	_____	_____
_____	( )	_____	_____
d) Diversity Requirement			
_____	( )	_____	_____
e) International Requirement*			
_____	( )	_____	_____

2. DEPARTMENT REQUIREMENTS

a) One Upper Division (3000-level or higher) General Education Course**

b) One two-course General Education Sequence (second course builds on ideas developed in the first course).

c) One additional Upper Division General Education Course

or

One additional General Education Sequence

* Required of all students entering the University of Utah in Fall 2007 and later.

** Satisfied by the Upper Division International Requirement

V. POLICIES AND INFORMATION

A. AP AND CLEP EXAMS

The University of Utah awards credit for satisfactory scores on certain **Advanced Placement (AP) exams** as outlined in the Undergraduate Bulletin (http://www.ugs.utah.edu/bulletin/). AP credit may be used to waive General Education requirements. Students must submit a request for evaluation to the Admissions Office to have their AP credits recorded.

The College of Engineering policy regarding Advanced Placement (AP) credit is summarized in the table on page 17, which indicates the classes and the equivalent grades assigned to specific AP scores, as well as the recommended placement. The grades are used only for admission to Intermediate or Upper Division status and do not affect the student's University of Utah GPA. The equivalent classes shown may be used to satisfy graduation requirements. Although the University of Utah grants credit for AP scores of 3 and above for all but the AP English exam (4 or above required), using a score of 3 in the major admission process may jeopardize the student's progress towards degree completion. A score of 3 indicates "C" work to the College and it is strongly recommended that students retake all classes with AP scores of 3.

Also, **College-Level Examination Program (CLEP) credit** may be earned by passing University-administered exams. **There is no advantage to receiving CLEP credit in mathematics and physical sciences as it does not replace any BSME course requirements.** However, CLEP credit can replace General Education courses to the extent of CLEP credit grant**e**d. Additional information on CLEP credit can be found at http://www.sa.utah.edu/admiss/CLEP.HTM or http://www.sa.utah.edu/testing/programs/clep.html.

College of Engineering
AP Equivalent Grades for Major Admission

AP Test	U of U Class	COE Suggested Placement	Score	Grade*	Grade*	Grade*
Chemistry	CHEM 1210/1220[1]	By COE Department[2]	5	A	A	
			4	B+	B	
Computer Science A	CS 1000/1410	CS 2420[3]	5	A	A	
		CS 1410[3]	4	B		
Computer Science AB	CS 1000/1410/ 2420	By COE Department[4]	5	A	A	A
		By COE Department[4]	4	A-	B+	B-
		CS 2420[3]	3	B+	B-	
Physics C: Mech	PHYS 2210	PHYS 2220	5	A		
			4	B		
Physics C: E & M	PHYS 2220	By COE Department[5]	5	A		
			4	B		
Calculus AB	MATH 1210	MATH 1270[6] or 1250[7]	5	A		
			4	B-		
Calculus BC	MATH 1210/1220	MATH 2210	5	A	A	
		MATH 1280[6] or 1260[7] or 2210	4	B	B-	
		MATH 1220	3	B-		
English	WRTG 2010	Upper Division WRTG – placement by COE Dept.[8]	5	A		
			4	B		

***** Grades will only be used to determine major status, not to calculate a U of U GPA. The University of Utah grants hours of credit, not grades, for AP test scores of 3 or above. The Department of Mechanical Engineering **may not accept grades of 3** in some areas.

[1] AP tests do not give credit for CHEM 1215 and 1225 (Chemistry labs). Students should talk to the Chemistry Department directly regarding credit for the AP lab course.

[2] Mech. Eng. students are not required to take any additional chemistry courses (but do need to take the CHEM 1215 laboratory).

[3] Course not required for Mech. Eng. students.

[4] Mech. Eng. students are not required to take any additional computer science courses.

[5] Mech. Eng. students are not required to take any additional physics courses.

[6] Math 1270 and 1280 may be taken for Honors Credit.

[7] Math 1250 and 1260 are only recommended for Math majors.

[8] Mech. Eng. students fulfill the University CW (Upper Division Communication/Writing) requirement in the Senior Design sequence (ME EN 3910/4000/4010).

B. WORK CREDIT

Academic credit is generally not given for work experience. A student may have core courses waived (by petition) due to constructive knowledge from work experience, but the credit hours must be made up with extra upper division course work. **Academic credit for work-related activities is available through Cooperative Education (ME EN 5910) or through ME EN 5920 or 5950**, as described in Section III-F.

C. TRANSFER COURSES

Courses transferred from other ABET-accredited engineering programs will ordinarily substitute for specific courses in our curriculum, provided the same material is covered and the grade of C- or better was earned.

The Articulation Table included at the end of this handbook provides a class-by-class listing of courses available at other institutions of higher education in Utah and Idaho that will fulfill requirements for the BSME degree at the University of Utah.

D. PROGRAM IRREGULARITIES

Program irregularities may arise due to transfer credits, curriculum changes, petitions to meet special problems, etc. Therefore, if lower division credits are found to be less than sufficient during progress reviews, it is usually ruled that these shall be made up by extra hours of technical electives, rather than by subjecting the student to lower-level make-up courses.

E. PETITION FOR VARIANCE

If a student believes that a special background, scheduling difficulty, need for a waiver of departmental rules, or other unique situations merit a deviation from the prescribed curriculum, or departmental or college policies and rules, the student may obtain a **Petition for Variance** from the Undergraduate Student Services Office, whereon the request and rationale for variance are to be presented by the petitioner. Supporting documentation should be submitted with the petition. **It is the student's responsibility to convince the faculty committee appointed to consider the case of the validity of the petition. The student should understand that petitions may be denied.**

If the petition is denied, and the student believes the decision is arbitrary or capricious, the student may appeal the decision to the Department of Mechanical Engineering Chair. Further appeals may be made to the College of Engineering Academic Appeals Committee. Students entering into the appeal process should familiarize themselves with Section II of the University of Utah's Student Code (http://www.regulations.utah.edu/academics/guides/students/).

F. REGISTRATION, WITHDRAWAL, AND INCOMPLETE POLICIES

Students must review the Academic Calendar on the Registrar's website each semester at http://www.sa.utah.edu/regist/calendar/datesDeadlines/deadlines.htm.

Registration deadlines, including add and drop dates, can be found on the Academic Calendar for a given semester. Information on adding and dropping classes can be found in the Registration and Withdrawal Policy section of the Undergraduate Bulletin (http://www.ugs.utah.edu/bulletin/).

Admitted students should register and view their class schedule via the Campus Information System (accessed from http://www.utah.edu).

Permission numbers are required to add classes beginning the second week of the semester. Classes can be added with a permission number through the 14th calendar day of the term.

During the first ten calendar days of the term, students may drop any class without permission or penalty. After this time, a grade of "W" is given when a student withdraws from (drops) a class.

The Department of Mechanical Engineering adheres to all University of Utah policies related to Incompletes (see the Registration and Withdrawal Policy section of the Undergraduate Bulletin).

G. LAB AND COMPUTER FEES

Laboratory fees in addition to normal tuition are required for certain courses. The amount of these fees is determined by periodic review of previous lab costs. Fees are **not refundable** for any reason. Details of the particular amounts are noted in the Class Schedule and related information is available from the instructor.

VI. MECHANICAL ENGINEERING UNDERGRADUATE COURSES

A. REQUIRED COURSES	B. ELECTIVE COURSES
ME EN 1000 DESIGN & VISUALIZATION ME EN 1300 STATICS/STRENGTH ME EN 2080 DYNAMICS ME EN 2300 THERMODYNAMICS I ME EN 2450 NUMERICAL TECHNIQUES ME EN 2650 CONCURRENT ENG. I ME EN 2655 CONCURRENT ENG LAB ME EN 3200 MECHATRONICS I ME EN 3210 MECHATRONICS II ME EN 3300 STRENGTH OF MATERIALS ME EN 3600 THERMODYNAMICS II ME EN 3650 HEAT TRANSFER ME EN 3700 FLUID MECHANICS ME EN 3900 PROFESSIONALISM SEMINAR ME EN 3910 DESIGN METHODOLOGY ME EN 4000 ENGINEERING DESIGN I ME EN 4010 ENGINEERING DESIGN II ME EN 4050 CONCURRENT ENG. II	ME EN 4999 HONORS THESIS/PROJECT ME EN 5000 LAW ME EN 5010 MANUFACTURING ME EN 5020 CAM ME EN 5030 RELIABILITY ME EN 5040 QUALITY ASSURANCE ME EN 5050 MICROMACHINING ME EN 5055 MICROSYSTEMS DESGN & CHAR. ME EN 5100 ERGONOMICS ME EN 5110 SAFETY ME EN 5120 HUMAN FACTORS ENG. ME EN 5130 HUMAN-MACHINE SYSTEMS ME EN 5200 ADV. CONTROL ME EN 5210 STATE SPACE METHODS ME EN 5220 ROBOTICS ME EN 5300 ADV STRENGTH ME EN 5400 VIBRATIONS ME EN 5410 INTRM. DYNAMICS ME EN 5500 ELASTICITY ME EN 5510 FINITE ELEMENTS ME EN 5520 COMPOSITES ME EN 5530 INTRO TO CONTINUUM ME EN 5600 INTERMEDIATE THERMO. ME EN 5620 MICROSCALE ENGINEERING ME EN 5710 AERODYNAMICS ME EN 5720 COMP. FLUID MECHANICS ME EN 5800 ENERGY CONVERSION ME EN 5810 THERMAL DESIGN ME EN 5820 THERMAL ENVIRONMENTAL ENGINEERING ME EN 5830 PROPULSION ME EN 5910 COOP ME EN 5920 DESIGN PROJECT ME EN 5930 UNDERGRAD. THESIS ME EN 5950 INDEP. STUDY ME EN 5960 SPECIAL TOPICS

C. COURSE DESCRIPTIONS

1000 Engineering Design and Visualization (**3**) Laboratory, Lecture. **Taught F, S.**
Prerequisite: Pre-ME EN status. Co-requisite: MATH 1210.
The engineering design process and the use of visualization in engineering design, including sketching, engineering drawing, and computer-aided design. A project covering all aspects of the design process, from problem definition and creativity to construction and testing.

1010 Computer-Aided Design Laboratory (**1**). **Taught F, S.**
Prerequisite: Pre-ME EN status.
This course is required for students who have completed a transferable Engineering Design and Visualization course (equivalent to ME EN 1000), but have not used the computer-aided design (CAD) software available in the department.
Meets with ME EN 1000 laboratory.

1300 Statics and Strength of Materials (**4**) Lecture. **Taught F, S.** (Summer - Tentative based on enrollment and budgetary constraints.)
Prerequisite: MATH 1210. Co-requisite: MATH 1220, PHYS 2210.
Forces, moments, couples, and resultants; static equilibrium and statically equivalent force systems, center of gravity and center of pressure; free body method of analysis; friction; internal forces in members, concept of stress and strain; Hooke's law, application to problems in tension/compression, shear torsion, and bending.

2020 Particle Dynamics (**2**) Lecture. **Taught F, S.**
Prerequisite: CVEEN 2010 or ME EN 1300.
Kinematics and kinetics of particles, including: position, velocity, acceleration, moving frames of reference, Newton's laws, conservation of energy and momentum, impact.
Meets with ME EN 2080 for the first half of the semester.

2080 Dynamics (**4**) Lecture. **Taught F, S**.
Prerequisite: ME EN 1300 and Intermediate ME EN status. Co-requisite: MATH 2250.
Kinematics and kinetics of particles and rigid bodies, including: position, velocity, acceleration, moving frames of reference, Newton's laws, conservation of energy and momentum, impact, and an introduction to vibrations.

2300 Thermodynamics I (**2**) Lecture. **Taught F, S.**
(Summer - Tentative based on enrollment and budgetary constraints.)
Prerequisite: PHYS 2210 and MATH 1220 and Intermediate ME EN status.
Thermodynamic properties, open and closed systems, equations of state, heat and work, first law of thermodynamics, second law of thermo-dynamics, availability and irreversibility, Carnot cycle, introduction to power and refrigeration cycles.
Meets with CH EN 2300.

2450 Numerical Techniques in Engineering (**2**) Lecture. **Taught S.**
(Summer - Tentative based on enrollment and budgetary constraints.)
Prerequisite: CS 1000 and MATH 2250 and Intermediate ME EN status.
Co-requisite: MATH 2210.
An introduction to numerical techniques, including: order of convergence, error accumulation, root finding, and solution of linear and nonlinear equations, numerical integration and differentiation, and solution of ordinary differential equations. Partial differential equations and their numerical solution will be discussed.

2650 Concurrent Engineering I: Manufacturing (**4**) Lecture. **Taught S.**
Prerequisite: ME EN 1300 and MSE 2160 and Intermediate ME EN status.
Structure and properties of ferrous and nonferrous materials, casting, forging, welding, heat treating, machining, grinding, numerical control, robotics, economic analysis.

2655 Manufacturing Laboratory (**1**). **Taught F, S.**
(Summer - Tentative based on enrollment and budgetary constraints.)
Introduction to the mechanical engineering machine shop, with hands-on experience using traditional machine shop equipment.

3200 Mechatronics I: Modeling, Actuators, and Data Collection (**4**) Laboratory, Lecture. **Taught F**.
Prerequisite: ECE 2210; CS 1000; ME EN 2080, 2450, 2650 and 2655; Upper Division ME EN status. **Fulfills Quantitative Intensive BS Requirement.**
This is the first of two mechatronics courses. Students should plan on taking the classes in direct sequence. Mechatronics I introduces dynamic system modeling, instrumentation, actuators, and computer based data collection.

3210 Mechatronics II: Mechanical Components and Control Systems (**4**) Laboratory, Lecture. **Taught S**.
Prerequisite: ME EN 3200 and Upper Division ME EN status. **Fulfills Quantitative Intensive BS Requirement.**
This is the second of the two mechatronics courses. Students should plan on taking the classes in direct sequence. Mechatronics II continues from Mechatronics I. Students will apply modeling, sensors, and actuators to feedback control systems. Microcontrollers are used to implement control systems in laboratory projects.

3300 Strength of Materials (**4**) Laboratory, Lecture. **Taught F, S.**
Prerequisite: ME EN 1300 and MATH 2250 and Upper Division ME EN status.
Shear and bending moment in beams, torsion of circular and noncircular sections, bending and shear stresses in beams, deflection of beams, statically indeterminate members and structures. Failure criteria, stress concentrations, column buckling. Laboratory in mechanical behavior of materials and stress analysis included.

3600 Thermodynamics II (**3**) Laboratory, Lecture. **Taught F.**
Prerequisite: Either ME EN 2300 or CH EN 2300 and Upper Division ME EN status.
Analysis of applied thermodynamic systems, including: gas power cycles, vapor power cycles, combined power cycles, refrigeration cycles, air conditioning cycles, gas mixtures, air-water vapor mixtures, chemical reactions, combustion, and chemical and phase equilibrium.

3650 Heat Transfer (**4**) Laboratory, Lecture. **Taught S.**
Prerequisite: ME EN 2450 and 3700, either ME EN 2300 or CH EN 2300, and Upper Division ME EN status. Co-requisite: MATH 3150.
Basic mechanisms of heat transfer, law of conservation of energy, conduction, convection, radiation, heat transfer with change of phase, heat exchangers.

3700 Fluid Mechanics (**4**) Laboratory, Lecture. **Taught F.**
Prerequisite: ME EN 2080, either ME EN 2300 or CH EN 2300, MATH 2210 and 2250, and Upper Division ME EN status.
Hydrostatics, introduction to kinematics and dynamics of Newtonian fluids. Integral and differential formulations of the conservation of mass, momentum, and mechanical energy. Similitude and dimensional analysis. Laminar and turbulent pipe flow. Boundary Layers, drag and flow over external surfaces. Introduction to gas dynamics, speed of sound, normal shocks, converging-diverging nozzles, oblique shocks.

3900 Professionalism and Ethics Seminar (**0.5**) Seminar. **Taught F**.
Prerequisite: Upper Division ME EN status.
Guest lecturers, group projects, current engineering forum, student leadership, with a focus on professionalism and engineering ethics.

3910 Design Methodology (**3**). Lecture. **Taught S**.
Prerequisite: ME EN 2450, 2650, 2655 and Upper Division ME EN status.
Co-requisite: ME EN 3210 and 3300 and 3650.
First course in the three-course Design Sequence (ME EN 3910, 4000, 4010). The course introduces a wide range of standard, mechanical elements that are extensively used in today's engineering world. The topics include statistics, fatigue, reliability, safety, selection of commonly used bearings, fasteners, shafts, fits and tolerances, material selection, etc.

4000 Engineering Design I: Conceptual Design and Prototype Testing (**3**) Lecture, Other (Design Reviews). **Taught F**.
Prerequisite: ME EN 2650, 2655, 3210, 3300, 3650, 3910 and Upper Division ME EN status.
Second course in the three-course Design Sequence (ME EN 3910, 4000, 4010). Builds directly upon the machine design skills learned in ME EN 3910. Basics of the design process (Design Methodology) including: problem definition, customer requirements, design specifications, concept generation, benchmarking, concept selection, prototyping, design refinement, product architecture, and planning (time,

money, and resources). Focused homework and writing assignments guide work on senior design projects. Culminates in design review based on formal presentations of fully documented, detailed engineering drawings of proposed designs and alpha prototype demonstrations.

4010 Engineering Design II: Final Product Design (**3**) Other (Design Reviews). **Taught S**.
Prerequisite: ME EN 4000 and Upper Division ME EN status. Co-requisite: ME EN 4050. **Fulfills Upper Division Communication/Writing BS Requirement.**
Design reviews and team assignments leading to the construction, testing and optimization of proposed design including: engineering analysis and testing of beta prototypes, final parameter and tolerance design, and economic analysis of final product. Culminates in demonstration of final product and verification and documentation of how final product meets all customer needs.

4050 Concurrent Engineering II: Failure and Reliability Considerations in Design (**2**) Lecture. **Taught S**.
Prerequisite: ME EN 2650 and 3300 and Upper Division ME EN status.
Design and manufacturing of mechanical structures for fatigue resistance and reliability, failure mechanisms, and criteria, wear, corrosion, tribology.

4999 Honors Thesis/Project (**3**) Honors Thesis Project. **Taught F, S, Sum**.
Prerequisite: Upper Division ME EN status.
Restricted to students in the Honors Program working on Honors degree.

5000 Law for Engineers (**3**) **Taught F of odd* years**.
Prerequisite: Upper Division ME EN status.
Designed to provide science and engineering students with a sufficient knowledge of law to recognize and deal with legal problems, which may arise in the fields of science, engineering, or technical management. Topics covered include courts, trial procedures, evidence, contract law, engineering contracts, agency, patents, trademarks, copyrights, trade secrets, product liability, employer/employee law, business law including corporations, partnerships, joint ventures, etc.

5010 Principles of Manufacturing Processes (**3**) **Taught F of odd* years**.
Prerequisite: ME EN 2650 and 2655 and Upper Division ME EN status.
Application of fundamental theories in solid mechanics, heat transfer, chemistry and surface science in solving complex problems in material processes.
Meets with ME EN 6010.

5020 Computer-Aided Manufacturing (**3**) **Taught F of even* years.**
Prerequisite: ME EN 2650 and 2655 and Upper Division ME EN status.
Principles and elements of computer-aided manufacturing, including: numerical control, computer-aided design, rapid prototyping, “Just-In-Time Manufacturing,” and introduction to “Intelligent Manufacturing.”
Meets with ME EN 6020.

5030 Reliability Engineering (**3**) **Taught S of even* years**.
Prerequisite: ME EN 4050 and Upper Division ME EN status.
Application of statistical concepts for interpretation of component and system failures, redundancy, maintainability, exponential failure laws, and failure prediction techniques.
Meets with ME EN 6030.

5040 Quality Assurance Engineering (**3**) **Taught S of even* years**.
Prerequisite: ME EN 4050 and Upper Division ME EN status.
Acceptance sampling procedures, control charts for quality controls, military standards in controlling quality.
Meets with ME EN 6040.

5050 Fundamentals of Micromachining Processes (**3**). **Taught S**.
Prerequisite: Upper Division ME EN status or instructor consent.
Introduction to principles of micromachining technologies. Topics include photolithography, silicon etching, thin film deposition and etching, electroplating, polymer micromachining, and bonding techniques. A weekly lab and review of micromachining applications are included.
Meets with BIOEN 6421, ECE 5221 and 6221, ME EN 6050 and MSE 6421.

5055 Microsystems Design and Characterization (**3**) **Taught F.**
Prerequisite: Upper Division ME EN status or instructor consent.
Third in a three-course series on Microsystems Engineering. Course generalizes Microsystems design considerations with practical emphasis on MEMS and IC characterization/physical analysis. Two lectures, one lab per week, plus ½ hr. lab lecture.
Meets with BIOEN 6423, CH EN 6659, ECE 6225, ME EN 6055, MET E 5055, MSE 6055.

5100 Ergonomics (**3**) **Taught F**.
Prerequisite: Upper Division ME EN status or instructor consent.
Introduction to study of humans at work; disability and accident prevention, and productivity improvement. Human musculoskeletal system as a mechanical structure. Recognition, evaluation, and control of ergonomic stresses in occupational environment.
Meets with ME EN 6100.

5110 Introduction to Industrial Safety (**3**) **Taught S.**
Prerequisite: Upper Division ME EN status or instructor consent.
Introduction to modern hazard control. Objectives and operation of occupational safety and health program. Requirements of the **OSHA** Act. Recognition and control of physical hazards in work environment through safety engineering. Psychological and ergonomic aspects of worker safety and health.
Meets with ME EN 6110.

5120 Human Factors in Engineering Design (3) Taught F of odd* years.
Prerequisite: Upper Division Engineering status.
Introduction to the discipline of Human Factors Engineering (HFE), the science of designing for human use. Course will focus on information processing and the cognitive aspects of ergonomics design. Students will gain insight into effects of various environments (heat, cold, noise, information overload, etc.) on humans and human performance. Physical ergonomics (cumulative trauma disorders and biomechanics) will be addressed briefly.
Meets with ME EN 6120.

5130 Design Implications for Human-Machine Systems (3) Taught F of even* years.
Prerequisite: Upper Division Engineering status.
Human Factors Engineering (HFE) aspects of design and implications on system performance. Various aspects of human interaction with systems, both simple (hand tools) and complex (piloting an aircraft) will be addressed. Course emphasizes HFE principles and the often catastrophic results of poor design with respect to humans in the system. Physical ergonomics (cumulative trauma disorders and biomechanics) will be addressed briefly.
Meets with ME EN 6130.

5200 Advanced Modeling and Control (**3**) **Taught F**.
Prerequisite: ME EN 3210 and Upper Division ME EN status.
Students learn modeling in the frequency domain, time domain, and sampled data domain. The theory and application of techniques and tools used for the design of feedback control systems, including root locus, Bode, and Nyquist techniques are discussed for continuous and sampled systems.
Meets with ME EN 6200.

5210 State Space Methods (**3**) **Taught S**.
Prerequisite: CH EN 4203 or ME EN 3210 or equivalent.
Introduction to modeling of multivariable systems in state space form. System analysis including stability, observability and controllability. Control system design using pole placement, and linear quadratic regulator theory. Observer design.
Meets with ME EN 6210, CH EN 5203, and CH EN 6203.

5220 Robotics (**3**) **Taught F**.
Recommended Prerequisite: CS 1000, MATH 2250, Upper Division ME EN status.
Mechanics of robots, comprising kinematics, dynamics, and trajectories. Planar, spherical, and spatial transformations and displacements. Representing orientation: Euler angles, angle-axis, and quaternions. Velocity and acceleration: the Jacobian and screw theory. Inverse kinematics: solvability and singularities. Trajectory planning: joint interpolation and Cartesian trajectories. Statics of serial chain mechanisms. Inertial parameters, Newton-Euler equations, D'Alembert's principle. Recursive forward and inverse dynamics.
Meets with CP SC 5310, CP SC 6310, ME EN 6220.

5300 Advanced Strength of Materials (**3**) **Taught F**.
Prerequisite: ME EN 3300 and MATH 2210 and 2250 and Upper Division ME EN status.
Strength of materials approach to advanced problems in stress analysis of structural members, and prediction of their failure; advanced topics in beam bending; torsion of noncircular cross-sections, and thin-walled tubes; inelastic bending, and torsion; energy methods; elastic instability.
Meets with ME EN 6300.

5400 Vibrations (**3**) **Taught S**.
Prerequisite: ME EN 2080, MATH 2210 and 2250, Upper Division ME EN status.
Free and forced vibrations of discrete linear systems with and without damping; Lagrange's equations and matrix methods for multiple-degree-of freedom systems; isolation of shock and vibrations; and applications.
Meets with ME EN 6400.

5410 Intermediate Dynamics (**3**) **Taught S of odd* years**.
Prerequisite: ME EN 2080, MATH 2210 and 2250, Upper Division ME EN status.
Review of basic dynamics, transformation of coordinate systems, rotating coordinate systems, Lagrange methods, Euler's equations, and dynamics of machinery.
Meets with ME EN 6410.

5500 Engineering Elasticity (**3**) **Taught F of odd* years**.
Prerequisite: ME EN 3300 and MATH 3150 and Upper Division ME EN status.
Practical, applied approach to elasticity; physical meaning of governing equations, and solutions of problems of practical importance; stresses, strains, and Hooke's law; equations of equilibrium, and compatibility; problems in plane stress and plane strain, torsion, and bending, and introduction to three-dimensional problems.
Meets with ME EN 6500.

5510 Introduction to Finite Elements (**3**) **Taught F**.
Prerequisite: ME EN 1300, MATH 2210 and 2250, Upper Division ME EN status.
Practical approach to finite-element analysis of solid mechanics, diffusion, and fluid mechanics problems. Introduction to use of commercial finite element programs. Introduction to theoretical basis; simple elements, element stiffness, boundary conditions, and modeling considerations.
Meets with ME EN 6510.

5520 Mechanics of Composite Materials (**3**) **Taught S**.
Prerequisite: ME EN 3300 and MATH 2210 and upper division ME EN status.
Introduction to modern fiber composite materials; design and analysis for structural applications. Material types, and manufacturing techniques. Anisotropic stress-strain response, and implications for design. Lamination theory, and computer codes for lamination analysis. Strengths of laminates. Examples and projects for design of structural members of advanced composite materials.
Meets with ME EN 6520.

5530 Introduction to Continuum (**3**) **Taught S of even* years.**
Prerequisite: MATH 2210, ME EN 3300, and Upper Division ME EN status.
Introduction to Cartesian tensors, state of stress, kinematics of deformation. General principles of mechanics. Constitutive equations of elasticity, viscoelasticity, plasticity, and fluid mechanics.
Meets with ME EN 6530.

5600 Intermediate Thermodynamics (**3**) **Taught S of even* years**.
Prerequisite: Either ME EN 2300 or CH EN 2300, and MATH 2210 and 2250, and Upper Division ME EN status.
Thermodynamic probability, statistical mechanics for systems of independent particles, the partition function, macroscopic thermodynamic properties for gases and solids from basic particle behavior.
Meets with ME EN 6600.

5620 Fundamentals of Microscale Engineering (**3**) **Taught F of even* years**.
Prerequisite: Upper Division Engineering status.
Introduction to micro scale and nano scale engineering. Topics include scaling laws, meteorology methods, and microfabrication technologies: photolithography sputtering, ion-beam etching, chemical vapor deposition, bulk micromachining, surface micromachining, LIGA, laser ablation, and micro-milling. Microscale thermal fluid phenomena, including slip flow, temperature jump, viscosity variation, surface tension effects and conduction in thin films, are introduced. MEMS and microfluidic applications, such as sensors, actuators, microtonal analysis systems and electronic cooling are presented.
Meets with ME EN 6620.

5710 Aerodynamics (**3**) **Taught S of odd* years**.
Prerequisite: ME EN 2080 and 3700 and Upper Division ME EN status.
Flow around bodies, inviscid incompressible flow, airfoil theory, lift and drag for lifting bodies, compressible aerodynamics, boundary layers, aircraft preliminary design.
Meets with ME EN 6710.

5720 Computational Fluid Dynamics (**3**) **Taught F of odd*years**.
Prerequisite: One of ME EN 2450 or MATH 5600 or CH EN 2450, and either ME EN 3700 or CH EN 3353, and Upper Division ME EN status.
Survey of approaches including time accurate and steady-state methods, explicit and implicit techniques, Eulerian and Lagrangian methods, laminar and turbulent flow, compressible and incompressible approaches, projection methods, stability considerations, etc. Application of CFD to mixing heat transfer and reaction.
Meets with ME EN 6720, CH EN 5353, and CH EN 6353.

5800 Energy Conversion (**3**) **Taught F**.
Prerequisite: Either ME EN 2300 or CH EN 2300, and MATH 2250, and Upper Division ME EN status.
Conversion of chemical and nuclear fuels to satisfy specific energy needs. Solar, MHD, synthetic fuels, biomass, fission, fusion, geothermal, and direct energy conversion.
Meets with ME EN 6800.

5810 Thermal Systems Design (**3**) **Taught F of even* years**.
Prerequisite: ME EN 3600 and 3650 and Upper Division ME EN status.
Design of steam-power plants, feed-water heater systems, pumping systems, compressor blades, turbine blades, and heat exchangers. Equation fitting and economic analysis as basis of design decisions. Optimization of thermal systems using Lagrange multipliers, search methods, dynamic programming, geometric programming, and linear programming. Probabilistic approaches to design.
Meets with ME EN 6810.

5820 Thermal Environmental Engineering (**3**) **Taught S of even* years**.
Prerequisite: ME EN 3600 and 3650 and Upper Division ME EN status.
Principles of design of systems for heating and cooling of buildings. Heat-load calculations, psychro-metrics, thermodynamic systems, and solar-energy concepts.
Meets with ME EN 6820.

5830 Aerospace Propulsion (**3**) **Taught S of even* years**.
Prerequisite: ME EN 3600 and 3700 and Upper Division ME EN status.
Analysis and design of propulsion systems for aerospace vehicles: solid and liquid chemical rocket systems, nuclear rocket engines, electrical rocket engines, nozzle theory, jet engine component analysis, turboprop engines, turbojet engines, ramjet engines, and turbofan engines.
Meets with ME EN 6830.

5910 Cooperative Education (**1 to 3**) Clinical. **Taught F, S, Sum**.
Prerequisite: Upper Division ME EN status.
On-the-job cooperative educational experience. The student must contact the Department of Mechanical Engineering Director of Undergraduate Studies and the Career Services Coordinator of Cooperative Education before registering for this class.

5920 Design Project (**1 to 3**) Independent Study. **Taught F, S, Sum**.
Prerequisite: ME EN 4010 and ME EN Upper Division status.
Group or individual engineering design projects. Departmental consent required.

5930 Undergraduate Thesis (**3**) Independent Study. **Taught F, S, Sum**.
Prerequisite: Upper Division ME EN status.
Contemporary engineering research problems. Departmental consent required.

5950 Independent Studies in Mechanical Engineering (**1 to 3**) Independent Study. **Taught F, S, Sum.**
Prerequisite: Upper Division ME EN status.

5960 Special Topics (**1 to 3**) **Taught as needed**.
Prerequisite: Upper division ME EN status.
Contemporary problems in Mechanical Engineering.

* Academic Year 2007-2008 is an “odd” year
* Academic Year 2008-2009 is an “even” year.

University of Utah Mechanical Engineering Articulation Table

U of U Year 1 - FALL		**SLCC**	**CEU**	**DIXIE**	**SNOW**	**SUU**	**WEBER**	**USU**	**UVU**	**BYU**	**BYU-Idaho**	**Westminster**
MATH 1210	Calculus I	MATH 1210	MATH 1210	MATH 1210	MATH 1210	MATH 1210	MATH 1210	MATH 1210	MATH 1210	MATH 112	MATH 112	MATH 201
ME EN 1000	1st Year Design/SolidWorks	ME EN 1050	ENGN 1000 & 1005	ENGR 1010*	ENGR 1000*	ENGR 2020*	ENGR 1000*	ENGR 1000	ENGR 1000*			
CHEM 1210	Chemistry I for Engineers	CHEM 1210	CHEM 1210	CHEM 1210	CHEM 1210	CHEM 1210	CHEM 1210	CHEM 1210	CHEM 1210	CHEM 105	CHEM 105	CHEM 111
CHEM 1215	Chemistry Lab	CHEM 1215	CHEM 1215	CHEM 1215	CHEM 1215	CHEM 1215	CHEM 1210	CHEM 1215	CHEM 1215	CHEM 107 or PHYS Lab	CHEM 105	CHEM 111

* Must take ME EN 1005 at U of U (SolidWorks Lab 1.0 CR-HR)

Year 1 - SPRING

MATH 1220	Calculus II	MATH 1220	MATH 1220	MATH 1220	MATH 1220	MATH 1220	MATH 1220	MATH 1220	MATH 1220	MATH 113	MATH 113	MATH 202
PHYS 2210	Physics I for Engineers	PHY 2210	PHYS 2210	PHYS 2210	PHYS 2210	PHYS 2210	PHYS 2210	PHYS 2210	PHYS 2210	PHSCS 121 & 123	PH 121 & 123	PHYS 211
ME EN 1300	Statics & Strengths	ME EN 2010 & 2140	ENGN 2010 & 2140	ENGR 2010 & 2140	ENGR 2010 & 2140	ENGR 2010 & 2140	ENGR 2010 & 2140	ENGR 2010 & 2140	ENGR 2010 & 2	CEEN 103 & 203	ME 217	
WRTG 2010	Int. Writing	ENGL 2010 or 2100	ENGL 2010	ENGL 2010	ENGL 2010 or 2014	ENGL 2010	ENGL 2010	ENGL 2010	ENGL 2020	ENGL 316	ENG 316	ENGL 110

Year 2 - FALL

CS 1000	Programming (MatLab/C++)	ENGR 1040 or CS 1050								ME EN 273***		
MATH 2250	Linear Algebra & ODEs	MATH 2250	MATH 2270 & 2280	MATH 2270 & 2280	MATH 2270 & 2280	MATH 2270 & 2280	Math 2250	MATH 2250	MATH 2270 & 2	MATH 334 & 343	MATH 341 & 371	MATH 204
PHYS 2220	Physics II for Engineers	PHY 2220	PHYS 2220	PHYS 2220	PHYS 2220	PHYS 2220	PHYS 2220	PHYX 2220	PHYS 2220	PHSCS 220	PH 220	PHYS 212
ME EN 2080	Dynamics	ME EN 2020 & 2060	2030**	ENGR 2030**	ENGR 2030**	ENGR 2030**	ENGR 2080	ENGR 2030**	ENGR 2030**	CE EN 204**	ME 204**	
MSE 2160	Materials Science	MSE 2160				ENGR 3010		MAE 2160		ME EN 250	ENGR 250	

** May be additional requirements due to credit hour difference

*** Articulates with either CS 1000 or ME EN 2450 — not both

Year 2 - SPRING

ME EN 2300	Thermodynamics I	ME EN 2300	ENGN 2300 *(ENGN 2400)*	ENGR 2300	ENGR 2300	ENGR 3000	ENGR 2300	MAE 2300	ENGR 2300	ME EN 321	ME 322	
ME EN 2450	Numerical Methods	ME EN 2450			ENGR 2450	MATH 3600		MAE 2200	ENGR 2450	ME EN 273***	ENGR 242	MATH 362 or *CMPT 362*
MATH 2210	Calculus III	MATH 2210	MATH 2210	MATH 2210	MATH 2210	MATH 2210	MATH 2210	MATH 2210	MATH 2210	MATH 214	MATH 214	MATH 303
ECE 2210	Electrical Engineering	EE 2210	ENGN 2250 & 2255				ENGR 2210			EC EN 301		
ME EN 2650	Concurrent I (Manufacturing)	ME EN 2650						MAE 2650****		ME EN 282****		

*** Articulates with either CS 1000 or ME EN 2450 — not both

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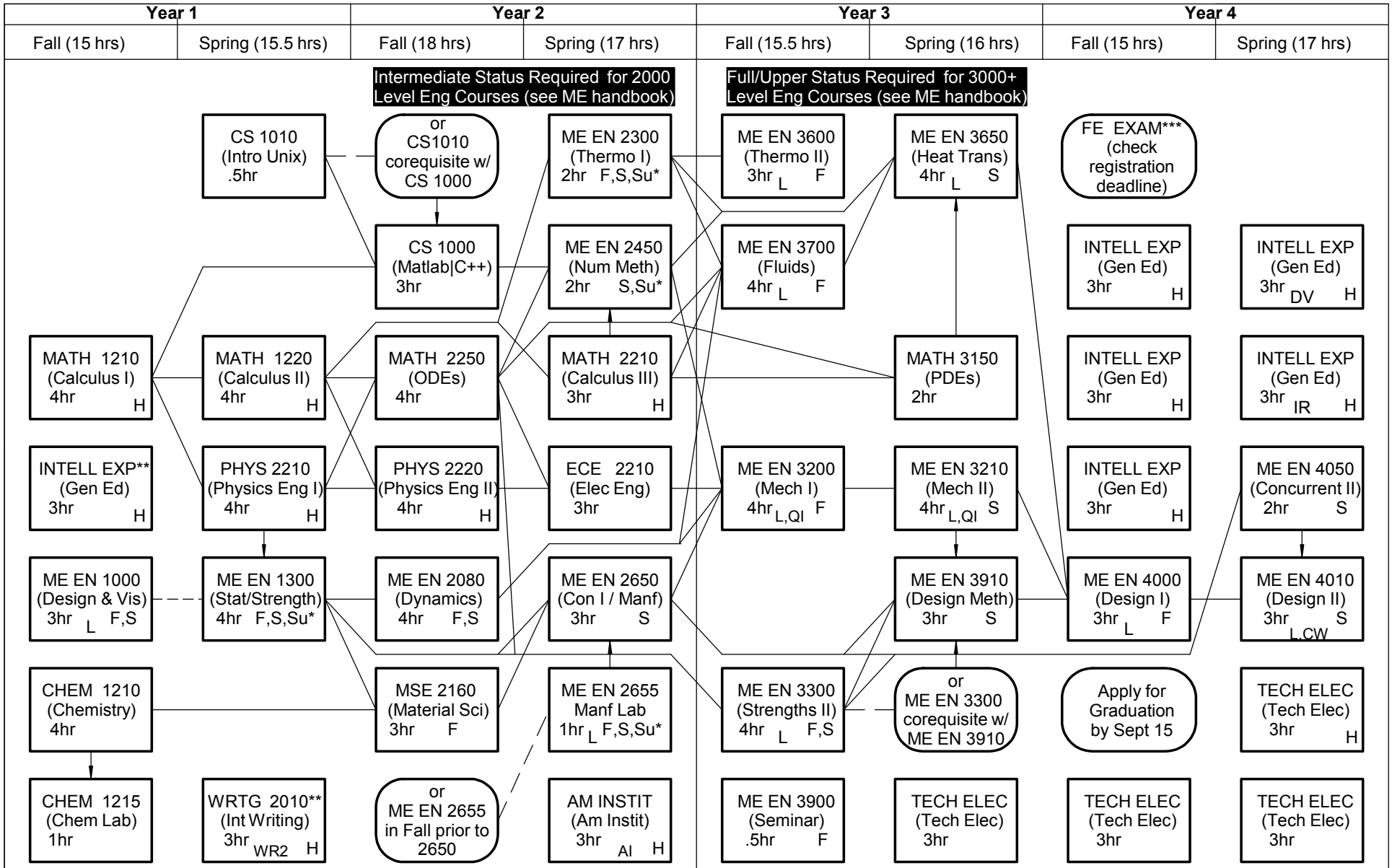
**** Must take ME EN 2655 at U of U (Machine Shop Lab 1.0 CR-HR)

UNIVERSITY OF UTAH MECHANICAL ENGINEERING DEPARTMENT



NOT ALL PRE/COREQUISITES SHOWN - STUDENT RESPONSIBLE FOR CHECKING AND MEETING PRE/COREQUISITES (See University Catalog for specific information)

F = Fall
S = Spring
Su = Summer

* Summer tentative on enrollment and budgetary constraints
** ELEAP option - take 2nd ELEAP in Spring and WRTG 2010 in Summer
*** Student strongly encouraged to take FE Exam in October - Copy off PASS letter must be forwarded/delivered to MEB 2220 for DARS update

L = includes LAB
H = Honors option available

DV = Diversity Requirement IR = International Requirement
QI = Quantitative Intensive CW = Upper Division Writing

Note: Prerequisites Strictly Enforced - plan ahead

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