B.S. in Mechanical Engineering
Degree Program Handbook
(**Spring 2022)**

The University of New Mexico
School of Engineering
Department of Mechanical Engineering

Compiled by: Tariq Khraishi
Director of Undergraduate Programs
(update date: 3/1/2022)

The School of Engineering (SOE) at the University of New Mexico is ranked among the top engineering schools in the country. Our Mechanical Engineering faculty have degrees from some of the best institutions in the world. We are ABET accredited, and we take great pride in the quality and breadth of our programs. This is apparent through the successes of our many outstanding alumni. In fact, we were previously recognized by ABET as one of few programs in the Nation with a healthy and diverse number of design courses in the curriculum, and by NSF (National Science Foundation) as a mechanical engineering program attracting above average percentage of female students compared to many other departments nationwide. We recognize that education is a lifelong process; let us help you with your educational journey.

College is an exciting and challenging part of your life; it takes dedication and marshaling of your energies to achieve your degree. As a student, your goal should be to become a professional, not just to take courses. We look forward to working with you while you are here and after you graduate, helping you gain the knowledge and build the skills necessary to achieve all your life's goals.

1 Introduction

This handbook provides information about the *Bachelor of Science in Mechanical Engineering (BSME)* degree program, offered by the Department of Mechanical Engineering (ME).

Students are expected to study this document carefully, and consult with their ME advisors if there are any questions.

The BSME program is accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET). The acronym “ABET”, as used in this handbook, is meant to refer to the EAC of ABET in all cases.

Successful completion of the ME program (or other ABET accredited engineering programs) with a B.S. degree is the first step to becoming a licensed professional engineer. Various states require engineering licenses for those individuals who publicly represent themselves as engineers. This requirement is for the purpose of protecting the public interest. Therefore, all ABET accredited programs must meet various minimum standards. The purpose of this document is to provide students with the information which supersedes and supplements the University of New Mexico (UNM) Catalog.

2 Career Opportunities

Mechanical Engineering is a very diversified profession that is concerned with the research and development of new technologies, adoption of technologies, design, analysis, and operation of machines, hardware, software, and systems. It has been, and continues to be, a field that provides challenging, exciting and rewarding career opportunities. Mechanical engineers apply mathematics, physics, chemistry, and other sciences, together with computers, instrumentation, and other tools to create a wide range of hardware, software, and systems.

The continuing need to improve and design products and systems makes the mechanical engineering profession essential and very much in demand. The B.S. degree program in ME provides graduates with the necessary skills to compete in this rapidly changing discipline. In addition, the BSME provides a solid, scientific foundation for other degrees such as the MBA, MD, DDS, etc.

The present demand for MEs is excellent, and the employment rate for UNM graduates continues to be high. The demand is expected to remain strong, with continued economic

expansion.

Mechanical Engineers are employed by large corporations as well as by small companies, in various governmental agencies and laboratories, and as consulting engineers. Many mechanical engineers have started and developed successful companies with products that meet society's needs and desires. The career work is varied; it includes research, development, design, manufacturing, sales, and management. It also provides professional opportunities for interaction among engineering disciplines and sciences. Industries employing mechanical engineers include public utilities, aerospace, computer, heating and air conditioning, automotive, transportation, and construction. Mechanical engineers are also employed by Government laboratories involved in activities as wide as developing alternative energy sources, oceanographic studies, space missions, aircraft testing, weapons development, and atmospheric research. Students are urged to become familiar with the types of assistance provided by the SOE's Internship Programs at Engineering Student Success (ESS) Center and by UNM Career Services (located in Student Services Center) in relation to both Internships/Co-operative Education Program and employment.

3 Admission to Baccalaureate Program

Students must be admitted for study at the University of New Mexico, and must have completed approximately one year of the freshman year subjects, before applications are processed for admission to the Baccalaureate Program in Mechanical Engineering. Approval from the ME Department is required. Applicants must consult the appropriate departmental advisor for evaluation of academic work before admission can be completed.

At least 18 semester hours of freshman year technical subjects are required by the School of Engineering for admission into degree programs. For the mechanical engineering department, these courses must include the following 14 credit hours: MATH 1512 Calculus I (4), MATH 1522 Calculus II (4), PHYS 1310 Calculus-Based Physics I (3), and ME 160L Mechanical Engineering Design I (3). Four other credit hours can be taken from: CS151L Computer Programming Fundamentals for Non-Majors (3) (or its replacement course ENG 130L Introduction to Engineering Computing (3)), CHEM 1215 General Chemistry I (3), CHEM 1215L General Chemistry I Laboratory (1), and PHYS 1310L Calculus-Based Physics I Laboratory (1). A minimum grade-point average of 2.75 in those technical courses is required for admission to undergraduate study in Mechanical Engineering.

A cumulative grade-point average of at least 2.20 (in technical plus non-technical courses) is also required for admission into ME. All applicants must have completed English 1110 or its equivalent before admission. As of Fall 2016, all courses required in the BSME program must have grades of C or better for satisfying both admission and graduation requirements. The same applies to required Core Curriculum courses.

Students transferring to the ME department (from any institution, including UNM) need to also meet the GPA and admission course requirements stated above.

Starting in Fall 2017 and for admission into the ME Department, any course required for the BSME cannot have been attempted more than three times. An attempt includes receiving any letter grade (A through F), WP, WF, W, WNC, CR, NC, I or AUDIT. For the purposes of this requirement, course work taken at other institutions is treated the same as course work taken at the University of New Mexico. Also, courses taken five or more years ago do not count towards this three-attempt rule.

4 Advisement

Pre-major engineering students who have indicated ME as their intended major are advised

by the ME Undergraduate Advisor. Upon admission to the ME program (until graduation), each student will be assigned to one of the faculty members for advisement. Students in the ME program are required to seek advisement from their designated advisor each semester during the pre-registration period.

The purpose of this session is to help the student with any problems he/she may have in his/her program of studies. Students will HAVE AN ADVISEMENT HOLD AND not be allowed to register until they have consulted with their advisor.

5 Probation, Suspension, and Dismissal

The School of Engineering (SOE) uses two probation procedures:

1. A student enrolled in the SOE will be placed on *Academic Probation* when the cumulative GPA of all work taken at UNM falls below 2.0.

2. A student enrolled in the SOE and admitted to the ME Department will be placed on *SOE Probation* under any of the following conditions:

    - When a cumulative GPA based on work taken at UNM and accepted towards the BSME degree falls below a 2.00 (overall) or below 1.50 in the most recent semester.

    - When the student is making unsatisfactory progress towards the BSME degree.

Students on probation are subject to suspension from UNM or dismissal from the SOE.

IMPORTANT NOTE: The info in this section may not be up-to-date. The student must refer and study the UNM Catalog for the latest UNM and/or SOE policies.

6 Program Goals

The principal goal of the BSME program is to provide students with the fundamentals of mechanical engineering to insure they will have a solid base for an engineering career. This includes building a sufficient knowledge, creative and analytical capability, and communication skills so that the graduates can continue to expand their learning as their fields of interest and the scope of mechanical engineering changes. Our core courses are intended to provide a broad base so that those who terminate their formal education with the BSME degree can continue to grow intellectually. Likewise, the base provides insight into fields that students may choose to study at the graduate level.

This goal is met by a curriculum in which fundamental knowledge of earlier years is applied in later engineering courses. Specifically, the goals for the BSME program at UNM are closely linked to the criteria set forth by ABET. The following statement has been adopted by the Mechanical Engineering Faculty to represent our educational goals.

Objectives

The Objectives of the Mechanical Engineering Department in educating its undergraduate students are:

A. *Graduates will have the educational background necessary to compete successfully in a global workplace.*

B. *Qualified graduates will pursue advanced study if desired.*

C. *Graduates will pursue leadership positions in their profession and/or communities.*

Outcomes

The Department of Mechanical Engineering at the University will provide students with a quality mechanical engineering education. Each Mechanical Engineering student will demonstrate the following by the time of graduation:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

3. An ability to communicate effectively with a range of audiences.

4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

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

7 The BSME Curriculum

The BSME Curriculum is shown in Figure 1 (http://degrees.unm.edu/units/4658/periods/104/plans). It is the student's responsibility to fulfill all the degree requirements.

Students are responsible for reading and understanding the UNM Catalog. Entering

students should especially read the sections which pertain to general academic regulations, School of Engineering (SOE) regulations, the requirements for the BSME program, and the course descriptions, including the prerequisites and co-requisites.

Figure 1 - Curriculum in Mechanical Engineering - Fall 2020

Total credit hours required for graduation: 121

Freshman - 1st semester 17 credit hours
CHEM 1215 General Chemistry I (3)
CHEM 1215L General Chemistry I Lab (1)
ENGL 1120 Composition II (3)
ME 160L Mech Engr Design I (3)
MATH 1512 Calculus I (4)
Core Arts& Design Elective (3)

Freshman - 2nd semester 17 credit hours
Core Communication Elective (3)
PHYS 1310 General Physics I (3)
PHYS 1310L General Physics I Lab (1)
MATH 1522 Calculus II (4)
CS 151L Computer Prog Fund (3), or
ENG 130L Intro to Engineering Computing
Core Humanities Elective (3)

Sophomore - 1st semester 16 credit hrs
ME 260L Mech Engr Design II (3)
CE 202 Engineering Statics (3)
PHYS 1320 General Physics II (3)
MATH 2530 Calculus III (4)
ME 217 Energy, Enviro, and Soc (3)

Sophomore - 2nd semester 16 credit hrs
ME 306 Dynamics (3)
ECE 203L Circuit Analysis (3)
MATH 316 Applied Ord Diff Eqns (3)
ME 318L Mech Engr Lab (4)
Core Second Language Elective (3)

Junior - 1st Semester 16 credit hours
ME 317L Fluid Mech (4)
ME 301 Thermodynamics (3)
CE 302 Mechanics of Materials (3)
Math Elective (3)[1]
ME 357 Intro to Mech Vibrations (3)

Junior - 2nd semester 13 credit hours
ME 360L Mech Engr Design III (3)
ME 380 Mech Control Systems (3)
ME 370L Engr Materials Science (4)
Mech Engr Elective (3)[2]/ME150 (3)

Senior - 1st semester 13 credit hours
ME 320L Heat Transfer (4)
ME 459 Mech Engr Design IV (3)
Mech Engr Elective (3)[1]
Mech Engr Elective (3)[1]

Senior - 2nd semester 13 credit hours
ME 460 Mech Engr Design V (4)
Technical Elective (3)[3]
Mech Engr Elective (3)[1]
Mech Engr Elective (3)[1]

FSAE Option

FSAE is a program in which the students design, build, and test a racing car. Students wishing to pursue the Formula SAE option, substitute the following curriculum for the second semester of their Junior year and both semesters of their senior year. All three FSAE courses must be completed for this option.

Junior - 2nd semester 14 credit hours
ME 360L Mech Engr Design III (3)
ME 380 Mech Control Systems (3)
ME 370L Engr Materials Science (4)
ME 406L FSAE I (4)

Senior - 1st semester 13 credit hours
ME 320L Heat Transfer (4)
ME 459 Mech Engr Design IV (3)
Mech Engr Elective (3)[1]/ME150 (3)
ME 407 FSAE II (3)

Senior - 2nd semester 12 credit hours
ME 408 FSAE III (3)
Technical Elective (3)[3]
Mech Engr Elective (3)[1]
Mech Engr Elective (3)[1]

[1] "Math Elective" course must be selected from MATH 311, 312, 313, 314, 321, or STAT 345.

[2] "Mechanical Engineering Electives" includes all Mechanical Engineering elective courses 300 level and above.

[3] "Technical Elective" may be selected from the Mechanical Engineering Electives or from approved upper division (300 level and above) courses from Math/Statistics, Chemistry, Physics, Computer Science, and Engineering. Technical Electives may not be taken on the CR/NC grading option.

Important Note: The pre-requisites for the courses above are given along with a list of ME courses in the appendix.

8 Core Curriculum Electives for ME Students

The Core Curriculum (General Education Curriculum) electives are given in the following UNM link: https://gened.unm.edu/. **A grade of C or better (not C-) is required in all courses used to fulfill the requirements of the Core Curriculum.** This includes required courses: ENGL 1110 - Composition I , & ENGL 1120 Composition II, MATH 1512 Calculus I, MATH 1522 Calculus II, CHEM 1215 General Chemistry I, CHEM 1215L General Chemistry I Lab, PHYS 1310 General Physics I, PHYS 1310L General Physics I Lab, ME 217, etc.

9 Mechanical Engineering Courses

See them on the http://degrees.unm.edu website, or specifically at:

http://degrees.unm.edu/units/4658/periods/108/plans

10 Independent Study and Research Project Experience

The following professors have indicated an interest in guiding BSME students through independent study (Problems Courses) or research projects:

Daniel Banuti
Assistant Professor
email: dbanuti@unm.edu
Phone: 505-277-1734
Office: ME 425
Area of Special Interest: Propulsion, combustion, simulation, supercritical fluids, thermodynamics, computational fluid dynamics, sustainable energy, supercritical CO_2, rocket engines

Sakineh Chabi
Assistant Professor
email: schabi@unm.edu
Phone: 505-277-1343
Office: ME 421
Area of Special Interest: engineering multifunctional materials, mechanics of materials, polymers, ceramics, and energy-related materials

Claus Danielson
Assistant Professor
email: cdanielson@unm.edu
Phone: 505-277-9997
Office: ME 401
Area of Special Interest: Optimal and constrained control, machine learning for autonomy, planning and optimization

Chris Hall
Professor
email: cdhall@unm.edu
Phone: 505-277-0210
Office: ME 430
Area of Special Interest: Spacecraft attitude dynamics, optimal spacecraft maneuvers, space mission planning

Ali Heydari
Assistant Professor
email: heydari@unm.edu
Phone: 505-277-1162
Office: ME 420
Area of Special Interest: Machine learning, robotics, kinetic control, assistive devices, power electronics and motor control

Nathan Jackson
Assistant Professor
email: njack@unm.edu
Phone: 505-277-0247
Office: ME 319
Area of Special Interest: MEMS fabrication, vibration energy harvesting, atomizer technology, acoustic resonators, smart material development, flexible/stretchable systems, neural interface devices, MEMS sensors and biosensor technology

Tariq Khraishi
Professor and Director of Undergraduate Program
email: khraishi@unm.edu
Phone: 277-6803
Office: ME 317
Area of Special Interest: Design, solid and fluid mechanics, crystal plasticity, materials science and engineering, biomechanics

Pankaj Kumar
Assistant Professor
email: pankaj@unm.edu
Phone: 505-277-3906
Office: ME 323
Area of Special Interest: Additive manufacturing, materials for extreme environments, alloys and microstructure design, powder metallurgy, materials characterization, mechanical behavior of materials, fatigue, creep, and fracture

Gowtham Mohan
Assistant Professor
Email: gowtham@unm.edu
Phone: 505-277-5613
Office: ME 423
Area of Special Interest: Concentrating solar power modelling and testing, thermal energy storage, desalination, hybrid solar collector development

Matthias Pleil
Lecturer III and Research Professor
Email: mpleil@unm.edu
Phone: 505-272-7157
Office: ME 403
Area of Special Interest: Microsystems fabrication and design, micro-nano technician education, STEM education

Svetlana Poroseva
Associate Professor
email: poroseva@unm.edu
Phone: 505-277-1493
Office: ME 422
Area of Special Interest: Turbulent flows, aerodynamics, wind energy, system survivability, integrated systems, uncertainty quantification

John Russell
Professor
email: jjrussel@unm.edu
Phone: 505-277-1345
Office: ME 328
Area of Special Interest: Vibrations, stability and control of dynamic systems, race car design

Yu-Lin Shen
Professor and Department Chair
email: shenyl@unm.edu
Phone: 505-277-6286
Office: ME 202A
Area of Special Interest: Mechanical behavior of materials, microelectronic devices and packages, thin films and heterogeneous material systems

Francesco Sorrentino
Associate Professor
email: fsorrent@unm.edu
Phone: 505-277-2349
Office: ME 330
Area of Special Interest: Dynamics and control of complex networks, identification of nonlinearsystems, adaptive sensor networks, adaptation in complex systems, and complex distributed energy systems. Other subjects of interest are the dynamics of large networks of coupled neurons and evolutionary game theory.

Peter Vorobieff
Professor and Director of Graduate Programs
email: kalmoth@unm.edu
Phone: 505-277-8347
Office: ME 424
Area of Special Interest: Fluid mechanics, energy, thermal science

Through these activities, students may obtain technical elective credits (ME451 or ME452: Problems Course; up to 6 credit hours of Problems Courses). To obtain approval, the student is required to prepare a written proposal that includes the following information:

1. Identification: title, author, course number, credit hours, semester, and supervising professor.
2. Introduction: a brief description of the problem, its engineering

significance, and how it fits into the student's educational goals.

3. Procedure: a description of the work as well as the approach to the problem; it should include the equipment, resources, technician time, and other needs for carrying out the work.
4. Results: a discussion of the expected results or goals of the activity.
5. Bibliographical references.

The proposal need not be lengthy: one or two pages will suffice.

Upon approval of the proposal by the supervising professor and the Undergraduate Advisor, it will be filed in the student's academic folder. This should be done no later than the first week of the semester.

11 Transfer Courses

Courses taken at nationally or internationally accredited colleges or universities may be transferred. These courses must be equivalent to the required courses in the BSME program at UNM.

Courses from engineering programs that are not accredited by ABET are not applicable towards the BSME degree at UNM.

A basic policy of ABET, which accredits the BSME program, is that technology courses should not be accepted in lieu of engineering courses.

12 Minimum Grades ("No C- or below" Rule)

For students admitted to the ME Department in Fall 2016 and beyond, the minimum acceptable grade for all courses applicable towards the BSME degree is a C.

13 Credit / No Credit Option

All courses applied towards the BSME degree must be taken for grade only; i.e., CR/NC option is not allowed for these courses (except in cases of AP and CLEP credits, as well as Core Humanities, Fine Arts, Writing/Speaking, and Second Language Electives).

14 Scholarships

The SOE and the ME Department award a number of scholarships to its students. Normally, a student applies for the scholarships in the spring or summer semester of the academic year. These scholarships are awarded for the following semester or year. Some scholarships are specifically designated for Mechanical Engineering. Students are encouraged to apply. For a list of scholarships available to ME students, the student should consult Engineering Student Success (ESS) Center: https://ess.unm.edu/.

15 Student Activities

Student organizations of the ME Department allow students to develop lasting

friendships.

The ME Department has a student section of the American Society of Mechanical Engineers (ASME). The section organizes tours of local industry and laboratories. It also invites speakers of interest to the students and faculty. ASME members frequently participate in design and/or paper presentation competitions.

The American Institute of Aeronautics and Astronautics (AIAA) student members also have the opportunity to prepare and present papers at an annual student conference.

Many of these groups' activities are held jointly with the local professional sections; this provides an excellent opportunity for students to interact with practicing engineers.

Pi Tau Sigma is the mechanical engineering honorary society that is open to qualified ME students. Eligible student are automatically contacted and invited to join.

16 Departmental Honors

Students who wish to graduate with Departmental Honors are required to meet the following criteria:

1. A minimum degree GPA corresponding to the following designations:

   3.5-3.74 *cum laude*
   3.75-3.89 *magna cum laude*
   3.9 (and higher) *summa cum laude*

2. ME 451/452 – Undergraduate Problems

   Complete one or more ME 451/452 Individual study (Undergraduate Problems) course(s) with a professor in the Mechanical Engineering Department. The intent of this individual study course is to research a topic for an honors thesis. (3 hours minimum)

3. ME 463 – Undergraduate Honors Thesis

   The students will enroll in ME 463 and complete an honors thesis. An honors thesis is a scholarly work based upon the research performed in the individual study course(s). (3 hours)

Please refer to sections of this document concerning independent studies and technical electives for further information.

17 Planning for Graduate Study

The ME Department offers programs of study towards the Master of Science and Doctor of Philosophy degrees. Consult the UNM Catalog and contact the departmental Graduate Advisor for detailed information.

Senior students with a GPA of 3.0 or greater who are within 10 semester hours of

completing the BSME degree may obtain graduate credit (in graduate courses) for a maximum of nine (9) semester hours, provided that they meet the requirements specified in the Graduate sections of the UNM Catalog.

18 Shared Credit Program - B.S./M.S. in Mechanical Engineering

The School of Engineering now offers a Shared Credit Degrees Program designed to allow students to complete B.S. and M.S. degrees in five years (depending on the student's mathematics preparation upon entering UNM as a first-year undergraduate student). To accomplish this, some courses are counted towards both the Bachelor's and Master's degrees.

Department of Mechanical Engineering allows up to 12 credit hours of undergraduate electives to be replaced by 500-level graduate courses that count towards both degrees.

Eligibility: Students may apply to the shared credit program during the undergraduate junior year, after completing 75 credit hours applicable to the BSME degree. At least 64 credit hours need to be mathematics, science and engineering courses (ME, CE, ECE, CS, Chem, Math, Stat and Phyc) applicable to the BSME degree. A cumulative GPA of at least 3.00 is normally required, counting only the completed courses applicable to BSME at the time of application.

The application deadline is November 30 in the Fall semester and April 30 in the Spring semester. The departmental decision will be made by the beginning of the following semester. Admission to the graduate portion of this program is provisional, and is not finalized until the student satisfactorily completes the requirements for the B.S. degree.

19 Application for Degree

During the second semester of a student's junior year or prior to enrollment of the 100th credit hour for the degree, a student is required to file the form “Application for an Undergraduate Degree.” This form may be obtained from the ME Undergraduate Program Coordinator or using https://me.unm.edu/students/undergraduate/undergraduate-forms/undergrad-app-for-degree.pdf. Failure to complete this form as indicated may delay graduation.

20 Concentration in Microsystems Engineering

The ME Department has one studies concentration. It is in Microsystems Engineering. The required courses for it are below. If you like to participate in it, you can ask your undergraduate staff advisor for assistance to add this concentration officially on your LoboTrax Degree Audit.

		Credit Hours
ME 318L	Mechanical Engineering Laboratory	4
ME 370L	Engineering Materials Science	4
ME 417	Fundamentals of Microsystems Fabrication	3
ME 418	Foundations of Microsystems Design	3
ME 419	Advanced Micro- and Nanosystems Engineering	4
		Total 18

21 ME Department Website

More information on the BSME, the UNM Mechanical Engineering degrees including graduate degrees, opportunities, the Shared Credit program, ME faculty and staff, requirements, etc. can all be found on the departmental website: https://me.unm.edu/

UNIVERSITY CATALOG

Academic Calendar

Keys and Symbols Reference

Mechanical Engineering (ME)

150. Introduction to Modern Mechanical Engineering. (3, may be repeated twice Δ)

Hands-on activities and projects on modern applications of mechanical engineering, while describing the science and math behind them.

160L. Mechanical Engineering Design I. (3)

Introduction to engineering graphics, the design process, computer aided design, engineering ethics, design economics and project management. Two hours lecture, 3 hours lab.

Prerequisite: MATH 1220 or ACT Math =>25 or SAT Math Section =>590 or ACCUPLACER College-Level Math =>69.

Pre- or corequisite: ENG 120 or MATH 1230 or MATH 1240 or MATH 1250 or MATH 1430 or MATH 1440 or MATH 1512 or MATH 1522 or MATH 2531.

---

217. Energy, Environment and Society. (3)

(Also offered as GEOG 217)

A look at the social, ethical, and environmental impacts of energy use both now and through history. A survey of renewable energy and conservation and their impact on environmental and social systems.

Meets New Mexico General Education Curriculum Area 4: Social and Behavioral Sciences.

260L. Mechanical Engineering Design II. (3)

The design process, project management, shop practice CNC and rapid prototyping, design economics and engineering ethics. Two hours lecture, 3 hours lab.

Prerequisite: 160L.

Pre- or corequisite: CHEM 1215 and CHEM 1215L.

---

301. Thermodynamics. (3)

Thermodynamic equilibrium, thermodynamic properties and equations of state. First and second laws of thermodynamics and their applications to engineering systems. Availability and irreversibility and their application to second law analysis.

Prerequisite: CHEM 1215 and CHEM 1215L and MATH 2531 and PHYS 1320.

Restriction: admitted to B.S.M.E. Mechanical Engineering.

****302. Applied Thermodynamics. (3)**

Thermodynamic relations, thermodynamic properties of mixtures, psychrometrics, thermodynamics of chemical reactions, phase and chemical equilibrium, thermodynamics cycles and design of energy systems.

Prerequisite: 301.

Restriction: admitted to School of Engineering.

---

306. Dynamics. (3)

Principles of dynamics. Kinematics and kinetics of particles, systems of particles and rigid bodies.

Prerequisite: CE 202 and MATH 2531.

Restriction: admitted to School of Engineering.

****317L. Fluid Mechanics. (4)**

Fluid statics. Control volume forms of continuity, momentum and energy. Pipe flow and turbomachinery. Introduction to boundary layers and turbulent flow. Laboratory experiments and demonstrations of basic concepts.

Prerequisite: 306 and 318L and MATH 2531 and MATH **316.

Pre- or corequisite: 301.

Restriction: admitted to B.S.M.E. Mechanical Engineering.

318L. Mechanical Engineering Laboratory. (4)

Measurement techniques and instrumentation for experiments in mechanical engineering, report writing, basic concepts of probability and statistics, discrete and continuous probability distributions, test statistics, classical and robust test of significance, measurement and uncertainty, design of experiments, regression analysis, applications in analysis of engineering experiments.

Prerequisite: MATH 2531 and PHYS 1320.

Pre- or corequisite: ECE 203 and MATH **316.

Restriction: admitted to B.S.M.E. Mechanical Engineering.

****320L. Heat Transfer. (4)**

Principles and engineering applications of heat transfer by conduction, convection and radiation. Laboratory experiments and demonstrations of fundamental heat transfer concepts.

Prerequisite: 301 and **317L and MATH **316.

Restriction: admitted to School of Engineering.

---

350. Engineering Economy. (3)

(Also offered as CE 350)

A study of methods and techniques used in determining comparative financial desirability of engineering alternatives. Includes time value of money (interest), depreciation methods and modern techniques for analysis of management decisions.

Prerequisite: MATH 1430 or MATH 1512.

Restriction: admitted to School of Engineering and junior or senior standing.

352L. Materials Laboratory. (1)

The effects of microstructure, processing, composition and thermal treatment on physical and mechanical properties of engineering materials will be investigated. A variety of materials will be processed, tested and microscopically studied in the laboratory.

Pre- or corequisite: 260L and CE 302.

Restriction: admitted to School of Engineering.

353L. Fluid Mechanics Lab. (1)

Laboratory experiments and demonstrations of basic concepts of fluid mechanics.

Prerequisite: 306 and 318L and MATH 2531 and MATH **316.

Corequisite: 301.

Restriction: admitted to School of Engineering.

354L. Heat Transfer Laboratory. (1)

Laboratory experiments and demonstrations of fundamental heat transfer concepts.

Prerequisite: 301 and **317L and MATH **316.

Restriction: admitted to School of Engineering.

---

357. Introduction to Mechanical Vibrations. (3)

Free and forced vibrations of one and two degrees of freedom systems for both steady state and transient forcing. Also vibrations of selected continuous systems and balancing.

Prerequisite: 306 and MATH **316.

Restriction: admitted to School of Engineering.

360L. Mechanical Engineering Design III. (3)

Finite element analysis and its use in the design process, validation of FEA results, CAD, engineering ethics, design economics and project management. Two hours of lecture, 3 hours of lab.

Prerequisite: 260L and CE 302 and MATH 2531 and MATH **316.

Restriction: admitted to School of Engineering.

****365. Heating, Ventilating and Air Conditioning Systems. (3)**

Methods of analysis and design of systems for conditioning of spaces for people and equipment.

Prerequisite: **320L.

Restriction: admitted to School of Engineering.

370L. Engineering Materials Science. (4)

The structure of matter and its relation to mechanical properties. Mechanical behavior of structural materials: metals, ceramics and polymers.

Prerequisite: 260L and CE 302.

Restriction: admitted to B.S.M.E. Mechanical Engineering.

****380. Analysis and Design of Mechanical Control Systems. (3)**

System dynamics and modeling; transfer functions; concept of feedback and system stability; transient and steady-state response; control system analysis and design using root locus and frequency response methods.

Prerequisite: 357 and MATH **316.

Restriction: admitted to B.S.M.E. Mechanical Engineering and senior standing.

---

400 / 500. Numerical Methods in Mechanical Engineering. (3)

Computer algebra, nonlinear equations, systems of linear equations, the eigen value problem, numerical integration and differentiation, initial value problems, boundary value problems; applications to model problems in solid mechanics, fluid mechanics and heat transfer.

Prerequisite: **317L and **320L and CE 302 and MATH **316.

Restriction: admitted to School of Engineering.

---

401 / 501. Advanced Mechanics of Materials. (3)

(Also offered as CE 501)

State of stress and strain at a point, stress-strain relationships; topics in beam theory such as unsymmetrical bending, curved beams, and elastic foundations; torsion of noncircular cross-sections, energy principles.

Prerequisite: CE 302.

Restriction: admitted to B.S.M.E. Mechanical Engineering and senior standing.

---

404 / 504. Computational Mechanics. (3)

Weak formulations of governing equations in solid mechanics, fluid mechanics, and heat conduction. Finite element equations in two and three-dimensions. Numerical algorithms for static and time-dependent cases.

Prerequisite: MATH **312 and ENG 130L.

Restriction: admitted to School of Engineering.

---

405 / 505. High Performance Engines. (3)

Students will capitalize on 1) applications of engineering fundamentals to engine operation and design; 2) implementation of computing and information technology for modeling, simulation, visualization, and design; and 3) case studies of “famous” racing engines.

Prerequisite: 301 or CBE 302.

Restriction: admitted to School of Engineering.

406L. Formula SAE Racecar Design. (4)

Design a racecar capable of participation in Formula SAE international competition including acceleration, autocross and endurance events. Vehicles are judged on performance, cost and design. Project management, vehicle dynamics, tires, brakes, suspension and steering are covered.

Restriction: admitted to School of Engineering and junior or senior standing.

---

407. Formula SAE Racecar Fabrication Lab. (3)

Manufacture vehicle designed in 406. Make project management decisions on build or buy balancing cost, performance and schedule. Use CAD/CAM extensively to design, machine and fabricate complex parts. Plan integrated drivers’ training and test programs.

Prerequisite: 357 and (406L with grade of "B" or better).

Restriction: admitted to School of Engineering.

---

408. Formula SAE Racecar Test Lab. (3)

Implement testing program to validate vehicle design fabricated in ME 407 using state of the art data acquisition equipment. Modify and redesign as required. Continue drivers' training program. Prepare car for Formula SAE international competition.

Prerequisite: 407 with a grade of "B" or better.

Restriction: admitted to School of Engineering.

---

416 / 516. Applied Dynamics. (3)

Kinematics and kinetics of a particle and systems of particles; Lagrange's equations; three-dimensional dynamics of rigid bodies.

Prerequisite: 306 and 357 and MATH **316.

Restriction: admitted to School of Engineering.

---

417 / 517. Fundamentals of Microsystems Fabrication. (3, may be repeated once Δ)

Through hands-on labs, teamwork, and interactive lectures, the student can expect to be provided with an overview of fundamental microsystems fabrication methods, process optimization, and characterization found in micromachining technologies in a cleanroom environment.

Restriction: senior standing.

---

418 / 518. Foundations of Microsystems Design. (3)

Learn about MEMS design through prior art research, specifications of MEMS design, transduction mechanisms used in MEMS, mask design, materials, project-based learning, and commercial case studies.

Restriction: admitted to School of Engineering and senior standing.

---

419 / 519. Advanced Micro- and Nanosystems Engineering. (4)

(Also offered as NSMS 519)

Lectures and laboratory projects on physical theory, design, analysis, fabrication, and characterization of micro and nanosystems. Special attention given to scaling effects involved with operation of devices at nano and microscale.

Restriction: admitted to School of Engineering and senior standing.

---

429 / 529. Gas Dynamics. (3)

One and two-dimensional compressible flow of ideal gases including shock compressible flow along with applications, including numerical and experimental methods.

Prerequisite: 301 and **317L.

Restriction: admitted to School of Engineering.

---

435 / 535. Introduction to Computational Fluid Dynamics. (4, may be repeated once Δ)

The course introduces basic steps and best practices of simulating engineering flows using methods and tools of computational fluid dynamics as well as the basics of programming in FORTRAN and data post-processing.

Prerequisite: **317L and (MATH **311 or MATH **314) and MATH **312.

---

436 / 536. Rotor Aerodynamics. (3)

Rotary-wing aircraft such as, for example, helicopters, have unique abilities to take off vertically and to hover. The course will cover basic methods of rotor aerodynamic analysis and related issues associated with the helicopter performance.

Prerequisite: **317L and MATH 311.

451–452. Undergraduate Problems. (1-3 to a maximum of 6 Δ; 1-3 to a maximum of 6 Δ)

A project of an original nature carried out under faculty supervision. A student may earn 451 or 452 credit for an industrial project by prearranging approval of the project by a faculty advisor and the department chairperson.

Restriction: admitted to B.S.M.E. Mechanical Engineering and senior standing.

---

459. Mechanical Engineering Design IV. (3)

Review of stresses. Statistical considerations. Methods of design for static and fatigue strength. Design of machine elements such as bolts, welded joints, springs, bearings, belts, chains, clutches, brakes and shafts.

Prerequisite: CE 302.

Restriction: admitted to School of Engineering.

---

460. Mechanical Engineering Design V. (4)

Capstone design course for Mechanical Engineering students. Students work in teams to design complete engineering systems. Considerations include technical solution, function, manufacturability, cost, safety and standards, and materials. Written and oral presentation skills are emphasized.

Co-requisites: **320L and **380 and 459.

Restriction: admitted to School of Engineering.

461–462 / 561–562. Special Topics. (1-4, no limit Δ; 1-4, no limit Δ)

Formal course work on special topics of current interest.

Restriction: admitted to B.S.M.E. Mechanical Engineering and senior standing.

---

463. Undergraduate Honors Thesis. (3)

Independent project of an original nature carried out under faculty supervision, in partial fulfillment of Departmental Honors designation.

Restriction: admitted to School of Engineering and permission of instructor.

---

471 / 571. Advanced Materials Science. (3)

This course covers advanced treatments of the science of engineering materials and mechanical behavior of materials. Examples are crystal structures, defects, micro mechanisms of deformation, thermodynamic and kinetic processes, and structure-processing-property relations of engineering materials.

Prerequisite: 370L.

Restriction: admitted to School of Engineering.

---

472 / 572. Aerospace Structures and Materials. (3 [3, may be repeated twice Δ])

This online course is devoted to structural analysis and material behavior pertaining to modern aircraft and spacecraft.

Prerequisite: 370L.

---

480 / 580. Dynamic System Analysis. (3)

Mathematical modeling of continuous and discrete systems (mechanical, hydraulic, electric, electro-mechanical, thermal, etc.). Analysis of state equations. Controllability, observability and stability.

Prerequisite: **380 and (MATH **314 or MATH **321).

Restriction: admitted to School of Engineering.

---

481 / 581. Digital Control of Mechanical Systems. (3)

Analysis and design of feedback systems in which a digital computer is used as the real-time controller. Design methods will include transform-based techniques using the Z-transform and time-domain techniques using the state-space approach.

Prerequisite: **380.

Restriction: admitted to School of Engineering.

---

482 / 582. Robot Engineering. (3)

Robot geometry, resolution, accuracy and repeatability, kinematic design of robots, Denavit-Hartenberg homogeneous transformations, direct and inverse kinematics and solutions, motion trajectories, differential tracking, force and compliant analysis, robotic control and programming.

Restriction: admitted to School of Engineering and senior standing.

---

486 / 586. Design for Manufacturability. (3)

Introduction to methods of design for manufacturability. Emphasis is on teamwork and designing your customer’s needs. This is achieved through statistical methods and computer based systems.

Restriction: admitted to B.S.M.E. Mechanical Engineering and senior standing.

---

500 / 400. Numerical Methods in Mechanical Engineering. (3)

Computer algebra, nonlinear equations, systems of linear equations, the eigen value problem, numerical integration and differentiation, initial value problems, boundary value problems; applications to model problems in solid mechanics, fluid mechanics and heat transfer.

---

501 / 401. Advanced Mechanics of Materials. (3)

(Also offered as CE 501)

State of stress and strain at a point, stress-strain relationships; topics in beam theory such as unsymmetrical bending, curved beams and elastic foundations; torsion of noncircular cross-sections, energy principles.

504 / 404. Computational Mechanics. (3)

Weak formulations of governing equations in solid mechanics, fluid mechanics, and heat conduction, Finite element equations in two and three-dimensions. Numerical algorithms for static and time-dependent cases.

---

505 / 405. High Performance Engines. (3)

Students will capitalize on 1) applications of engineering fundamentals to engine operation and design; 2) implementation of computing and information technology for modeling, simulation, visualization, and design; and 3) cases studies of “famous” racing engines.

Prerequisite: Engineering Thermodynamics equivalent to ME 301.

---

512. Introduction to Continuum Mechanics. (3)

Vector and tensor analysis, kinematics of continua, equations of motion, first and second laws of thermodynamics, constitutive equations for elastic solids and compressible viscous fluids.

---

516 / 416. Applied Dynamics. (3)

Kinematics and kinetics of a particle and systems of particles; Lagrange’s equations; three-dimensional dynamics of rigid bodies.

---

517 / 417. Fundamentals of Microsystems Fabrication. (3, may be repeated once Δ)

Through hands-on labs, teamwork, and interactive lectures, the student can expect to be provided with an overview of fundamental microsystems fabrication methods, process optimization, and characterization found in micromachining technologies in a cleanroom environment.

---

518 / 418. Foundations of Microsystems Design. (3)

Learn about MEMS design through prior art research, specifications of MEMS design, transduction mechanisms used in MEMS, mask design, materials, project-based learning, and commercial case studies.

---

519 / 419. Advanced Micro- and Nanosystems Engineering. (4)

(Also offered as NSMS 519)

Lectures and laboratory projects on physical theory, design, analysis, fabrication, and characterization of micro and nanosystems. Special attention given to scaling effects involved with operation of devices at nano and microscale.

---

520. Advanced Thermodynamics I. (3)

Precise development of thermodynamic definitions, fundamental relations, equilibrium conditions, Legendre transformation and thermodynamic potentials. Maxwell relations, stability of thermodynamic systems, properties of materials, introduction to irreversible thermodynamics.

---

521. Thermal System Design and Optimization. (3)

Review of thermal sciences, optimization methods, introduction to thermal design and optimization, design of different thermal systems such as heat exchanger, energy conversion, heat transfer enhancement, Cryogenics, micro-electronic cooling. Environmental issues and thermoeconomics.

Prerequisite: 301 and **317L and **320L.

---

529 / 429. Gas Dynamics. (3)

One and two-dimensional compressible flow of ideal gases including shock compressible flow along with applications, including numerical and experimental methods.

Prerequisite: 301 and **317L.

---

530. Theoretical Fluid Mechanics I. (3)

Derivation of the Navier-Stokes equations. Introduction to two- and three-dimensional potential flow theory; viscous flow theory, including the development of Prandtl boundary-layer equations and the momentum integral approach, and compressible flow theory, including thermodynamics of shock waves, friction and heat addition.

---

534. Boundary Layers. (3)

Derivation of boundary layer equations, similarity solutions, integral methods and experimental results for laminar boundary layers. Stability of laminar boundary layers. Boundary layer transition. Turbulent fluctuations and transport.

Prerequisite: 530.

---

535 / 435. Introduction to Computational Fluid Dynamics. (4, may be repeated once Δ)

The course introduces basic steps and best practices of simulating engineering flows using methods and tools of computational fluid dynamics as well as the basics of programming in FORTRAN and data post-processing.

---

536 / 436. Rotor Aerodynamics. (3)

Rotary-wing aircraft such as, for example, helicopters, have unique abilities to take off vertically and to hover. The course will cover basic methods of rotor aerodynamic analysis and related issues associated with the helicopter performance.

Prerequisite: **317L and MATH 311.

---

540. Elasticity. (3)

Field theory of elasticity; Saint Venants problems; introduction to plane theory of elasticity.

Prerequisite: 512.

---

542. Deformation Analysis and Modeling. (3)

Fundamental skills for applying finite element modeling to analyze deformation of materials, with emphasis on thin film systems, device components, and composite materials under mechanical and thermal loading.

551–552. Problems. (1-3 to a maximum of 6 Δ; 1-3 to a maximum of 6 Δ)

---

559. Design Project. (3)

Independent work under the guidance of the student's Committee-on-Studies in support of the Project course requirement of the Plan II (non-Thesis) M.S. degree.

561–562 / 461–462. Special Topics. (1-4, no limit Δ; 1-4, no limit Δ)

---

571 / 471. Advanced Materials Science. (3)

This course covers advanced treatments of the science of engineering materials and mechanical behavior of materials. Examples are crystal structures, defects, micro mechanisms of deformation, thermodynamic and kinetic processes, and structure-processing-property relations of engineering materials.

Prerequisite: 370L.

---

572 / 472. Aerospace Structures and Materials. (3 [3, may be repeated twice Δ])

This online course is devoted to structural analysis and material behavior pertaining to modern aircraft and spacecraft.

---

580 / 480. Dynamic System Analysis. (3)

Mathematical modeling of continuous and discrete systems (mechanical, hydraulic, electric, electro-mechanical, thermal, etc.). Analysis of state equations. Controllability, observability and stability.

---

581 / 481. Digital Control of Mechanical Systems. (3)

Analysis and design of feedback systems in which a digital computer is used as the real-time controller. Design methods will include transform-based techniques using the Z-transform and time-domain techniques using the state-space approach.

---

582 / 482. Robot Engineering [Robot Engineering II]. (3)

Robot geometry, resolution and repeatability, kinematic design of robots, Denavit-Hartenberg homogeneous transformations, direct and inverse; kinematics and solutions, motion trajectories, differential tracking, force and compliant analyses, dynamics, control and programming.

---

586 / 486. Design for Manufacturability. (3)

Introduction to methods of design for manufacturability (DEM). Emphasis is on team work and designing to your customers needs. This is achieved through statistical methods and computer based systems.

591–592. Seminar. (0-1, no limit Δ; 0-1, no limit Δ)

Offered on a CR/NC basis only.

---

594. Introduction to Space Situational Awareness. (3)

This course introduces engineering students to the space environment, the space object population, and methods used for system description and prediction.

---

595. Orbital Mechanics. (3)

Fundamentals of the orbital mechanics of artificial and natural satellites, emphasizing analysis, prediction, and control of the orbital mechanics of spacecraft.

Prerequisite: 306 or MATH **316.

---

596. Spacecraft Attitude Dynamics and Control. (3)

Space missions and how pointing requirements affect attitude control systems. Rotational kinematics and attitude determination algorithms. Modeling and analysis of the attitude dynamics of space vehicles.

Prerequisite: **380.

---

597. Small Spacecraft Design I. (3)

The course covers the fundamentals of each of the subsystems in a spacecraft, from propulsion to the spacecraft structure and from attitude determination and control to thermal control of spacecraft.

---

599. Master's Thesis. (1-6, no limit Δ)

Offered on a CR/NC basis only.

---

634. Turbulent Flows. (3)

Turbulent flow with emphasis on thin-shear layer flow and mixing processes. Phenomenological descriptions of turbulent closure schemes and modeling techniques. Instability and transition. Numerical schemes for solving incompressible and compressible turbulent boundary layer and free turbulence equations.

Prerequisite: 534.

---

699. Dissertation. (3-12, no limit Δ)

Offered on a CR/NC basis only.

Course Search:

Filter by Subject

View Courses

Submit

Keyword Search:

Keyword Submit

Office of the Registrar
MSC11 6325
1 University of New Mexico
Albuquerque, NM 87131

Phone: (505) 277-8900
Fax: (505) 277-6809