B.S. in Mechanical Engineering
Degree Program Handbook
(Fall 2015)

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

Compiled by: Tariq Khraishi
            Director of Undergraduate Programs
(update date: 11/9/2015, v2)
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 Services (ESS) 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: Calculus I (Math 162) (4), Calculus II (Math 163) (4), General Physics I (Phys I) (3), ME 160L (Mechanical Engineering Design I) (3). Four other credit hours can be taken from: CS151L (Computer Programming Fundamentals for Non-Majors) (3), Chem121 (General Chemistry I) (3), Chem123L (General Chemistry Laboratory I) (1), and Phys160L (General Physics I Laboratory) (1). Note that, as of Fall 2015, all of the above listed courses are required as part of the BSME curriculum. 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 110 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.

4 Advisement

Pre-major engineering students who have indicated ME as their intended major are advised by the ME Undergraduate Advisor as needed (since their advisement falls normally on the Engineering Student Services academic advisors/staff). 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:

a. an ability to apply their knowledge of mathematics, science, and engineering
b. an ability to design and conduct experiments as well as analyze and interpret data
c. an ability to design a system, component, or process that meets desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. an ability to function in multi-disciplinary teams
e. an ability to identify, formulate, and solve engineering problems
f. an understanding of professional and ethical responsibility
g. an ability to communicate effectively
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i. a recognition of the need for and an ability to engage in life-long learning
j. a knowledge of contemporary issues
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

7 The BSME Curriculum

The BSME Curriculum is shown in Figure 1. 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 2015
Total credit hours required for graduation: 124

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td><strong>Freshman - 1st semester 17 credit hours</strong></td>
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<tr>
<td>Chem 121 General Chemistry I (3)</td>
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<tr>
<td>Chem 123L General Chemistry I Lab (1)</td>
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<tr>
<td>Engl 110 Accelerated Composition (3)</td>
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<tr>
<td>ME 160L Mech Engr Design I (3)</td>
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<tr>
<td>Math 162 Calculus I (4)</td>
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<tr>
<td>Core Fine Arts Elective (3)</td>
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<tr>
<td><strong>Sophomore - 1st semester 16 credit hours</strong></td>
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<tr>
<td>ME 260L Mech Engr Design II (3)</td>
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<tr>
<td>CE 202 Engineering Statics (3)</td>
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<tr>
<td>Phyc 161 General Physics II (3)</td>
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<td>Math 264 Calculus III (4)</td>
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<tr>
<td>ME 217 Energy, Enviro, and Soc(3)</td>
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<tr>
<td><strong>Junior - 1st Semester 16 credit hours</strong></td>
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<tr>
<td>ME 317L Fluid Mech (4)</td>
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<tr>
<td>ME 301 Thermodynamics (3)</td>
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<td>CE 302 Mechanics of Materials (3)</td>
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<tr>
<td>Math Elective (3)</td>
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<tr>
<td>Core Humanities Elective (3)</td>
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<tr>
<td><strong>Senior - 1st semester 13 credit hours</strong></td>
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<tr>
<td>ME 320L Heat Transfer (4)</td>
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<tr>
<td>ME 459 Mech Engr Design IV (3)</td>
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<tr>
<td>ME 380 Mech Control Systems (3)</td>
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<tr>
<td>Mech Engr Elective (3)</td>
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<tr>
<td><strong>Freshman - 2nd semester 17 credit hours</strong></td>
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<tr>
<td>Engl 120 Composition III (3)</td>
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<tr>
<td>Phyc 160 General Physics I (3)</td>
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<td>Phyc 160L General Physics I Lab (1)</td>
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<tr>
<td>Math 163 Calculus II (4)</td>
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<tr>
<td>CS 151L Computer Prog Fund (3)</td>
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<tr>
<td>Core Humanities Elective (3)</td>
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<tr>
<td><strong>Sophomore - 2nd semester 16 credit hours</strong></td>
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<tr>
<td>ME 306 Dynamics (3)</td>
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<td>ECE 203L Circuit Analysis (3)</td>
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<td>Math 316 Applied Ord Diff Eqns (3)</td>
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<td>ME 318L Mech Engr Lab (4)</td>
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<td>Core Writing &amp; Speaking Elective (3)</td>
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<tr>
<td><strong>Junior - 2nd semester 16 credit hours</strong></td>
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<tr>
<td>ME 360L Mech Engr Design III (3)</td>
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<tr>
<td>ME 357 Intro to Mech Vibrations (3)</td>
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<tr>
<td>ME 370L Engr Materials Science (4)</td>
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<tr>
<td>Econ 105 Intro to Macroeconomics (3)</td>
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<tr>
<td>Core Second Language Elective (3)</td>
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<tr>
<td><strong>Senior - 2nd semester 13 credit hours</strong></td>
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<tr>
<td>ME 460 Mech Engr Design V (4)</td>
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<tr>
<td>Technical Elective (3)</td>
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<tr>
<td>Mech Engr Elective (3)</td>
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<tr>
<td>Mech Engr Elective (3)</td>
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</tbody>
</table>
**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.

**Senior - 1st semester 13 credit hours**
- ME 320L Heat Transfer (4)
- ME 459 Mech Engr Design IV (3)
- ME 380 Mech Control Systems (3)
- ME 407 FSAE II (3)

**Junior - 2nd semester 17 credit hours**
- ME 360L Mech Engr Design III (3)
- ME 357 Intro to Mech Vibrations (3)
- ME 370L Engr Materials Science (4)
- Econ 105 Intro to Macroeconomics (3)
- ME 406L FSAE I (4)

**Senior - 2nd semester 12 credit hours**
- ME 408 FSAE III (3)
- Technical Elective (3)\(^1\)
- Mech Engr Elective (3)\(^1\)
- Core Second Language Elective (3)

1 “Mechanical Engineering Electives” includes all Mechanical Engineering elective courses 300 level and above.

2 “Math Elective” course must be selected from Math 311, 312, 313, 314, 321, or Stat 345.

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.
Core Curriculum Electives for ME Students

The Core Curriculum electives are given in the following UNM link for Fall 2015: http://unmcore.unm.edu/common/images/unm-core-curriculum.pdf. 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: English 101 (or 110) & 102 (or 120), Math 162 (or 163), Chemistry 121 (or 123L), Physics 160 (or 160L), American Studies 182, and Economics 105.
## UNM CORE CURRICULUM WORKSHEET

All UNM Students are required to complete the Core Curriculum as part of their baccalaureate (Bachelor’s) degree program. There are VERY limited, specific exceptions allowed, and only for certain specific colleges or majors. **Unless noted, all courses are one semester in length and all courses are 3 credit hours.**

A **GRADE OF C (NOT C-) IS NEEDED FOR ALL COURSES TO SATISFY THE CORE REQUIREMENT.**

### AREA 1: WRITING AND SPEAKING – 9 credit hours required, including English 110, English 120 and 1 additional course.

| Pre-Fall 2014: ENGL 101: Composition 1 | ENGL 110: Composition 1 | ENGL 113: Enhanced Composition |
| Pre-Fall 2014: ENGL 102: Composition 2 | ENGL 111 & 112: Composition 1 & 2 (2 Semesters) | ENGL 120: Composition 3 |

All Students are required to demonstrate competency in English 120 and complete one additional course from the following:

| ENGL 219: Technical Writing | CIJ 130: Public Speaking | UHON 201: Rhetoric and Discourse |
| ENGL 220: Expository Writing | PHI 156: Reasoning & Critical Thinking |

### AREA 2: MATHEMATICS – 3 credit hours required. Choose one course from the following:

| MATH 121: College Algebra | MATH 150: Pre-Calculus | MATH 180: Elements of Calculus |
| MATH 129: Survey of Mathematics | MATH 153: Pre-Calculus & Trigonometry (5cr) | MATH 181: Elements of Calculus 2 |
| MATH 215: Math for Elementary Teachers 3 | MATH 162: Calculus 1 (4cr) | STAT 145: Intro to Statistics |
| MATH 163: Calculus 2 (4cr) | MATH 164: Calculus 3 (4cr) |

### AREA 3: PHYSICAL AND NATURAL SCIENCES – 7 credit hours required. Choose two courses from the following:

| ANTH 120: Arch Method & Theory | CHEM 101: Chemistry in Our Community | PHYS 102: Introduction to Physics |
| ANTH 122L: Required Lab for ANTH 120 (1cr) | CHEM 111: Elem of General Chemistry (4cr) | PHYS 102L: Opt Lab for PHYS 102 (1cr) |
| Pre-Spring 2013: ANTH 121L: Arch M & T (4cr) | CHEM 121: General Chemistry 1 | PHYS 105: Physics and Society |
| ANTH 150: Evolution & Human Emergence | CHEM 123L: Req Lab for CHEM 121 and 131 (1cr) | PHYS 151: General Physics |
| ANTH 151L: Opt Lab for ANTH 150 (1cr) | CHEM 122: General Chemistry 2 | PHYS 151L: Opt Lab for PHYS 151 (1cr) |
| ANTH 160: Human Life Course | CHEM 124L: Req Lab for CHEM 122 and 132 (1cr) | PHYS 152: General Physics |
| ANTH 161L: Opt Lab for ANTH 160 (1cr) | CHEM 131: Principles of Chemistry (3cr) | PHYS 152L: Opt Lab for PHYS 152 (1cr) |
| ASTR 101: Intro to Astronomy | CHEM 132: Principles of Chemistry (3cr) | PHYS 160: General Physics |
| ASTR 101L: Opt Lab for ASTR 101 (1cr) | EPS 101: Intro to Geology | PHYS 160L: Opt Lab for PHYC 160 (1cr) |
| BIOC 101: Biology for Non-Majors | EPS 105L: Opt Lab for EPS 101 (1cr) | PHYS 161: General Physics |
| BIOC 112L: Opt Lab for BIOL 110 (1cr) | EPS 201L: Earth History (4cr) | PHYS 161L: Opt Lab for PHYC 161 (1cr) |
| BIOC 121L: Principles of Biology (4cr) | ENVS 101: The Blue Planet | *NTSC 261L: Physical Science (4cr) |
| BIOC 122L: Principles of Biology (4cr) | ENVS 102L: Opt Lab for ENVS 101 (1cr) | *NTSC 262L: Life Science (4cr) |
| BIOC 123: Bio for Health-Related Sciences | GEOG 101: Physical Geography | *NTSC 263L: Environmental Science (4cr) |
| BIOC 134L: Opt Lab for BIOL 123 (1cr) | GEOG 105L: Opt Lab for GEOG 101 (1cr) | UHON 203: Science in the 21st Century |
| BIOC 135L: Intro to Macromolecules | *ME/GEOG 217: Energy, Environment & Society # |
| ECON 106: Intro to Comparative and Global Ethnic Societies # | | |

*ENGL 200 and ME 217 cannot both be taken towards Social and Behavioral Sciences core.

### AREA 4: SOCIAL AND BEHAVIORAL SCIENCES – 6 credit hours required. Choose two courses from the following:

| AFST/CSS/NATV/SUST/WNST 109: Intro to Comparative and Global Ethnic Societies # | ECON 106: Intro to Microeconomics | PSY 105: General Psychology |
| AMST 182: Intro to Env Sci & Technology | COP 101: Intro to Environmental Problems | POLS 110: The Political World |
| AMST 185: Race, Class & Ethnicity # | CRP 181: Intro to Environmental Problems | POLS 200: American Politics |
| ANTH 101: Intro to Anthropology | *ENG 200: Technology in Society # | POLS 220: Comparative Politics |
| ANTH 130: Cultures of the World # | GEOG 102: Human Geography # | POLS/PCT 240: International Politics # |
| ANTH 220: World Archaeology | UHON 210: Intro to Linguistics | SOC 101: Intro to Sociology # |
| ECON 105: Intro to Macromacromolecules | *ME/GEOG 217: Energy, Environment & Society # | SOC 216: Dynamics of Prejudice # |

### AREA 5: HUMANITIES – 6 credit hours required. Choose two courses from the following:

| AFST 104: Intro to African Studies # | ENGL 150: Study of Literature | NATV 150: Intro to Native American Studies # |
| AMST 186: Intro to Southwest Studies # | ENGL 292: World Lit: Ancient World - 16th Century # | MLNG 101: Languages and Cultures # |
| AMST/CSS/NATV 201: Intro to Chicana & Chicano Studies # | ENGL 293: World Lit: 17th Century through Present # | PHIL 101: Intro to Philosophical Problems # |
| CLST 107: Greek Mythology | GEOG 140: World Regional Geography # | PHIL 201: Greek Thought |
| CLST 204: Greek Civilization | HIST 101: Western Civilization (to 1648) # | PHIL 202: From Descartes to Kant |
| CLST 205: Roman Civilization | HIST 102: Western Civilization (from 1648) # | RELG 107: Living World Religions # |
| Pre-Fall 2012 CLCS 223/224 Lit Questions | HIST 161: History of the US to 1877 | RELG 263: Eastern Religions # |
| COMP 222: Fairy and Folk Tales | HIST 162: History of US since 1877 | RELG 264: Western Religions # |
| COMP 224: Lit Questions | HIST 181: History of Early Latin America # | UHON - Legacy Seminar, 100 – 200 Level |
| | HIST 182: Modern Latin American History # | UHON 205: Humanities, Society & Culture |

### AREA 6: FOREIGN LANGUAGE – 3 credit hours required.

One course chosen from any lower-division non-English language offerings from the Department of Linguistics (including Sign Language), Spanish and Portuguese, Foreign Languages and Literatures, and foreign languages in other departments or programs (except Latin 105, Pre-Spring 2007).

Foreign Language Course: __________

### AREA 7: FINE ARTS – 3 credit hours required. Choose one from the following:

| ARCH 121: Intro to Architecture | DANC 105: Dance Appreciation | THEA 105: Intro to Theatre Appreciation |
| Pre-Fall 2010: ARCH 101: Intro to Architecture | FA 284: Experiencing the Arts | Pre-Fall 2010: THEA 122: Theatre Appreciation |
| ARTH 101: Intro to Art | MA 210: Intro to Film Studies | UHON 207: Fine Arts as Global Perspective |
| ARTH 201: History of Art 1 | MUS 139: Music Appreciation | Any 3 credit hour studio or performance course offered by the Dept. of Art & Art History, Music, Theatre & Dance, Media Arts, or IFDM will also complete Area 7 of core. |
| ARTH 202: History of Art 2 | MUS 142: Rock Music Appreciation |

# Denotes course that meets “U.S. and Global Diversity and Inclusion” 3-credit undergraduate degree requirement.

Course is no longer offered but will be accepted.

Prepared by ICONN 6/8/2015
9  Mechanical Engineering Courses

See the appendix for Mechanical Engineering courses.

10  Independent Study and Research Project Experience

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

**Chris Hall**
Professor and Department Chair
email: cdhall@unm.edu
Phone: 277.1325
Office: ME 202A
Area of Special Interest: Spacecraft Dynamics and Control, Spacecraft Design, and Nonlinear Dynamics

**Tariq Khraishi**
Professor
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

**Asal Naseri Kouzehgarani**
Lecturer
email: anaseri@unm.eduOffice: ME 323

**Zayd Leseman**
Associate Professor
email: zleseman@unm.edu
Phone: 277.4940
Office:ME 403
Area of Special Interest: Materials Science, Solid Mechanics, Biomechanics, Design

**Ron Lumia**
Professor
email: lumia@unm.edu
Phone: 272.7155
Office: ME 319
Area of Special Interest: Dynamic Systems and Control, Software for Manufacturing

**Andrea Mammoli**
Professor
email: mammoli@unm.edu
Phone: 277.9215
Office: ME 420
Area of Special Interest: Energy, Fluid Mechanics

Svetlana Poroseva
Assistant Professor
email: poroseva@unm.edu
Phone: 277.1493
Office: ME 422
Area of Special Interest: Turbulent Flows, Aerodynamics, Wind Energy, System Survivability, Integrated Systems, Uncertainty Quantification

Arsalan Razani
Professor
email: razani@unm.edu
Phone: 277.6251
Office: ME 332
Area of Special Interest: Thermal Sciences, Energy

John Russell
Professor
email: jjrussel@unm.edu
Phone: 277.1345
Office: ME 328
Area of Special Interest: Vibrations, Stability and Control of Dynamic Systems, Race Car Design

Yu-Lin Shen
Professor and Associate Chair
email: shenyl@unm.edu
Phone: 277.6286
Office: ME 202A
Area of Special Interest: Materials, Solid Mechanics

Francesco Sorrentino
Assistant Professor
email: fsorrent@unm.edu
Phone: 277-2349
FAX: 505-277-1571
Office: ME330
Area of Special Interest: Dynamics and control of complex networks, identification of nonlinear systems, 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.

Mehran Tehrani
Assistant Professor
email: mtehrani@unm.edu
Through these activities, students may obtain technical elective credits (ME451-2 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 Services.

15 Student Activities

Student organizations of the ME Department allow students to develop lasting friendships. The ME Department has an active 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 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 3.50 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. Failure to complete this form as indicated may delay graduation.
Mechanical Engineering

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.

Pre- or corequisite: ENG 120 or MATH 162.

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.

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 121 and CHEM 123L.

Restriction: B.S.M.E. majors only.

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 121 and 123L and PHYC 161 and MATH 163 and MATH 264.

Restriction: B.S.M.E. majors only and admitted to School of 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 264.

Restriction: admitted to School of Engineering.

314. Design of Machinery. (3)

Graphical and analytical techniques in kinematics and kinetics of linkages. Synthesis of linkages. Cam design.

Prerequisite: 306.

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 264 and MATH **316.

Corequisite: 301.

Restriction: B.S.M.E. majors only and admitted to School of 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 264 and PHYC 161.

Pre- or corequisite: ECE 203 and MATH **316.
Restriction: B.S.M.E. majors only and admitted to School of 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 162 or MATH 180.

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

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.

Corequisite: 370L.

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 264 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.

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 264 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, no limit ∆)**

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: ME majors and admitted to School of 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: ME majors and senior standing and admitted to School of Engineering.

**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.


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: ME majors and senior standing and admitted to School of Engineering.

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 CS 151L.

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 that will participate 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: B.S.M.E. majors and junior or senior standing and admitted to School of Engineering.

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 407 using state of the art data acquisition equipment. Modify and redesign as required. Continue drivers’ training program. Participate in 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.

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: senior standing admitted to School of Engineering.

**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.

**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: ME majors and senior standing and admitted to School of Engineering.

**455. Engineering Project Management. (3)**

(Also offered as CE 455)

Estimating, proposing, planning, scheduling, quality and cost control and reporting of an engineering project. Case studies of typical engineering projects. Small projects carried out by student teams.

Restriction: ME majors and senior standing and admitted to School of Engineering.

**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. (3)**

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.

Prerequisite: **320L and **380 and 459.

Restriction: admitted to School of Engineering.

**461 / 561 - 462 / 562. Special Topics. (1-4, no limit Δ, 1-4, no limit Δ)**
463. **Undergraduate Honors Thesis.** (3)

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

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

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.

Restriction: admitted to School of Engineering.

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: senior standing and admitted to School of Engineering.

485 / 585. **Modern Manufacturing Methods.** (3)

Study of business of manufacturing, emphasizing modern approaches. Topics include: U.S. manufacturing dilemma; JIT, kanban, pull manufacturing, quality; modeling; design for production; manufacturing economics; management issues; DIM; case studies.

Restriction: ME majors and senior standing and admitted to School of Engineering.

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.