

MECHANICAL ENGINEERING (ME BD)
Recommended Action Plan (RAP)
Bachelor of Science Degree
132-133 credits

| Fall Semester Freshman Year – 17 credits | | Credits | Spring Semester Freshman Year – 16 credits | | Credits |
|---|---|---------|---|---|---------|
| ¹ EDSGN 100S | <i>Intro to Engr Design (FYS)</i> | 3 | <i>CMPSC 200</i> | <i>Programming for Engr with C++ (GQ)</i> | 3 |
| CHEM 110 | Chemical Principles I (GN) | 3 | <i>ECON 2 or 4</i> | <i>Microec or Macroec Anly (GS)</i> | 3 |
| <i>CHEM 111</i> | <i>Experimental Chemistry I (GN)</i> | 1 | MATH 141 | Calculus II (GQ) | 4 |
| <i>ENGL 015</i> | <i>Rhetoric and Composition (GWS)</i> | 3 | MATH 220 | Matrices (GQ) | 2 |
| MATH 140 | Calculus I (GQ) | 4 | PHYS 211 | Physics: Mechanics (GN) | 4 |
| <i>GA,GH, or GS, From General Education List</i> | | 3 | | | |
| | | | | | |
| Fall Semester Sophomore Year – 16.5 credits | | Credits | Spring Semester Sophomore Year – 17 credits | | Credits |
| E MCH 211 | Statics | 3 | <i>E E 211</i> | <i>Electrical Circuits & Power Distribution</i> | 3 |
| <i>MATH 230</i> | <i>Calculus and Vector Analysis</i> | 4 | E MCH 212 | Dynamics | 3 |
| MATH 251 | Ord Partial Differential Equations | 4 | E MCH 213 | Strength of Materials | 3 |
| <i>PHYS 212</i> | <i>Physics: Elect/Magnetism (GN)</i> | 4 | M E 300 | Engineering Thermodynamics | 3 |
| <i>BB H/KINES, From University List (GHA)</i> | | 1.5 | <i>PHYS 214</i> | <i>Wave Motion and Quantum (GN)</i> | 2 |
| | | | <i>GA,GH, or GS, From General Education List</i> | | 3 |
| | | | | | |
| Fall Semester Junior Year – 16 or 17 credits | | Credits | Spring Semester Junior Year – 16 or 15 credits | | Credits |
| <i>ENGL 202C</i> | <i>Technical Writing (GWS)</i> | 3 | <i>CAS 100</i> | <i>Effective Speech (GWS)</i> | 3 |
| M E 320 | Fluid Flow | 3 | M E 357 | System Dynamics | 3 |
| M E 345W | Instrumentation, Meas & Statics | 4 | M E 367 | Machine Design | 3 |
| M E 347 | Computer-Aided Design | 3 | M E 410 | Heat Transfer | 3 |
| Students whose last name begins with A-La take | | | Students whose last name begins with A-La take both | | |
| M E 380 | Machine Dynamics | 3 | M E 365 | Materials Lab and | 1 |
| Students whose last name begins with Le-Z take both | | | MATSE 259 | Prop & Process of Engr Materials | 3 |
| M E 365 | Materials Lab and | 1 | Students whose last name begins with Le-Z take | | |
| MATSE 259 | Prop & Process of Engr Materials | 3 | M E 380 | Machine Dynamics | 3 |
| | | | | | |
| Fall Semester Senior Year – 16 credits | | Credits | Spring Semester Senior Year – 16.5 credits | | Credits |
| M E 468 | Engr for Manufacturing | 3 | M E 449 | Mechanical Design Projects | 3 |
| M E xxx | M E Lab Elective, Program List | 1 | <i>BB H/KINES, From University List (GHA)</i> | | 1.5 |
| M E 448 | Engr Design Concepts | 3 | <i>GA,GH, or GS, From General Education List</i> | | 3 |
| <i>GA,GH, or GS, From General Education List</i> | | 3 | <i>GA,GH, or GS, From General Education List</i> | | 3 |
| Tech Elective, Program List (300 or 400-level) | | 3 | Tech Elective, Program List (300 or 400-level) | | 3 |
| Tech Elective, Program List (300 or 400-level) | | 3 | Tech Elective, Program List (300 or 400-level) | | 3 |

Notes:

- **Bold type** indicates courses requiring a quality grade of C or better.
- *Italic* indicates courses that satisfy both major and General Education requirements.
- ***Bold italic*** indicates courses requiring a quality grade of C or better and that satisfy both major and General Education requirements.
- GWS, GHA, GQ, GN, GA, GH, and GS are codes used to identify General Education requirements.
- W is the code used to designate courses that satisfy University Writing Across the Curriculum requirements.
- If you have not completed two years of high school study of one foreign language and graduated in the year 2001 or later, you must also schedule 3-4 credits of college level foreign language (in addition to your program requirements).
- A ME BD student must complete general education requirements, the requirements for the major, the number of elective credits required, and earn at least a minimum 2.00 grade-point average.
- General education requirements include 6 credits of arts (GA), 6 credits of humanities (GH), 6 credits of social and behavioral sciences (GS), 3 credits of health and physical activity (GHA), 9 credits of natural sciences (GN), 9 credits of writing/speaking (GWS), and 6 credits of quantification (GQ).
- Also required are 3 credits of United States cultures (US), 3 credits of International Cultures (IL) which can be used to satisfy part of the general education requirements. A (USI) may count for either category, but not both.
- The School of Engineering Advising Handbook is on-line at <http://www.behrend.psu.edu/academic/engineering/PDFS/SchoolHandbook.pdf>
- University Undergraduate Advising Handbook is on-line at <http://www.psu.edu/dus/handbook/>.
- Requirement Web page <http://www.psu.edu/advising/requirements.htm>.
- Blue Book Web site <http://www.psu.edu/bulletins/bluebook/>.
- ¹Students starting at a location other than Behrend must take EDSGN 100 plus a seminar course.

School-Approved Electives for Mechanical Engineering 2009-10

ME BD students are required to take four 3-credit courses and one 1-credit lab (13 credits) of technical electives. Three of the 3-credit courses and the one 1-credit lab (10 credits) must be selected from one of the following thematic areas:

Thermal and Fluid Sciences

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|-----|--------|--|
| M E | 408(3) | Energy Systems (fall) |
| M E | 308(1) | Fluid Flow and Heat Transfer Lab (fall and spring) |

and any two of the following:

| | | |
|------|--------|--|
| M E | 428(3) | Applied Computational Fluid Dynamics (spring) |
| M E | 491(3) | Bioengineering in Mechanical Engineering (fall) |
| BIOL | 141(3) | Introductory Physiology* (only for students who take M E 491) (spring) |
| PHYS | 420(3) | Thermal Physics (spring) |

Mechanical Systems

| | | |
|-----|--------|--|
| M E | 370(3) | Vibrations (fall) |
| M E | 465(1) | Introduction to Manufacturing Laboratory (fall only) |

and any two of the following:

| | | |
|------|--------|--|
| M E | 467(3) | Applied Finite Element Analysis (fall and spring) |
| M E | 469(3) | Metallic Manufacturing Processes (spring) |
| M E | 491(3) | Bioengineering in Mechanical Engineering (fall) |
| M E | 497(3) | Automotive Engineering (spring) |
| BIOL | 141(3) | Introductory Physiology* (only for students who take M E 491) (spring) |

Business

| | | |
|------|--------|--|
| MGMT | 409(3) | Project Management for Engineers (fall and spring) |
| M E | 4xx(3) | Any of the above M E 400-level courses |
| M E | 465(1) | Introduction to Manufacturing Laboratory (fall only) |

and one of the following:

| | | |
|------|--------|---|
| MGMT | 301(3) | Basic Management Concepts (fall and spring) |
| SCM | 310(3) | Introduction to Operations Management (fall and spring) |

* A student who has already taken BIOL 141 to fulfill other requirements, such as the science requirement, should take another course from the above list.

The fourth 3-credit course can be selected from any of the above M E courses. Students in either the Thermal and Fluid Sciences or Mechanical Systems thematic may also select the fourth course from any of the above courses (not just M E) or from the following list of additional courses. Students in the Business thematic who are also enrolled in either the Operations/Supply Chain/ERP minor or the Technical Sales minor may substitute 400-level SCM courses for the 400-level M E courses.

Additional Courses (not available to students in the Business thematic)

| | | |
|-----|---------|--------------------------------|
| M E | *494(3) | Research Project |
| M E | *495(3) | Internship |
| M E | *496(3) | Independent Study |
| M E | *497(3) | Special Topics |
| MET | 452(3) | Rapid Prototyping (spring) |
| MET | 457(3) | Lean Manufacturing (fall) |
| MET | 306(3) | Computer-Aided Design (spring) |

| | | |
|-------|--------|--|
| Q C | 450(3) | Quality Control and Quality Improvement (spring) |
| E E | 482(3) | Introduction to Digital Control Systems |
| E E | 316(3) | Introduction to Embedded Microcontrollers |
| PHYS | 400(3) | Intermediate Electricity and Magnetism (not offered 09/10) |
| PHYS | 419(3) | Theoretical Mechanics (fall) |
| PHYS | 458(3) | Intermediate Optics (not offered 09/10) |
| PSYCH | 444(3) | Introductory Engineering Psychology (fall) |

*Selection of 494-497 courses requires written approval of the mechanical engineering faculty.

Students may petition the M E faculty for alternative thematic areas. The petition must include a justification as to why the proposed thematic enhances their professional development. Petitions should be submitted for approval before the first day of classes of the student's last semester prior to graduation.

Tentative Selected Mechanical Engineering Electives for 2009-10

Fall

M E 370 Vibrations (3 cr) Characteristics of dynamic systems with free or forced vibrations, both damped and undamped; includes matrix and/or finite element methods. Prerequisites: E MCH 212, CMPSC 201, MATH 220, MATH 251

M E 408 ENERGY SYSTEMS (3 cr) Theory, analysis, design, selection, and application of energy conversion systems. Prerequisites: M E 320, M E 410, M E 347.

MET 457 Lean Manufacturing (3 cr) Understand and implement lean manufacturing techniques in the manufacturing workplace. Topics will include historical significance, benchmarking, lean methods, implementation techniques, metrics, tracking changes, and continuous improvement. Lean methods will include Value Stream Mapping, Workplace organization (5S), Setup reduction (SMED, Poka-Yoke), Cellular manufacturing (JIT, Kanban), Total Preventive Maintenance (TPM). Class will include hands-on simulations and case studies from industry. Prerequisites: M E 468, 7th semester standing

M E 467 Applied Finite Elements (3 cr) Review of matrix algebra; discretization; finite element formulation; application of finite element computer codes. Prerequisites: M E 410, M E 347

M E 491 Introduction to Bioengineering (3 cr) This course serves as the first course in bioengineering. Different topics in bioengineering, such as motion biomechanics, physiological fluid mechanics, physiological modeling, rehabilitation engineering, etc, will be discussed. The focus of this course is how to apply the engineering knowledge in the context of life science. Prerequisites: E E 211, M E 320, M E 357, E MCH 213

MGMT 409 Project Management (3 cr) is offered as a technical elective and is specifically geared to engineering and engineering technology students. It is a problem based, interdisciplinary course studying the project management skills and techniques needed to manage projects in a modern business environment. A computer simulation using a quality improvement project will be used to enable students to practice project management and compete against other teams. Students will also learn additional teaming skills and tools. The course is specifically designed to enhance the business competencies desired of entry level employees as identified by survey results obtained from employers of SOE graduates and from SOE alumni. Prerequisites: 7th semester standing

PSYCH 444 Introductory Engineering Psychology (3 cr) Methods and results of experimental psychology pertinent to problems which involve man-machine relationships. Prerequisite: PSYCH 100, 6 credits of GQ or PSYCH.

Spring

M E 428 Applied Computational Fluid Dynamics (3 cr) Introduction to theory and application of computational techniques for solving fluid flow and heat transfer. Prerequisite: M E 320, M E 347, M E 410.

M E 469 Metal Manufacturing Processes (3 cr) This course focuses on theoretically calculating parameters for the various metal working processes (i.e - forces, power, tool life, etc.) and subsequently verifying these theoretical results through experimental testing. For example: students will learn theoretical techniques for calculating the friction, strain and forces in extruding metallic specimen at various temperatures. The class will then perform extrusion experiments in the laboratory under the same conditions and compare the theoretical and experimental results, discussing similarities and differences. Prerequisites: M E 468

ME 497: Automotive Engineering (3 cr) This elective course introduces students to the analysis and design of automotive components and systems. Focus will be directed to internal combustions engines, powertrains/drivelines, steering systems, suspensions systems, brakes, and vehicle's dynamics. To students, this course will be a unique opportunity to see the integration of previously-acquired knowledge from thermodynamics, selection of engineering materials, elements of machinery, principles of mechanical design, mathematical modelling of dynamic systems, and more; in one of the most diverse engineering sectors (Automotive). The nature of the course is both qualitative and quantitative, with more emphasis on the latter. Therefore, student evaluation is based on a set of short evenly-distributed qualitative quizzes, in addition to several team-oriented projects, each targeting one of the main topics covered throughout the course. Prerequisites: M E 357, ME 367, M E 380

MGMT 409 Project Management (3 cr) Same as MGMT 409 on previous page.

M E 467 Applied Finite Elements (3 cr) Same as M E 467 on previous page.