

Courses Associated with Each Specialty Area in Mechanical Engineering and Applied Mechanics

The following are the courses associated with each area of specialization. Some courses were previously designated as ENGM or METL as noted in parentheses. This list will be reviewed and revised by the Graduate Committee of MEAM. A student may use any list dated from the time of first attendance in the degree program (M.S. or Ph.D.).

Common Courses: These courses may be used for any one of the specialty areas (subject to approval of the Graduate Committee; Please consult with the area chair)

- * MECH 801. Analytical Methods in Engineering I (3 cr) (formerly ENGM 801)
- * MECH 802. Analytical Methods in Engineering II (3 cr) (formerly ENGM 802)
- MECH *890. Advanced Analysis of Mechanical Engineering Systems (3 cr I) Lec 3.
- MECH 891. Special Topics in Engineering Mechanics (1-6 cr, max 6) Lec. (formerly ENGM 891)
Subject must be in specified area
- MECH 996. Advanced Laboratory and Analytical Investigations (1-12 cr, max 12)
Subject must be in specified area
- MECH 898. Laboratory and Analytical Investigations (1-6 cr, max 6, I, II, III) Lab.
Project must be in specified area
- MECH 996. Laboratory and Analytical Investigations (1-12 cr)
Project must be in specified area

Specialty areas: The following are courses currently associated with each specific specialty area. A student may petition the Graduate Committee to use another course in place of a designated course. Note that some course designations have been changed, effective August 1, 2013. The former course info is noted in parentheses.

1. Thermal Sciences

- MECH 802. Turbomachinery (3 cr) Lec 3.
- MECH 803. Internal Combustion Engines (3 cr I, II) Lec 3, lab 2.
- MECH 804. Theory of Combustion (3 cr, I) Lec 3.
- MECH 806. Air Conditioning Systems Design (3 cr) Lec 3.
- MECH 807. Power Plant Systems Design (3 cr) Lec 3.
- MECH 808. Heat Exchanger Design (3 cr) Lec 3.
- MECH 824. Laser Material Processing with Compressible Flow Perspective (3 cr) Lec 3.
- MECH 825. Solar Energy Engineering (3 cr) Lec 3.

MECH 826. Heat Transfer at Nanoscales and in Ultrashort Time Domains (3 cr I, II)
MECH 831. Computational Heat Transfer and Fluid Flow (3 cr II) Lec 3.
MECH 881. Introduction to Nuclear Engineering (3 cr) Lec 3.
MECH 900. Advanced Thermodynamics (3 cr) Lec 3.
MECH 904. Advanced Combustion Theory (3 cr) Lec 3.
MECH 922. Conduction Heat Transfer (3 cr) Lec 3.
MECH 923. Convection Heat Transfer (3 cr) Lec 3.
MECH 924. Radiation Heat Transfer (3 cr) Lec 3.

2. Fluid Mechanics

*MECH 810. Viscous Flow I (3 cr I, II) Lec 3.
*MECH 812. Viscous Flow II (3 cr I, II) Lec 3.
MECH 813. Aerodynamics (3 cr) Lec 3.
MECH 814. Compressible Flow (3 cr) Lec 3.
MECH 815. Two-Phase Flow (3 cr) Lec 2, lab 3.
MECH 816. Engineering Acoustics (3 cr) Lec 3.
MECH 831. Computational Heat Transfer and Fluid Flow (3 cr II) Lec 3
MECH 912. Advanced Topics in Fluid Dynamics (3 cr) Lec 3.
MECH 916. Turbulent Flows (3 cr I, II) Lec 3.

3. Solid Mechanics

*MECH 843. Introduction to Piezoelectricity with Applications (3 cr) (formerly ENGM 843)
MECH 848. Advanced Mechanics of Materials (3 cr) (formerly ENGM 848)
MECH 852. Experimental Stress Analysis I (3 cr) Lec 2, lab 2. (formerly ENGM 852)
MECH 854. Introduction to Continuum Modeling (3 cr II) (formerly ENGM 850)
MECH 910. Continuum Mechanics (3 cr) (formerly ENGM 910)
MECH 915. Stress Waves in Solids (3 cr) Lec 3. (formerly ENGM 915)
MECH 930. Mechanics of Composite Materials (3 cr) Lec 3. (formerly ENGM 930)
MECH 933. Theory of Elasticity I (3 cr) (formerly ENGM 922)
MECH 934. Theory of Elasticity II (3 cr) (formerly ENGM 923)
MECH 935. Nonlinear Mechanics (3 cr) Lec 3. (formerly ENGM 919)
MECH 936. Theory of Elastic Stability (3 cr) (formerly ENGM 920)
MECH 937. Theory of Plates and Shells I (3 cr) (formerly ENGM 916)
MECH 938. Theory of Plates and Shells II (3 cr) Lec 3. (formerly ENGM 917)
MECH 939. Viscoelasticity (3 cr) (ENGM 925)
MECH 940. Fracture Mechanics (3 cr I or II) (formerly ENGM 940)
MECH 941. Mechanics of Dislocations and Cracks (3 cr) (formerly ENGM 941)
MECH 942. Theory of Plasticity (3 cr) (formerly ENGM 942)

MECH 952. Experimental Stress Analysis II (3 cr) Lec 2, lab 3. (formerly ENGM 952)

4. **Systems, Design and Controls**

MECH 837. Biomedical Device Design (3 cr) Lec 3.

MECH 842. Intermediate Kinematics (3 cr) Lec 3.

MECH 845. Mechanical Engineering Design Concepts (3 cr) Lec 2, lab 3.

MECH 850. Mechanical Engineering Control Systems Design (3 cr) Lec 2, lab 2.

MECH 852. Digital Control of Mechanical Systems (3 cr) Lec 2, lab 3.

MECH 853. Robotics: Kinematics and Design (3 cr) Lec 3

MECH 857. Mechatronic Systems Design (3 cr) Lec 3, lab 2.

MECH 943. Machine Design (3 cr) Lec 2, lab 3.

MECH 945. Probabilistic Design of Machine Elements (3 cr)

MECH 950. Impact Engineering (3 cr) Lec 3.

MECH 958. Advanced Mechatronics (3 cr) Lec 3, lab 2.

5. **Dynamics and Vibrations**

MECH 842. Intermediate Kinematics (3 cr) Lec 3.

MECH 844. Intermediate Dynamics of Machinery (3 cr) Lec 3.

MECH 849. Advanced Dynamics (3 cr) (ENGM 847)

MECH 853. Robotics: Kinematics and Design (3 cr) Lec 3.

MECH 855. Vehicle Dynamics (3 cr) Lec 3.

MECH 856. Dynamics of Internal Combustion Engines (3 cr I) Lec 3.

MECH 857. Mechatronic Systems Design (3 cr) Lec 3, lab 2.

* MECH 875. Vibration Theory and Applications (3 cr) (ENGM 875)

MECH 915. Stress Waves in Solids (3 cr) Lec 3. (ENGM 915)

MECH 958. Advanced Mechatronics (3 cr) Lec 3, lab 2.

6. **Computational Methods**

MECH 831. Computational Heat Transfer and Fluid Flow (3 cr II) Lec 3.

MECH 851. Introduction to Finite Element Analysis (CIVE 851) (3 cr) (formerly ENGM 851)

MECH 880. Numerical Methods in Engineering (3 cr I) Lec 3. (formerly ENGM 880)

* MECH 888. Nonlinear Optimization in Engineering (IMSE *888) (3 cr) Lec 3. (formerly ENGM 888)

MECH 918. Fundamentals of Finite Elements (3 cr) Lec 3. (formerly ENGM 918)

MECH 932. Advanced Finite Element Methods (3 cr) Lec 3.

MECH 950. Impact Engineering (3 cr) Lec 3.

MECH 951. Advanced Topics in Finite Element Methods (3 cr) (formerly ENGM 951)

7. Materials Engineering

- MATL 860. Mechanical Aspects of Materials (3 cr) Lec 3. (formerly METL 860)
MATL 861. Materials Laboratory II (3 cr) Lab 6. (formerly METL 861)
MATL 862. X-ray Diffraction (3 cr) Lec 3. (formerly METL 862)
* MATL 864. Thin Films and Surface Engineering (3 cr) Lec 3. (formerly METL 864)
MATL 865. Applied Physical Metallurgy and Design (3 cr) Lec 3. (formerly METL 865)
MATL 866. Materials Selection for Mechanical Design (3 cr) Lec 2, lab 2. (formerly METL 866)
MATL 867. Principles of Powder Metallurgy (3 cr) Lec 2, lab 3. (formerly METL 867)
MATL 868. Failure Analysis: Prevention and Control (3 cr) Lec 2, lab 2. (formerly METL 868)
MATL 869. Physical Materials Systems (3 cr) Lec 3. (formerly METL 869)
MATL 870. Thermodynamics of Alloys (3 cr) Lec 3. (formerly METL 870)
MATL 871. Electron Microscopy of Materials (3 cr) Lec 2, lab 2. (formerly METL 871)
MATL 872. Kinetics of Alloys (3 cr) Lec 3. (formerly METL 872)
MATL 873. Corrosion (3 cr) Lec 3. (formerly METL 873)
MATL 874. Extractive Metallurgy (3 cr) Lec 3. (formerly METL 874)
* MATL 875. Glass and Ceramic Materials (3 cr) Lec 3. (formerly METL 875)
MATL 898. Laboratory and Analytical Investigation (1-6 cr, max 6, I, II, III) Lab. (formerly METL 898)
MATL 960. Materials Aspects of Fracture (3 cr) Lec 3. (formerly METL 960)
MATL 962. Imperfections in Crystals (3 cr) Lec 3. (formerly METL 962)
MATL 970. Advanced Thermodynamics of Materials (3 cr) Lec 3. (formerly METL 970)
MATL 972. Transformation in Materials (3 cr) Lec 3. (formerly METL 972)
MATL 997. Research Other Than Thesis (1-6 cr, max 6) (formerly METL 997)
MATL 998. Advanced Materials Topics (1-3 cr per sem, max 9) (formerly METL 998)
*MECH 843. Introduction to Piezoelectricity with Applications (3 cr) (formerly ENGM 843)

8. Biomedical Engineering (several of the courses are currently under MECH 890 or 898)

- MECH 836. Introduction to Continuum Biomechanics (3 cr) Lec 3.
MECH 837. Biomedical Device Design (3 cr) Lec 3.
- CHME 873. Biochemical Engineering (3 cr) Lec 3.
CHME 874. Advanced Biochemical Engineering (3 cr) Lec 3.
CHME 896. Advanced Topics in Chemical Engineering Computation (Areas: Biomaterials and Biocompatibility, Tissue Engineering)(3 cr) Lec 3.
- BSEN 814. Medical Imaging Systems (3 cr) Lec 3.
BSEN 816. Introduction to Biomaterials (3 cr) Lec 3.
BSEN 818. Tissue Engineering (3 cr) Lec 3.
BSEN 912. Advanced Ultrasound Imaging (3 cr) Lec 3.

BSEN 935. Analysis of Engineering Properties of Biological materials (3 cr) Lec 3.

IMSE 815. Cognitive Ergonomics (3 cr) Lec 3.

IMSE 816. Physical Ergonomics (3 cr) Lec 3.

ELEC 852. Bioinformatics (3 cr) Lec 3.

ELEC 863. Digital Signal Processing (3 cr) Lec 3.

ELEC 898. Special Topics in Electrical Engineering IV (Biomedical related topics) (3 cr) Lec 3.

9. **Manufacturing** (these IMSE courses will be requested to be redesignated)

IMSE 821. Applied Statistics and Quality Control (3 cr) Lec 3.

MECH 822. Industrial Quality Control (3 cr) Lec 3. (formerly IMSE 822)

IMSE 870. Theory and Practice of Materials Processing (3 cr) Lec 3.

IMSE 901. Total Quality Management Using Six Sigma Techniques (3 cr) Lec 3.

IMSE 922. Quality Engineering: Use of Experimental Design and Other Techniques (3 cr)
Lec 3.

IMSE 923. Manufacturing and Dynamic Systems Modeling (3 cr) Lec 3.

IMSE 970. Advanced Manufacturing Processes (3 cr) Lec 3.

MATL 865. Applied Physical Metallurgy and Design (3 cr) Lec 3. (formerly METL 865)