

COURSE DESCRIPTIONS

MECHANICAL ENGINEERING

MCEG 5043: Physical Metallurgy

Prerequisites: MCEG 2023, MCEG 3013, and MCEG 3313.

This course provides the student with an in-depth background to the mechanisms and applications of dislocation motion, crystal plasticity, phase transformations and solidification processes. Common industrial and experimental processes are studied for both ferrous and non-ferrous materials.

Note: May not be taken for credit after completion of MCEG 4043.

MCEG 5053: Corrosion Principles

Prerequisites: MCEG 2023, MCEG 3313, CHEM 2124.

This course provides the student with an introductory study on the principles, mechanisms and chemistry of material corrosion. The study will extend to material failures linked to corrosion processes and effects of environment on corrosion potential and kinetics.

Note: May not be taken for credit after completion of MCEG 4053.

MCEG 5323: Power Plant Systems

Prerequisites: MCEG 3313, MCEG 4403.

A study of the design and operation of steam-electric power plant components and systems. Fossil and renewable energy plants are emphasized.

Note: May not be taken for credit after completion of MCEG 4323.

MCEG 5343: Internal Combustion Engines

Prerequisites: MCEG 3313, MCEG 4403.

A study of the operating and design principles of internal combustion engines. The course will cover combustion cycles, emissions and performance analysis and testing.

Note: May not be taken for credit after completion of MCEG 4343.

Lecture three (3) hours with lab exercises.

MCEG 5413: Finite Element Analysis

Prerequisites: ELEG 2103, MCEG (ELEG) 3003, and MCEG 3013.

Introduction to approximate methods using finite elements. Development of the finite element method using variational formulations. Applications include machine design, mechanical vibrations, heat transfer, fluid flow, and electromagnetics.

MCEG 5453: Energy Management

Prerequisites: MCEG 3313, MCEG 4403, MCEG 4443, or consent of instructor.

Energy management in commercial building and industrial plants. Utility rate structures. Sources of primary energy. Energy conversion devices. Prime movers of energy. Heat. Electricity. Lighting. HVAC Equipment. Building envelope. Electric motors. Estimating energy savings. Economic justification. Energy auditing.

MCEG 5463: Heating, Ventilating, and Air-Conditioning Design

Prerequisite: MCEG 3313.

A study of the principles of human thermal comfort including applied psychrometrics and air-conditioning processes. Fundamentals of analysis of heating and cooling loads and design of HVAC systems.

Note: May not be taken for graduate credit after completion of MCEG 4463.

MCEG 5473: Mechanical Vibrations

Offered: approximately, every other year

Prerequisites: MCEG 2033, MATH 3243.

The study of free and forced vibration of single degree-of-freedom systems, response to harmonic, periodic and non-periodic excitations. Multi degree-of-freedom systems and matrix methods are explored. Computational techniques for predicting system response of continuous systems are introduced.

Note: May not be taken for credit after completion of MCEG 4473.

MCEG 5503: Nuclear Power Plants I

Prerequisites: MCEG 3503, MCEG 4403.

A study of the various types of nuclear reactor plants including the methods used for energy conversion. Relative advantages/disadvantages of various plant types investigated.

Note: May not be taken for credit after completion of MCEG 4503.

MCEG 5993: Special Problems in Engineering I

Prerequisite: Permission of instructor

A individual or group study in an advanced area of engineering under the direction of a faculty advisor. May be taught in conjunction with an associated MCEG 4993 section.

Note: May not be taken for credit after gaining credit for a 4993 section with the same topic.

MCEG 6013: Continuum Mechanics

Offered: Once every two years

Prerequisites: Graduate admission and MCEG 3013 or equivalent

Development of field equations and generalized constitutive expressions for fluid and solid continua. Topics include: tensor analysis, kinematics, conservation of mass and momentum, and invariance and symmetry principles.

MCEG 6023: Elasticity

Offered: Once every two years

Prerequisites: MCEG 6013 Continuum Mechanics.

Analysis of stress and strain in two and three dimensions, equilibrium and compatibility equations, torsion of non-circular members, and variational methods.

MCEG 6323: Energy Systems

Prerequisites: MCEG 4433, MCEG 4403 or permission of instructor.

A study of various energy sources and the production of usable energy from them. Conventional and alternative energy sources are covered as well as economic environmental concerns.

MCEG 6443: Advanced Heat Transfer

Prerequisites or Co-requisites: MCEG 3313, 4403, 4443, or permission of instructor.

A study of the advanced principles of heat transfer: numerical methods in heat transfer, advanced boundary layer theory, advanced thermal radiation topics, and heat exchangers.

MCEG 6503: Reactor Physics

Prerequisites: PHYS 3213, MCEG 3503, MATH 5243 Differential Equations II.

A study of the fundamental physical principles in the operation and design of nuclear reactors. Includes neutron-nucleus interactions, neutron energy spectra and energy dependent cross sections, neutron transport and diffusion theory, multi-group approximations, criticality calculations, and reactor analysis and design methods.

MCEG 6513: Radiation Measurement

Prerequisites: MCEG 3503, MCEG 3512.

The study of radiation techniques and equipment used by scientists and engineers. Topics of interest will include techniques and equipment for detecting ionizing radiation below about 20 MeV, coincidence counting methods, and reactor laboratory experiments (as available).

Lecture two (2) hours, lab three (3) hours.

MCEG 6523: Nuclear Materials

Prerequisites: MCEG 2023 and MCEG 3503.

A study of the properties of materials utilized in nuclear reactors, shielding systems, and other systems exposed to radiation. Emphasis will be placed on understanding and mitigation the damage of such materials by neutron and gamma radiation.

MCEG 6533: Radiation Interactions and Shielding

Prerequisites: MCEG 3503, MCEG 3523.

Radiation Interactions and Shielding. Basic principles of radiation interactions, transport and shielding. Radiation sources, nuclear reactions, radiation transport, photon interactions, dosimetry, and shielding design will be covered.

MCEG 6881: Special Topics in Engineering

Prerequisite: Permission of instructor.

Special topics in engineering relating to 2022 engineering topics not covered in other courses.

Note: May be repeated for credit if course content varies.

MCEG 6882: Special Topics in Engineering

Prerequisite: Permission of instructor.

Special topics in engineering relating to 2022 engineering topics not covered in other courses.

Note: May be repeated for credit if course content varies.

MCEG 6883: Special Topics in Engineering

Prerequisite: Permission of instructor.

Special topics in engineering relating to 2022 engineering topics not covered in other courses.

Note: May be repeated for credit if course content varies.

MCEG 6891: Independent Study

Prerequisites: Completion of 18 hours toward program requirements, approval of advisor.

Students will complete an engineering project approved by their Advisory Committee. The project must include elements of engineering design and project management with a subject relevant to the student's program of study. Successful completion of the project will include a professional report and full presentation of the project findings/results.

Note: May be repeated for credit if course content varies.

MCEG 6892: Independent Study

Prerequisites: Completion of 18 hours toward program requirements, approval of advisor.

Students will complete an engineering project approved by their Advisory Committee. The project must include elements of engineering design and project management with a subject relevant to the student's program of study. Successful completion of the project will include a professional report and full presentation of the project findings/results.

Note: May be repeated for credit if course content varies.

MCEG 6893: Independent Study

Prerequisites: Completion of 18 hours toward program requirements, approval of advisor.

Students will complete an engineering project approved by their Advisory Committee. The project must include elements of engineering design and project management with a subject relevant to the student's program of study. Successful completion of the project will include a professional report and full presentation of the project findings/results.

Note: May be repeated for credit if course content varies.

MCEG 6894: Independent Study

Prerequisites: Completion of 18 hours toward program requirements, approval of advisor.

Students will complete an engineering project approved by their Advisory Committee. The project must include elements of engineering design and project management with a subject relevant to the student's program of study. Successful completion of the project will include a professional report and full presentation of the project findings/results.

Note: May be repeated for credit if course content varies.

MCEG 6895: Independent Study

Prerequisites: Completion of 18 hours toward program requirements, approval of advisor.

Students will complete an engineering project approved by their Advisory Committee. The project must include elements of engineering design and project management with a subject relevant to the student's program of study. Successful completion of the project will include a professional report and full presentation of the project findings/results.

Note: May be repeated for credit if course content varies.

MCEG 6896: Independent Study

Prerequisites: Completion of 18 hours toward program requirements, approval of advisor.

Students will complete an engineering project approved by their Advisory Committee. The project must include elements of engineering design and project management with a subject relevant to the student's program of study. Successful completion of the project will include a professional report and full presentation of the project findings/results.

Note: May be repeated for credit if course content varies.