Bachelor of Science in Mechanical Engineering (BSME) Course Descriptions

EGR 102. Introduction to Engineering and Engineering Problem Solving. *(3).*
Introduction to engineering practices, various engineering disciplines, common engineering science foundations of all branches, teaming, ethics, and communication, including CAD. *Graded ABC>N.*

EGR 165. Computer-Aided Design *(2).*
Review of basic drafting principles, orthographic projection, line and plane relationships, dimensioning, and conventional representations. Introduction to the operation of a computer graphics system. System orientation; graphics generation, editing, and manipulation; basic detailing, dimensions, library development; database management.

EGR 230. Statics.
PHY 243 with a grade C (2.0) or better. (3).
Understanding of the principles of mechanics and their application to the solution of engineering problems, especially in equilibrium state. Free-body diagrams introduced; equilibrium problems and resultants of general force systems stressed.

EGR 260. Mechanics of Deformable Solids.
EGR 230 and MTH 220, each with a grade of C (2.0) or better. (3).
Deformable solids, stress and strain, principal axes, material behavior (elastic, plastic, viscoelastic, temperature dependent). Boundary value problems, torsion, beams. Instability, columns.

EGR 265. Computer Aided Engineering Analysis.
EGR 165 with a grade of C (2.0) or better. (3).
Introduction to geometric element analysis, deformation, stresses, strains, buckling, von Mises stresses, steady state and transient thermal analysis, and design optimization using Pro/Mechanica, ANSYS Finite Element Analysis, Fluent CFD.

EGR 280. Science of Engineering Materials.
MTH 122, PHY 245, each with a grade of C (2.0) or better. CHM 262 with a grade of C (2.0) or better or concurrent election Concurrent election of EGR 281 recommended. (3).
Introduction to the science of engineering materials. Emphasis on the correlation between material properties and internal structure; examination of metals, alloys, ceramics, polymers, and composite materials for engineering applications.

EGR 281. (305). Engineering Materials Laboratory.
Prior election with a grade of C (2.0) or better, or concurrent election, of EGR 280. (1).
Laboratory practice in fabrication, preparation, testing and evaluation of materials, including metals, alloys, ceramics, glasses, polymers and composites. *Concurrent election of EGR 280 recommended.*

EGR 291. Supervised Study in Engineering.
Consent of instructor. (1-4).

Laboratory work or study of the literature on designated problems chosen by the student in consultation with a faculty supervisor. *May be reelected to a total of four credits. Graded ABCDE/Y.*

EGR 310. Engineering Economics.
EGR 102; prior or concurrent election of MTH 121; or consent of instructor. (3).
Decision-making process in engineering with economic analysis; the role of quality and cost considerations in manufacturing; economies of scale; cash flow analysis; decisions involving capital expenditures, incremental analysis of multiple options, make or buy, rate of return, and present/future value analysis; income tax and interest considerations.

EGR 312. Kinematics and Mechanisms.
MTH 220 and EGR 230, each with a grade of C (2.0) or better. (3).
Introduction to the relationships between geometry and motions of a machine or mechanism and the forces which produce these motions. Emphasis on graphical, analytical methods of analysis and synthesis.

EGR 315. Machine Element Design.
EGR 260 and CSC 175 or 271, each with a grade of C (2.0) or better; or consent of instructor. (3).
Applications of the principles of mechanics of materials and other engineering sciences to the design of such machine elements as fasteners, gears, springs, bearings, clutches, chain and belt drives; analysis of functional and performance requirements; failure theories and their design criteria. Impact loading, stress concentration, and fatigue. ANSYS Finite Element analysis software will be used for analysis and optimization of design.

EGR 321. Analog and Digital Electronics.
PHY 145 or 245 with a grade of C (2.0) or better; or consent of instructor. (3).
Properties of semiconductors; diodes, transistors, and other devices and their characteristics; amplifiers, oscillators, filters, and regulators; logic gates, combinational and sequential circuits; analog and digital ICs. *Also listed as PHY 321.*

EGR 322. Analog and Digital Electronics Laboratory.
Prior election of EGR/PHY 321 with a grade of C (2.0) or better; or concurrent election of EGR/PHY 321; or consent of instructor. (1).
Semiconductor device characteristics; rectifiers and amplifiers; logic circuit analysis and design; operational amplifiers and active filters; power supplies; memories, A/D and D/A. *Also listed as PHY 322.*

EGR 330. Engineering Circuit Analysis.
PHY 245 and MTH 222, each with a grade of C (2.0) or better. (3).
Introduction to linear electric circuit analysis, including dc, ac, transient, delta, and wye circuits; active and passive elements. *Concurrent election of EGR 335 expected.*
EGR 335. Engineering Circuit Analysis Laboratory.
Prior election with a grade of C (2.0) or better, or concurrent election, of EGR 330. (1).
Laboratory experiments in circuit analysis. One three hour laboratory period weekly.

EGR 350. Fluid Mechanics.
CHM 260, MTH 220, PHY 245, each with a grade of C (2.0) or better. (3).
Introduction to the mechanics of fluids. Fluid properties, kinematics, fluid statics, Bernoulli equation, control volume; differential forms of the fundamental laws, dimensional analysis, similitude and fluid/flow phenomena. FLUENT Computational fluid dynamics will be used for fluid flow analysis throughout the course.

EGR 353. Thermodynamics.
CHM 262, MTH 220, and PHY 245, each with a grade of C (2.0) or better. (3).
Study of the first and second laws of thermodynamics and their applications to the analysis of processes involving the control and utilization of energy. Properties and behavior of pure substances, ideal gases, and mixtures; heat engine and refrigeration cycles.

EGR 355. Thermofluids Engineering Laboratory.
Prior election with a grade of C (2.0) or better in each, or concurrent election, of EGR 340 and 353. (1).
Laboratory experiments in the thermal properties of matter, including thermodynamic states, transport and transfer of thermal energy, momentum and mass, with and without internal thermal sources, and the transient and steady-state thermal properties of matter.

EGR 356. Heat Transfer.
EGR 353, MTH 222, each with a grade of C(2.0) or better; or consent of instructor. (3).
Conductive, convective, and radiative heat transfer in steady state and transient conditions. Convection in external and internal flow, and free convection.

EGR 367. Intermediate Electricity and Magnetism.
PHY 245, MTH 220, 222, 305 each with a grade of C (2.0) or better; or consent of instructor. (3).
Electrostatics, behavior of dielectrics, electric currents and magnetism, electromagnetic induction, alternating current circuits, Maxwell's equations. *Also listed as PHY 367.*

EGR 370. Dynamics.
EGR 230, MTH 305, CSC 175 each with a grade of C (2.0) or better; or consent of instructor. (3).
Application of principles of mechanics and other engineering science to analysis of force systems in motion, including kinematics of particles and rigid bodies; kinetics of particles and rigid bodies by Newton’s laws; work and energy methods; impulse and momentum.

EGR 376. Solid State Physics.
PHY 343; MTH 220, 222, 305 each with a grade of C (2.0) or better; or consent of instructor. (3).
Crystal structure, diffraction by crystals, thermal properties, dielectric properties; free electron theory of metals, band theory, semi-conductors, magnetism, magnetic resonances, defects, superconductivity. *Also listed as PHY 375.*

EGR 380. System Dynamics and Control.
Prior election with a grade of C (2.0) or better, or concurrent election, of EGR 370; or consent of instructor. (3).
Modeling and analysis of such dynamic systems as electrical, fluid and thermal. Laplace transforms and solution techniques for first and second order linear differential equations. Introduction to linear feedback control theory, block diagrams, transient and frequency responses, stability, system compensation and design.

EGR 391. Independent Study.
Consent of instructor. (1-4).
Laboratory study or study of current literature on a selected topic. *May be reelected to a total of six credits. Graded ABCDE/Y.*

EGR 395. Cooperative Practice in Engineering.
EGR 280 and 301, each with a grade of C (2.0) or better; consent of Industrial Engineering Program Supervisor. (3).
Industrial and engineering job planned jointly by the student, the Industrial Supervisor, and the Engineering Cooperative Coordinator. Project report and oral presentation required. Student's work evaluated by the Industrial Supervisor and the Engineering Cooperative Coordinator. *May be reelected. Graded Pass/Fail/Y.*

EGR 410. Vibrations.
EGR 370 with a grade of C (2.0) or better; or consent of instructor. (3).
Free and forced vibrations of systems with one degree of freedom; rotating and reciprocating unbalance, critical speeds, vibration isolation and transmissibility, vibrating measuring instruments, support motion, frequency motion. Linear multiple-degree systems; analysis by matrix and approximation methods, modal analysis and mode summation.

EGR 433. Advanced Physics Laboratory II/III.
Consent of instructor. (1-3).
Original problems selected and pursued in consultation with the instructor. For two credits, one four-hour laboratory weekly. *May be reelected once, to a maximum of five credits. Also listed as PHY 433. Graded ABCDE/Y.*

EGR 466. Engineering Design II.
EGR 280, EGR 315 or 365, two additional 300-level EGR courses, all with a grade of C (2.0) or better; senior standing; consent of instructor. (3).
Advanced design concepts including feedback, process and product improvement, computer aided design. Team projects and exercises in design improvement. Students will be required to design, develop and manufacture a functional part or system as a capstone design project. *Graded ABCDE/Y.*

EGR 470. Product Development.

MTH 122 and at least junior standing; or bachelor's degree in appropriate field; or consent of instructor. (3).
Properties of the product/technology development process, issues of product strategy, R&D management and implementation of new processes, including analysis of the process of product development; quality control, development and application of control charts. Theory of constraint and its application in manufacturing and engineering.

EGR 476. Engineering Design of Experiments.
EGR 305, 340 and BUS 211, each with a grade of C (2.0) or better. (3).
Methods of design of experiments (DOE) developed and

495. Honors Thesis I.
Consent of the Department Chair. Open only to Honors Program students in engineering. (4). Credit and grade for EGR 495 is not given until successful completion of EGR 496. Also listed as HON 495. Graded ABC>N/Y.

496. Honors Thesis II.
Prior or concurrent election of EGR 495 and consent of Department Chair. Open only to Honors Program students in engineering. (4). Also listed as HON 496. Graded ABC>N/Y.