Engineering Science
(ES)

Courses

ES A103 Engineering Graphics 3 Credits
Introduces the fundamentals of engineering graphics and provides training in visualization skills necessary for graphically presenting of engineering ideas using standard drawing techniques and Computer Aided Design (CAD).
Prerequisites: MATH A152 with a minimum grade of C or MATH A155 with a minimum grade of C.

ES A106 Engineering Graphics 2 Credits
Develops visualization skills, orthographic projections, creation of sectional views, auxiliary views, isometric pictorials, and adding necessary details such as dimensions and tolerances. Develops hand drawing skills and the use of computer-aided design (CAD) software as tools for creating engineering graphics.
Prerequisites: (MATH A151 with a minimum grade of C and MATH A152 with a minimum grade of C) or MATH A155 with a minimum grade of C or ALEKS Overall Test 1 with a score of 78 or ALEKS Overall Test 2 with a score of 78 or ALEKS Overall Test 3 with a score of 78 or ALEKS Overall Test 4 with a score of 78 or ALEKS Overall Test 5 with a score of 78.

ES A208 Engineering Statics and Dynamics 5 Credits
Static and dynamic analysis of particles and rigid bodies. Statics topics covered include Newton’s laws of motion, Newton's law of gravitational attraction, force and force systems, equilibrium, structural analysis, internal forces, friction, and center of gravity and centroid. Dynamics topics covered include particle and rigid body kinematics and kinetics, force and acceleration, work and energy, impulse and momentum, and vibrations.
Prerequisites: MATH A252 with a minimum grade of C and PHYS A211 with a minimum grade of C.

ES A209 Statics 3 Credits
Analyzes force systems in two and three dimensions; discusses composing and resolving of forces and force systems; applies principles of equilibrium for various bodies and simple structures, friction, centroids, and moments of inertia. Applies concept of vector algebra wherever necessary.
Prerequisites: MATH A252 with a minimum grade of C and PHYS A211 with a minimum grade of C and PHYS A211L with a minimum grade of C.

ES A210 Dynamics 3 Credits
Introduces kinematics and kinetics of particles and rigid body motion. Applies principles of work and energy, impulse and momentum to particles and rigid body motion. Applies concept of vector algebra wherever required.
Prerequisites: ES A209 with a minimum grade of C.

ES A261 Introduction to Engineering Computation 3 Credits
Introduces computation methods and tools for engineering applications. Introduction to computer programming with MATLAB.
Prerequisites: MATH A221 with a minimum grade of C or MATH A251 with a minimum grade of C.

ES A302 Engineering Data Analysis 3 Credits
Introduces concepts of probability and statistics needed to solve various engineering problems.
Prerequisites: MATH A252 with a minimum grade of C and (ES A261 with a minimum grade of C or EE A261 with a minimum grade of C).

ES A309 Elements of Electrical Engineering 3 Credits
Electrical fundamentals: elementary circuit analysis, network theorems, steady state, and transient analysis of DC circuits with resistors and one energy storage device (L or C). Steady state analysis of AC circuits with resistors, capacitors, and inductors using complex number and phasor representation. Power in DC and AC circuits. Transformers, meters, and applications of simple electrical components and circuits.
Prerequisites: PHYS A212 and MATH A302 or concurrent enrollment.

ES A331 Mechanics of Materials 3 Credits
Stress-strain relations, axially loaded and torsional members, review of shear and bending moment diagrams for beams, flexural and shearing stresses, deflections of beams, plane stress, combined stresses, buckling of columns, elementary design of beams and columns.
Prerequisites: ES A209 with a minimum grade of C and MATH A302 with a minimum grade of C or concurrent enrollment.

ES A341 Fluid Mechanics 3 Credits
Introduction to physical properties and behavior of fluids. Topics include hydrostatics and dynamics of liquids and gases, dimensional analysis, fluid forces on immersed bodies, pipe flow, fluid machinery, and open channel flow.
Prerequisites: ES A209 with a minimum grade of C and (ES A302 with a minimum grade of C or concurrent enrollment or MATH A302 with a minimum grade of C or concurrent enrollment).

ES A341L Fluid Mechanics Laboratory 1 Credit
Provides supplemental explanation and practical exercises applying physical properties and behavior of fluids, including hydrostatics, fluid forces, pipe flow, fluid machinery, and open channel flow.
Prerequisites: ES A341 with a minimum grade of C or concurrent enrollment.

ES A346 Introduction to Thermodynamics 3 Credits
Thermodynamic systems, properties, processes and cycles. Fundamental principles of thermodynamics (first and second laws) and elementary applications.
Prerequisites: (CHEM A106 with a minimum grade of C or PHYS A211 with a minimum grade of C) and MATH A252 with a minimum grade of C.

ES A411 Northern Design 3 Credits
Introduction to design and maintenance of facilities in northern climates to construct sustainable, energy-efficient and durable buildings and infrastructure suitable for the unique needs of northern inhabitants.
Registration Restrictions: Senior standing or graduate standing in an accredited program in architecture or engineering, or instructor permission.