# EM - ENGINEERING MECHANICS (EM)

**EM 102  -  Graphical Communications for Civil Engineers  2 Credits**

**Hours:** 1R-2L-2C
**Term Available:** S
**Graduate Studies Eligible:** No
**Prerequisites:** None

Introduces the basic techniques used in engineering and scientific communication. Topics will include sketching of pictorials, computer-aided drawing, orthographic drawings, auxiliary views, reading engineering drawings and using electronic forms of communication.Focus on civil engineering applications.

**EM 103  -  Introduction to Design  2 Credits**

**Hours:** 1R-3L-2C
**Term Available:** S
**Graduate Studies Eligible:** No
**Prerequisites:** None

Introduces the engineering design process including problem definition, analysis, alternate solutions, specifications of final solution, and techniques of oral and written communications. Stresses the importance of teamwork through group design efforts.

**EM 104  -  Graphical Communications  2 Credits**

**Hours:** 1R-2L-2C
**Term Available:** F
**Graduate Studies Eligible:** No
**Prerequisites:** None

Introduces the basic techniques used in engineering and scientific communication. Topics will include sketching of pictorials, computer-aided drawing, orthographic drawings, auxiliary views, reading engineering drawings and using electronic forms of communication.

**EM 120  -  Engineering Statics  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** F,S
**Graduate Studies Eligible:** No
**Prerequisites:** MA 111 or MA FTC or MA RA100 or MA 105

Covers two- and three-dimensional force systems, equilibrium, structures, distributed forces, shear and bending moment diagrams, friction, and area moments of inertia. Emphasizes free-body diagrams. Students may not receive credit towards graduation for both ENGD110 and any of BE 122, EM 120, or EM 121.

**EM 121  -  Statics & Mechanics of Materials I  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** F,W,S
**Graduate Studies Eligible:** No
**Prerequisites:** MA 111 or MA RA100 or MA 105 or 00 FTP

Covers two- and three-dimensional force systems, equilibrium, structures, distributed forces, and strength and elastic deflection of engineering materials due to loads applied axially. Emphasizes free-body diagrams. Students may not receive credit towards graduation for both ENGD110 and any of BE 122, EM 120, or EM 121.

**EM 202  -  Dynamics  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** F
**Graduate Studies Eligible:** No
**Prerequisites:** (MA 112 or MA 107) and (EM 120 or EM 121) and PH 111

Kinematics and kinetics of particles in space and rigid bodies in plane motion. Applications of the principles of Newton's laws, work-energy, impulse-momentum, and conservation laws to solutions of simple two-dimensional dynamics problems. Students may not receive credit towards graduation for both EM202 and ES214.

**EM 203  -  Mechanics of Materials  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** W
**Graduate Studies Eligible:** No
**Prerequisites:** EM 120 or EM 121

Strength and elastic deflection of engineering materials due to loads applied axially, in torsion, in bending, and in shear. Combined stresses and principal stresses. Applications to design of beams and shafts. Students may not receive credit towards graduation for both EM203 and any of EM204 or BE222.

**EM 204  -  Statics & Mechanics of Materials II  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** F,S
**Graduate Studies Eligible:** No
**Prerequisites:** EM 120 or EM 121 or BE 122

Strength and elastic deflection of engineering materials due to loads applied in torsion, in bending, and in shear. Shear diagrams, bending moment diagrams, and area moments of inertia. Combined stresses and principal stresses. Applications to design of beams and shafts. Students may not receive credit towards graduation for both EM 204 and any of EM 203 or BE 222.

**EM 301  -  Fluid Mechanics  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** S
**Graduate Studies Eligible:** No
**Prerequisites:** EM 202

Covers fluid properties, fluid statics, fluid dynamics, including pipe flow, and turbomachinery. Stresses the control volume approach, Eulerian description of flow, and conservation principles (mass, momentum, and energy). Students may not receive credit towards graduation for both EM301 and any of CHE 301 or ES212.

**EM 304  -  Advanced CAD | Professional Certification  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** W
**Graduate Studies Eligible:** No
**Prerequisites:** EM 104 or ENGD 100 or BE 118

This course covers advanced solid modeling techniques using SolidWorks. It is structured around the certification sequence offered by SolidWorks, and students will become officially certified by SolidWorks in a variety of modeling techniques by the end of the quarter. There are no exams in this course, but students must complete several levels of SolidWorks certification in order to pass. The course also includes two design/build projects in order to hone the CAD modeling skills of the students.

**EM 305  -  Advanced CAD | Design Applications  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** F
**Graduate Studies Eligible:** No
**Prerequisites:** (EM 104 or ENGD 100 or BE 118) and (ES 201 or ENGD 215 or BE 132) and (EM 204 or BE 222)

The course examines interactions between CAD tools and design processes. Common foundational tools (such as use of global variables, equations, and configurations) and techniques for maintaining design intent and allowing for model reuse will be introduced. Students will apply these foundational tools and techniques to a series of design projects that require students to develop and apply math models to their CAD parts/assemblies and produce physical parts. The successful student will leave this class with a practical understanding of the importance for design intent to support adjustment to changing engineering requirements and model reuse.

**EM 306  -  Vibration Analysis  4 Credits**

**Hours:** 3R-3L-4C
**Graduate Studies Eligible:** No
**Prerequisites:** ES 205 or ES 305

Dynamic analysis of vibrating mechanical systems. Includes studies of single- and multiple-degrees-of-freedom, damped and undamped systems in both free and forced motion. Applications to vibration isolation and absorption, design of vibration measurement instrumentation, rotating unbalance, and torsional vibration of rotors.

**EM 402  -  Three-Dimensional Dynamics  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** F
**Graduate Studies Eligible:** No
**Prerequisites:** ES 214

**EM 403  -  Advanced Mechanics of Materials  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** See Department
**Graduate Studies Eligible:** No
**Prerequisites:** EM 203 or EM 204

Establishes the tensor formulation of Generalized Hooke's Law for 3D linear elastic materials. Explores the physical meaning of von Mises failure theory through specialized stress measures (such as hydrostatic stress, octahedral stress, and distortional stress). Explores the use of strain gauges to estimate component stress states. Uses the equations of compatibility to set up the classical formulation of elasticity problems. Establishes mathematical solutions to the plane stress and plane strain problems to derive stress concentration factors.

**EM 493  -  Selected Topics in Engineering & Technology  1-4 Credits**

**Hours:** 0R-0L-(1 - 4)C
**Term Available:** See Department
**Graduate Studies Eligible:** No
**Prerequisites:** None

None available

**EM 501  -  Topics in Fluid Mechanics  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** See Department
**Graduate Studies Eligible:** Yes
**Prerequisites:** ME 401

Course may be repeated for different topics in fluid mechanics.

**EM 502  -  Advanced Dynamics  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** See Department
**Graduate Studies Eligible:** Yes
**Prerequisites:** ES 205

Kinematics and dynamics of particles and rigid bodies in two- and three-dimensional motion. Includes Lagrangian and Hamiltonian formulation of equations of motion. Applications to conservative, nonconservative, holonomic and non-holonomic systems.

**EM 503  -  Advanced Vibration Analysis  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** See Department
**Graduate Studies Eligible:** Yes
**Prerequisites:** EM 406

Dynamic analysis of multiple-degree-of-freedom lumped parameter vibrating systems as well as continuous systems. Lagrange&apos;s equations of motion. Applications include numerical methods and matrix formulation. Introduction to nonlinear and random vibration analysis. Methods of Rayleigh and Rayleigh-Ritz.

**EM 505  -  Theory of Elasticity  4 Credits**

**Hours:** 4R-0L-4C
**Term Available:** See Department
**Graduate Studies Eligible:** Yes
**Prerequisites:** EM 203 or EM 204

Introduces the classical formulation of problems in elasticity. Emphasizes the derivation and the applications of the basic constitutive equations of elasticity such as strain-displacement, equilibrium, compatibility, and stress-strain. Covers St. Venant&apos;s problems, energy principles, and variational methods.