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Course Descriptions - Engineering Mechanics

All courses in the engineering mechanics area are the responsibility of the Civil and Mechanical Engineering Departments.

CLSK 100 College and Life Skills 1R-0L-1C F Pre: None

This course will assist Rose-Hulman students in acquiring life skills and in learning more about themselves. These new skills will assist the student in a smooth transition from high school to college and will provide the students with the tools necessary for success as a student and in life. Additionally this course will introduce students to people and resources at Rose-Hulman who can assist them in providing a positive educational as well as personal experience.

EM 101 Statics 2R-0L-2C W Pre: None

Covers static force analysis. Introduces scalars and vectors with applications to the study of forces, moments, and couples. Stresses free body diagrams with engineering examples.

EM 103 Introduction to Design 1R-2L-2C S Pre: 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 1R-2L-2C F Pre: 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 4R-0L-4C F,S Pre: MA 111

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.

EM 121 Statics and Mechanics of Materials I 4R-0L-4C F,S Pre: MA 111

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.

EM 202 Dynamics 4R-0L-4C F Pre: MA 112 and EM 120 or 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.

EM 203 Mechanics of Materials 4R-0L-4C F,W Pre: EM 120

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.

EM 204 Statics and Mechanics of Materials II 4R-0L-4C F,S Pre: EM 121

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.

EM 301 Fluid Mechanics 4R-0L-4C S Pre: 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).

***EM403 Advanced Mechanics of Materials 4R-0L-4C S Pre: EM 203 or EM 204**

Covers advanced topics in mechanics of deformable bodies and theories of failure. Introduces the theory of elasticity.

EM 406 Vibration Analysis 4R-0L-4C F Pre: ES 205

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 493 Selected Topics in Engineering and Technology

UNDERGRADUATE-GRADUATE COURSES

***EM 501 Topics in Fluid Mechanics 4R-0L-4C Arr Pre: EM 301 or ES 202**

Course may be repeated for different fluid mechanics topics.

***EM 502 Advanced Dynamics 4R-0L-4C Pre: 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 4R-0L-4C W Pre: EM 406**

Dynamic analysis of multiple-degree-of-freedom lumped parameter vibrating systems as well as continuous systems. Lagrange'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 4R-0L-4C Pre: 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's problems, energy principles, and variational methods.

***EM 508 Energy Methods in Engineering Mechanics 4R-0L-4C Pre: EM 403 and MA 330**

General concepts and principles in mechanics, conservative mechanical systems, and variational methods. Applications to deformable bodies.

*May be used to satisfy Mechanical Engineering requirement for an advanced technical elective.

