Energy Engineering Courses

At Rutgers, courses related to engineering aspects of energy are offered within the School of Engineering and are listed below:

14:125:210 BIOMEDICAL DEVICES AND SYSTEMS Time and frequency domain analysis of electrical networks; hydrodynamic, mechanical, and thermal analogs; basic medical electronics, and energy conversion systems. Design of biological sensors. Prerequisites: 01:640:251, 01:750:227 and 229, 14:125: 201. Corequisite: 14:125:211.

14:125:308 INTRODUCTION TO BIOMECHANICS (3) Relationship between applied and resultant forces and stresses acting on the musculoskeletal system. Basic concepts of vectors, internal and external forces, functional anatomy, trusses and equilibria of spatial force systems, moments, and work and energy concepts. Stress and strain tensors, principal forces, viscoelasticity, and failure analysis from classical mechanics. Prerequisites: 01:640:244, 01:750:228 and 230, 14:125: 303 and 305, 14:440:221.

11:127:424 BIOENVIRONMENTAL ENGINEERING UNIT PROCESSES LABORATORY II (1) Demonstration of biochemical operations used in the treatment of municipal and industrial wastewater, including biodegrad-ability and biodegradation kinetics, energy balance in a biological reactor, respirometry, activated sludge, anaerobic toxicity, and aerobic digestion. Prerequisite: 01:160:171 or equivalent. Corequisite: 11:127:414. 11:127:490 STRUCTURAL DESIGN AND ENVIRONMENTAL CONTROL (3) Functional requirements and design aspects for controlled environment plant production systems, including structures, energy flows and balances, and environmental control equipment. Prerequisites: 14:180:215, 243.

11:127:492 ENERGY CONVERSION FOR BIOLOGICAL SYSTEMS (3) Principles of energy conversion techniques and their application to various biomechanical systems, including solar energy systems, compostation, methane and alcohol production, and the internal combustion engine. Prerequisite: 14:650:351.

14:150:405 SOLAR CELL DESIGN AND PROCESSING
This class will be heavily design oriented and will be aimed to satisfy 2 units of Engineering Design according to ABET specifications.

14:155:201 CHEMICAL ENGINEERING ANALYSIS I (3) Introductory course. Mass and energy balances, recycle and bypass calculations. First Law of Thermodynamics and application to closed and open systems. Formulation of simple chemical equilibria. Analysis and solution of mass and energy balance problems for complex processes. Prerequisites: 01:160:160, 171; 01:640:152.

14:155:304 TRANSPORT PHENOMENA IN CHEMICAL ENGINEERING II (3) Energy and mass transfer in chemical engineering processes, with computer applications. Steady-state and unsteady-state heat conduction and molecular diffusion. Energy and mass transfer in fluids undergoing flow, phase change, and/or chemical reaction. Radiant heat transfer. Heat exchangers and mass transfer equipment. Prerequisites: 14:155:303, 01:640:421 or equivalent.

14:180:382 HYDRAULIC AND ENVIRONMENTAL ENGINEERING (3) Basic concepts of viscous flows; conservation laws (mass, momentum, and energy); pipe flows and open-channel flows; water distribution systems; hydraulic modeling (stream and marine pollution); air, stream, and marine pollution problems. Computer applications. Prerequisite: 14:180:387.

14:180:387 FLUID MECHANICS (3) Fluid properties, statics and kinematics; concepts of system and control volume; mass, momentum, and energy conservation principles; laminar and turbulent flows in conduits and channels; boundary layer theory; drag and lift; ideal fluid flow. Prerequisites: 14:440:222, 01:640:244.

14:180:389FLUID MECHANICS LABORATORY (1) Experimental applications and demonstrations; measurement of fluid properties; applications of mass, energy, and momentum principles; energy losses; forces on immersed bodies; flow measurement devices. Corequisite: 14:180:387.

14:332:411 ELECTRICAL ENERGY CONVERSION (3) Principles of converting electrical energy into mechanical energy, and the reverse, via electromagnetic field interaction. Identification of different machines and their applications, understand machine-operating principles, and analyze key characteristics. Understanding of magnetic and thermal constraints. Prerequisites: 14:332:221-222.

14:440:222 ENGINEERING MECHANICS: DYNAMICS (3) Kinematics of particles and rigid bodies; rectangular, path, and polar descriptions. Relative motion. Kinetics of particles, particle systems, and rigid bodies; equations of motion, principles of work and energy, linear and angular impulse and momentum. Impact. Prerequisites: 14:440:221,

01:640:152, 01:750:124. Corequisite: 01:640:251.

14:650:312 FLUID MECHANICS (3) Control volume concepts of mass, momentum, and energy transport. Hydrostatics, Euler's equations, potential flow, Navier Stokes equations, turbulence, and boundary layer theory. Prerequisite: 01:640:244.

14:650:342 DESIGN OF MECHANICAL COMPONENTS (3) Design philosophy; stress and deflection analysis; energy methods; theories of failure; fatigue; bearings; design of such mechanical elements as springs, weldments, and gears. Prerequisites: 14:650:291, 14:440:222.

14:650:474 SOLAR THERMAL ENERGY COLLECTION AND STORAGE (3) Introduction to the design and theory of systems that employ solar thermal energy as a replacement for fossil fuel energy used in buildings and homes. Design project. Open only to senior engineering or physical sciences majors.

14:650:485 TOPICS IN MECHANICAL ENGINEERING (3) One or two topics of current importance and interest studied intensively. Topic examples: acoustics, combustion, energy conversion, refrigeration, urban engineering, and propulsion. Open only to senior mechanical engineering majors.