

# MECHANICAL ENGINEERING (MENG)

## MENG 210 | STATICS

**Units: 3 Repeatability: No**

Prerequisites: PHYS 270 and MATH 150

Equilibrium analysis of particles and rigid bodies using vector analysis of forces and moments in two and three dimensions; free body diagrams; friction; analysis of trusses; distributed forces; basics of shear and moment diagrams; centroids; and moments of inertia. Three hours lecture weekly. Fall and spring semesters.

## MENG 260 | INTRODUCTION TO THERMAL SCIENCES

**Units: 3 Repeatability: No**

Prerequisites: MATH 151 and PHYS 270

Introduction to basic engineering thermodynamics, fluid mechanics, and heat transfer. Applications to engineering systems. Three hours lecture weekly. Fall and spring semesters.

## MENG 294 | SPECIAL TOPICS IN MECHANICAL ENGINEERING

**Units: 1-4 Repeatability: Yes (Can be repeated for Credit)**

Special topics seminar in areas of special interest to mechanical engineering. May be repeated for credit with a different topic.

## MENG 299 | INDEPENDENT STUDY

**Units: 1-3 Repeatability: Yes (Can be repeated for Credit)**

Individual project in creative design and synthesis under the general supervision of a participating professor. Project proposal must be submitted and approved prior to enrollment. May be repeated for credit.

## MENG 300 | APPLIED THERMODYNAMICS

**Units: 3-4**

Prerequisites: MENG 260

Further developments of concepts from classical thermodynamics. Application of laws of thermodynamics to gas and vapor power cycles, mixtures of gases and vapors, and refrigeration cycles. Moist air analysis and chemically reacting systems. Three hours lecture weekly. Fall semester.

## MENG 311 | MATERIALS SCIENCE AND ENGINEERING

**Units: 3 Repeatability: No**

Prerequisites: CHEM 151 and CHEM 151L and MATH 151

Basic concepts of material structure and its relation to properties; atomic structure; mechanical properties; engineering applications; introduction to semiconductor materials.

## MENG 321 | MATLAB PROGRAMMING AND PROBLEM SOLVING

**Units: 1 Repeatability: No**

Prerequisites: COMP 110 and MENG 210

Computer programming in Matlab with elementary numerical analysis of engineering problems. Arithmetic and logical operations, arrays, graphical representation of computations, symbolic mathematics, solution of equations, and introduction to data structures.

## MENG 350 | MANUFACTURING PROCESSES

**Units: 3 Repeatability: No**

Prerequisites: MENG 210 and (MENG 311 or ENGR 311)

Description, classification and analysis of manufacturing processes used in the transformation of different raw materials (e.g. metal, polymers, and ceramics) into consumer or capital goods. Topics include analysis of variables that affect process operations, performance, quality, cost, sustainability and the design of process plans.

## MENG 350L | MANUFACTURING PROCESSES LABORATORY

**Units: 1 Repeatability: No**

A laboratory course to compliment the lecture material presented in ISYE 350. One three-hour laboratory weekly. Spring Semester.

## MENG 351 | MACHINE SHOP PRACTICES

**Units: 1 Repeatability: No**

Introduction to metal and wood working machines and practices, with emphasis on development of basic competence and safety. Three-hour laboratory weekly. Sophomore standing in Mechanical engineering. Fall semester.

## MENG 352 | CAD PRACTICES

**Units: 1 Repeatability: No**

Introduction to 3D computer-aided design of components and assemblies using modern solid modeling tools. Three-hour laboratory weekly. Sophomore standing in Mechanical engineering. Fall semester.

## MENG 360 | FLUID MECHANICS

**Units: 3 Repeatability: Yes (Can be repeated for Credit)**

Prerequisites: MENG 260 and MATH 250 and MATH 310

Basic laws of fluid mechanics with applications to engineering problems, including dimensional analysis and similitude, boundary layer analysis, internal and external flows, and turbomachinery analysis. Three hours lecture. Spring semester.

## MENG 365 | WATER IN CALIFORNIA AND ISRAEL: CHALLENGES AND SOLUTION

**Units: 3 Repeatability: No**

Prerequisites: MENG 360 (Can be taken Concurrently)

Discussion of the hydrological cycle, distribution of water resources, water delivery and treatment infrastructure, as well as wastewater management. Focus on water challenges and solutions in California and Israel.

## MENG 370 | MECHANICS OF MATERIALS

**Units: 3 Repeatability: No**

Prerequisites: MENG 210

Analytical methods for determining stress and strain, torsion, bending of beams, shearing stress in beams, combined stresses, principal stresses, and deflection in beams. Three hours lecture weekly. Spring semester.

## MENG 370L | MECHANICS OF MATERIALS LABORATORY

**Units: 1 Repeatability: No**

Prerequisites: MENG 370 (Can be taken Concurrently)

Laboratory for MENG 370. Three-hour laboratory weekly. Spring semester.

## MENG 375 | DYNAMICS

**Units: 3 Repeatability: No**

Prerequisites: MENG 210

Analysis of dynamics of particles and rigid bodies using vector methods in two and three dimensions. Topics include kinematics and kinetics of translational and rotational motion, energy and momentum methods. Three hours lecture weekly. Fall semester.

## MENG 380 | KINEMATICS AND DESIGN OF MACHINERY

**Units: 3**

Prerequisites: MENG 375

Kinematics and dynamic analysis of machinery; mechanism synthesis techniques for function, motion, path generators; and design applications with linkages, cams, and gears. Three hours lecture weekly. Spring semester.

## MENG 381 | DESIGNING YOUR LIFE

**Units: 1 Repeatability: No**

Prerequisites: ENGR 103

Application of design thinking to personal decision making. Development of oral and written communication, teamwork, and leadership skills.

**MENG 400 | HEAT TRANSFER****Units: 3 Repeatability: No**

Prerequisites: MENG 360

Heat transfer by conduction, convection, radiation, and combinations thereof. Introduction to heat exchanger analysis and design, along with other applications. Three hours lecture. Fall semester.

**MENG 400L | HEAT TRANSFER LABORATORY****Units: 1 Repeatability: No****Non-Core Attributes: Lab**

Prerequisites: MENG 400 (Can be taken Concurrently)

Laboratory for MENG 400. Three laboratory weekly. Fall semester.

**MENG 410 | ALTERNATIVE ENERGY SYSTEMS****Units: 3 Repeatability: Yes (Can be repeated for Credit)**

Prerequisites: MENG 300

Thermodynamics of traditional fossil fuels and bio fuel combustion. Analysis of solar, wind, wave, and tidal power systems. Introduction to fuel cells and advanced battery technology. Discussion of the current technological limitation of each topic listed above. Three hours of lecture weekly.

**MENG 415 | SOLAR ENERGY CONVERSION AND STORAGE****Units: 3 Repeatability: No**

Prerequisites: MENG 260

This course introduces principles and technologies for converting sunlight into electricity and heat. This class will study the behavior of photovoltaic solar energy systems and solar thermal technologies. The design and sizing of residential photovoltaic systems will be covered, including estimation of costs, benefits and subsidies. Introduction to hardware elements, effect of renewables on the grid and available electrochemical, thermal and other energy storage devices will be included.

**MENG 420 | COMPUTER APPLICATIONS IN MECHANICAL ENGINEERING****Units: 3 Repeatability: No**

Prerequisites: MATH 250 and MATH 310 and MENG 370 and MENG 352 and (ENGR 121 or COMP 150 or COMP 110)

Mechanical design and analysis using commercially available solid modeling, kinematics, and FEA computer software. Numerical methods and their applications using root solving, optimization, regression analysis, numerical differentiation and integration will be covered. An introduction to finite difference and finite element methods will also be presented. Two hours lecture and one three-hour laboratory weekly. Fall semester.

**MENG 430 | DESIGN OF MACHINE ELEMENTS****Units: 3-4**

Prerequisites: MENG 370

Analysis and design of mechanical components against failures under steady and fatigue loads. Design applications of various machine elements, such as shafts, bearings, gears, springs, and fasteners. These are integrated into mini-design projects required of all students. Three hours lecture weekly. Spring semester.

**MENG 445 | INTRODUCTION TO ROBOTICS****Units: 3**

Prerequisites: MENG 375

This course covers introductory materials related to the subject of robotics. The course is designed to encompass theories as well as practices, intended for both the user and the designer of a robotic system. Topics include modeling and analyses of the mechanics of robots, actuators, sensors, and vision systems.

**MENG 460 | SYSTEM DYNAMICS AND VIBRATIONS****Units: 3**

Prerequisites: MENG 375

Analysis and design of dynamic systems in various engineering domains; modeling of mechanical and electrical systems, free and forced responses, time and frequency domain analysis, applications in isolation and control of mechanical vibrations, and vibration measuring instruments. Three hours lecture weekly. Spring semester.

**MENG 460L | SYSTEM DYNAMICS AND VIBRATIONS LABORATORY****Units: 1**

Prerequisites: MENG 460 (Can be taken Concurrently)

Laboratory for MENG 460. Three-hour laboratory weekly. Spring semester.

**MENG 462 | TOPICS IN FLUID MECHANICS****Units: 3 Repeatability: Yes (Can be repeated for Credit)**

Prerequisites: MENG 360

Additional topics in fluid mechanics, including the differential description of fluid flow, its application to channel flow, pipe flow, and boundary layers, scaling of the equations, methods in computational fluid dynamics, and an introduction to turbulence. Three hours lecture weekly.

**MENG 465 | INTRODUCTION TO COMPUTATIONAL FLUID DYNAMICS****Units: 3 Repeatability: No**

Prerequisites: MENG 360

This course introduces students to finite volume methods as a means of solving differential equations that arise in fluid dynamics. The conservation of mass, momentum and energy equations will be solved using a software package. Fundamentals of numerical analysis related to fluid mechanics and heat transfer will be reviewed. Applications include modeling laminar and turbulent channel flow, pipe flow, boundary layers, heat exchangers, or flow past an airfoil.

**MENG 470 | FINITE ELEMENT ANALYSIS****Units: 3 Repeatability: No**

Prerequisites: MATH 310 and MENG 351 and MENG 370

Finite element based solutions to engineering problems with an emphasis on elastostatic problems in structural mechanics. The power and pitfalls associated with the finite element method highlighted through practical modeling assignments. Modeling and practical applications using commercial finite element codes. Three hours lecture weekly.

**MENG 491 | SENIOR DESIGN PROJECT I****Units: 3 Repeatability: No**

Prerequisites: (MENG 311 or ENGR 311) and ENGL 304 and MENG 351

(Can be taken Concurrently) and MENG 352 (Can be taken Concurrently) and MENG 400 (Can be taken Concurrently) and MENG 400L (Can be taken Concurrently) and MENG 430 (Can be taken Concurrently) and (COMM 203 (Can be taken Concurrently) or NAVS 201 (Can be taken Concurrently) or MILS 301 (Can be taken Concurrently))

Mechanical engineering capstone design experience in a simulated industrial environment. Students work in teams, in collaboration with an engineering faculty and/or an engineering professional from industry, on an open-ended design project. This involves designing, construction, testing, and evaluation as well as consideration of issues related to ethics, economics, safety and professional practice. Two-hour lecture and four-hour laboratory weekly.

**MENG 491W | SENIOR DESIGN PROJECT I****Units: 4 Repeatability: No****Non-Core Attributes: Writing-Pre F17 CORE**

Prerequisites: COMM 203 and ENGR 311 and MENG 351 and MENG 352 and MENG 400 (Can be taken Concurrently) and MENG 430 (Can be taken Concurrently)

This course prepares students to approach an engineering design project in a small team. Topics include project selection, research methods on chosen project, a review of the design process, including concept generation, concept selection, construction, testing, and evaluation, as well written and oral presentation skills. Three-hour lecture recitation and one three-hour laboratory weekly. Fall semester.

**MENG 492 | SENIOR DESIGN PROJECT II****Units: 3 Repeatability: No****Core Attributes: Advanced Integration**

Prerequisites: MENG 491W or MENG 491

Mechanical engineering capstone design experience in a simulated industrial environment that applies and integrates engineering and nonengineering topics.. Students work in teams, in collaboration with an engineering faculty and/or an engineering professional from industry, on an open-ended design project. This involves designing, construction, testing and evaluation as well as consideration of issues related to ethics, economics, safety and professional practice. The course also includes documentation of design project including written reports and oral presentations to multiple audiences.

**MENG 494 | SPECIAL TOPICS IN MECHANICAL ENGINEERING****Units: 1-4 Repeatability: Yes (Can be repeated for Credit)**

Special topics seminar in areas of special interest to current engineering practice in Mechanical Engineering. May be repeated for credit.

**MENG 496 | UNDERGRADUATE RESEARCH****Units: 0.5-3 Repeatability: Yes (Can be repeated for Credit)**

Faculty-directed undergraduate research in mechanical engineering. Problem proposal must be submitted and approved prior to enrollment. Written report required. Upper division standing in the EE major. Prior approval by the department chair is required. May be repeated for credit.

**MENG 498 | INTERNSHIP/CO-OP EXPERIENCE****Units: 1-3 Repeatability: Yes (Can be repeated for Credit)**

Directed upper division level internship/co-operative experience in engineering research, design, development, manufacturing, or the engineering activity. Written report required. Credit not applicable to minimum program graduation requirement. Placement contingent upon approval of participating organization. May be repeated for credit.

**MENG 499 | INDEPENDENT STUDY****Units: 1-3 Repeatability: Yes (Can be repeated for Credit)**

Individual design or research project under the general supervision of participating professor. Project proposal must be submitted and approved prior to enrollment. May be repeated for credit.