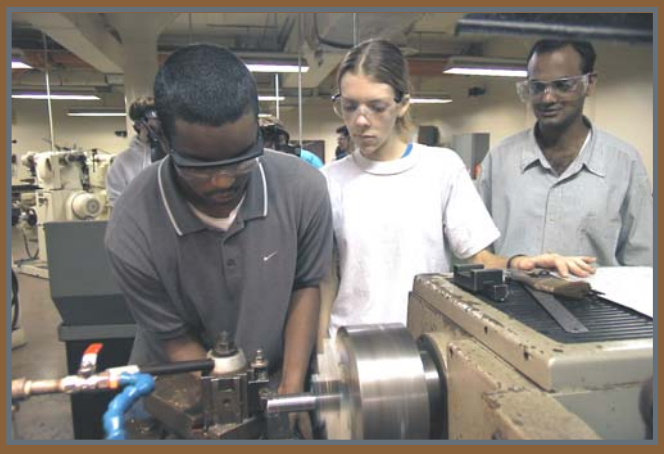
Machine Design Specialty

Department of Mechanical Engineering



M.E. Machine Design students get hands-on experience in machining.

Kettering University

Objectives of the Machine Design Specialty

The term “design” covers a wide spectrum of concepts from designer jeans to high temperature components and subsystems in jet engines. The Machine Design specialty emphasizes design of engineering components, subsystems and/or systems. According to ABET, engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often open-ended and thus iterative), in which the basic scientific and mathematical principles together with engineering sciences are integrated and applied to optimally convert resources in an efficient manner to meet a stated objective. Some of the basic elements of the design process are the establishment of clear objectives, synthesis, analysis, construction, testing and evaluation. Engineering design may involve conceptual design of a new device or modification of an existing device to meet new customer requirements, or to correct an operating problem. A designer may be responsible for directing the efforts of other personnel such as a draftspersons (CAD specialists), motion and stress analysts (CAE experts), manufacturing process engineers, assembly and testing personnel, field operating and customer interfacing personnel, all of whom are responsible for the realization of the final product. Thus, a designer works under constraints, taking into account economic, health and safety, social and environmental factors, codes of practice and applicable laws.

An analyst may be responsible to perform motion analysis (kinematic and dynamic analysis) of a mechanical system before designing each individual component or subsystem using the appropriate design criteria and the applicable codes and standards. Selection of proper engineering materials along with a clear understanding of how they behave in a variety of operating conditions, such as static loading (stress-strain curve), variable loading (stress-life evaluations), and elevated temperatures (creep and thermal fatigue) conditions is very important. Further, an understanding of how the material properties may change due to different heat-treatment processes and how this impacts the original design of a component is also critical for the final product realization. The designer along with other personnel in his/her team may be responsible for one or more of these activities.

What Courses Will I Take?

Regardless of the chosen concentration, every student pursuing an M.E. degree at Kettering takes 39 courses and a thesis.

Four of the 39 courses define a specialty. A representative program for a Machine Design student follows on the back page of this flyer.

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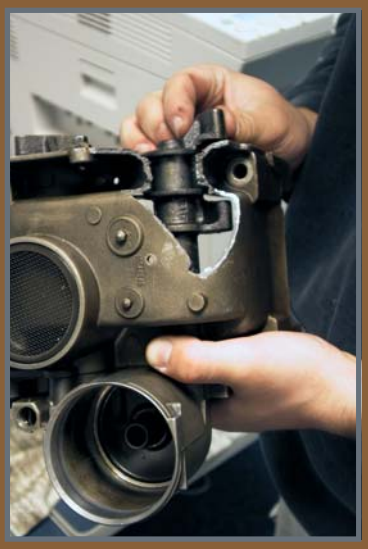

Students pursuing a Machine Design concentration may find themselves in the middle of a small or large manufacturing projects or even working with automotive oil pumps as seen above.

Freshman I Term

CHEM-135/136	Principles of Chemistry & Lab
MECH-100	Engineering Graphical Communication[1]
ORTN-101	Orientation
MATH-101	Calculus I
COMM-101	Witten & Oral Communication I

Freshman II Term

HUMN-201	Introduction to Humanities
MATH-102	Calculus II
IME-100	Interdisciplinary Design & Manufacturing[1]
PHYS-114/115	Newtonian Mechanics & Lab

Sophomore I Term

ECON-201	Economic Principles
MATH-203	Multivariate Calculus
MECH-210	Mechanics I
PHYS-224/225	Electricity and Magnetism & Lab

Sophomore II Term

CHEM-145/146	Industrial Organic Chemistry & Lab
EE-212 &	Applied Electrical Circuits Lecture
MECH-231L	Signals for Mechanical Systems Lab
MATH-204	Differential Equations & Laplace Transforms
MECH-212	Mechanics II

Junior I Term

IME-301	Engineering Materials
MATH-305	Numerical Methods and Matrices
MECH-310	Mechanics III
MECH-311	Intro. to Mechanical System Design[2]
SSCI-201	Introduction to the Social Sciences

Junior II Term

COMM-301	Written & Oral Communication II
MATH-408	Probability & Statistics
MECH-300	Computer Aided Engineering[2]
MECH-312	Mechanical Components I
MECH-320	Thermodynamics

Senior I Term

MECH-322	Fluid Mechanics
MECH-330	Dynamic Systems I
MECH-412	Mechanical Components & Design II
MECH-516	Intro. to Finite Element Analysis

Senior II Term

MECH-420	Heat Transfer
MECH-430	Dynamic Systems II
	Advanced Social Science Elective
	Machine Design Specialty Related Elective

Senior III Term

LS-489	Senior Seminar
MECH-422	Energy Systems Lab
	Machine Design Specialty Related Elective
MECH-512	Mechanical Systems Design Project*
	(*this is the Machine Design capstone course)

The airplane is a great example of a continuous machine design project.

Specialty Related ME Electives List: Students may choose one general course from the ME Elective's List or choose from the following list of courses to complete their ME Elective/Specialty Relative Elective :

- IME-474 Design for Manufacture and Assembly
- MECH-490 Fluid Power Systems
- MECH-516 Intro. to FEA with Structural Application

[1]Approximately one-half of the students take MECH-100 FR-I and IME-100 FR-II, the other one0half take IME-100 FR-I and MECH-100 FR-II.
[2]Approximately one-half of the students take MECH-300 JR-II and MECH-311 JR-I, the other one-half take MECH-311 JR-II and MECH-300 SR-I.