BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING

Welcome to YSU's Mechanical Engineering program. We offer Bachelor of Engineering (BE) and Master of Science in Engineering (MSE) degrees in Mechanical Engineering. The undergraduate program provides a strong background in mathematics, the sciences, and fundamentals of engineering, as well as tracks in the design and analysis of solid mechanics systems, thermal fluid flow systems, and dynamic systems. In addition to a quality education, most students participate in co-op or internship job assignments during their time with us, making them more marketable upon completion of their degrees. Graduates of the program enjoy placement in many areas of the diverse mechanical engineering job market.

I hope that you find this web page informative. If you have any additional questions, please contact me.

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Mechanical engineering is the branch of the engineering profession that is concerned with harnessing the power of machines to accomplish tasks and goals faster, safer, and more efficiently. Within the broad field of mechanical engineering, this can vary greatly in complexity and magnitude, from athletic equipment for enhancing performance to household items for living comfort to cars that get us where we're going to medical devices that keep us healthy.

The challenge of mechanical engineering is to weave together fundamental knowledge of not just mathematics, physics and chemistry, but also fluid and thermal sciences, kinetics and dynamics in order to approach problem solving creatively and design real-world solutions. Our curriculum prepares students for a wide variety of technical and professional careers areas that have their roots in mechanical engineering: aerospace, power generation, transportation, biotechnology, manufacturing, product design, robotics and controls, and many more.

Program Mission

The mission of the mechanical engineering program is to further the missions and objectives of the University and the College of Science, Technology, Engineering and Mathematics by providing an opportunity for a quality education in Mechanical Engineering to the people it serves, particularly those in northeast Ohio and western Pennsylvania. The program also strives to provide professional service to the local and regional industry and to the public. The program is committed to meeting regional and state-wide priorities in higher education by providing its students with a broad, general education and an up-to-date technological curriculum in a four-year undergraduate program, and an application-oriented evening graduate program, offering a Master of Science in Engineering degree to practicing engineers and recent engineering graduates. The program also strives to enhance quality research and scholarly activities to be integrated with teaching and meet the needs of the region by providing area schools, businesses, industries, and government agencies with technical expertise.

Program Educational Objectives

The program educational objectives of the mechanical engineering undergraduate program are to educate graduates who will be professional, productive, and ethical members of society. As they progress professionally after graduation, our alumni will do the following:

1. Demonstrate **successful application of mechanical engineering knowledge and skills** through:
   a. employment in leadership roles in industry, academia, government, or other organizations
   b. engagement in research and development in graduate study or industry
   c. analytical problem solving in less traditional careers such as law, medicine, business, public policy, secondary education, service industries, etc.
   d. mentorship of younger engineers in careers involving management or entrepreneurship
2. Demonstrate the **commitment to lifelong learning** through:
   a. active participation in professional development opportunities in their disciplines; such as conferences, short courses, graduate education
   b. development of new knowledge and skills necessary for new areas of expertise or careers
   c. adaption of their fundamental engineering knowledge for effectiveness in changing global markets and workforce trends
3. Demonstrate **active engagement in professional service** through:
   a. application of their engineering knowledge to advance society and to help solve technical and societal problems
   b. engagement in activities that promote sustainable economic development that enhances the quality of life
   c. promotion of the engineering profession as a source of societal good
   d. participation in community activities where their engineering knowledge adds significantly to their contributions

These Program Educational Objectives describe long-term accomplishments for which we seek to prepare the graduates of Youngstown State University mechanical engineering program. It is expected that progress toward these objectives is measurable.

Student Outcomes

The YSU mechanical engineering program student outcomes ensure that our graduates have been given the skills to attain the program educational objectives after graduation. Student outcomes for direct assessment are ABET specified outcomes (1) through (7). Our students are expected to graduate with:

1. Engineering Expertise - an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

2. Design Expertise - an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

3. Communication Skills - an ability to communicate effectively with a range of audiences

4. Professional Responsibility - an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

5. Teamwork Competency - an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6. Experimental Competency - an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. Life-long Learning - an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Accreditation

The Mechanical Engineering BE program has been accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org (http://www.abet.org/).

Annual Enrollment and Graduation Data

Term	Enrollment
Fall 2012	154
Fall 2013	167
Fall 2014	194
Fall 2015	210
Fall 2016	253
Fall 2017	252
Fall 2018	239

Academic Year	Degree Awarded
2012-2013	27
2013-2014	34
2014-2015	46
2015-2016	41
2016-2017	59
2017-2018	65

Vision Statement

Mechanical engineering and mechanical engineering education, in particular, face dramatic challenges in the future due to rapidly changing technologies and a new pattern of societal and industrial demands. The vision of the program is to meet these challenges and exceed the expectations of its constituents by focusing on the following primary strategies of the program:

- Continuous improvement of an educational environment for outstanding teaching and learning
- Development of a productive research program through a strategic focus on technology development in emerging areas such as green energy, computer simulation, and nanotechnology
- Successful co-op and internship programs that provides students with on-the-job training opportunities
- An assessment program and procedures in order to insure a high quality program focusing on the needs of the program's constituents (the students, alumni, employers, faculty, administrations, community and the general public)
- Healthy enrollment that facilitates diversification of curriculum and faculty research and professional development

In order to achieve its educational objectives and to further the missions and objectives of the University and the College, the program provides an educational environment, teeming with opportunities for students to learn and acquire essential knowledge and skills that are defined in the ABET Criteria 2000, through its curriculum and extra-curricular activities. The program maintains undergraduate and graduate curricula that are well balanced in engineering fundamentals, state-of-the-art technology, and real-world engineering applications, in the primary specialty areas of fluid thermal sciences, and mechanics of deformable bodies. The undergraduate curriculum also contains courses that foster:

- critical and independent thinking
- decision making
- development of interpersonal communication and a life-long learning attitude
- working within a team
- integration of knowledge, skills, ethics, and personal responsibility

Although the program intends to cultivate the capabilities of its students' problem solving, fundamental and advanced engineering analyses, design, research, and development, it also intends to provide the students with maximum exposure to hands-on, experimental skills to insure the high quality of its graduates. Through courses like stress analysis, thermal fluid applications, and finite element analysis, students will acquire strong tools for design and pertinent knowledge to solve real-world engineering problems. Our emphasis on engineering applications, computer simulation, and hands-on experience are complementary to each other and encourage students to apply analytical methods to engineering problems.

This approach enhances the effectiveness of teaching and also facilitates the students' understanding of abstract and difficult subjects. The ultimate goal of the program is to provide the society and industry with "whole person" mechanical engineers with superior technical capability.

Mechanical Engineering Laboratories

The mechanical engineering program maintains six physical experimental laboratories in Moser Hall. A wide array of modern equipment, instrumentation devices, and department-owned computers are housed in spacious rooms that support academic instruction and research activities in applied thermodynamics, heating and air conditioning, fluid mechanics, heat transfer, stress analysis, vibrations, and material property characterization. Other mechanical engineering laboratories are simulation and computing-related laboratories that include computer-aided design, machine design, kinematic and dynamic systems, and finite-element analysis. The College and the mechanical engineering program maintain modern computing facilities in Moser Hall and constantly upgrade hardware and software. The students and faculty also use the university computing facilities in Meshel Hall and Kilcawley Center.

For more information, visit **Mechanical Engineering (http://www.ysu.edu/academics/science-technology-engineering-mathematics/mechanical-engineering-major/).**

Cooperative Education

The mechanical engineering program strongly encourages its students to actively participate in the optional cooperative education program. The parallel co-op arrangement which combines work and study each semester is recommended. However, full time employment in the summer can also be included. Students must register for a co-op course and submit documentation as specified by professional practice office.

Advisement

The mechanical engineering program specifies mandatory advisement. Every student in the program is advised every semester before his or her registration. Students cannot finalize their registration without approval of the faculty advisor or chair.

Industrial Advisory Board

The Industrial Advisory Board is another valuable resource in ensuring a quality program. It is composed of members of various local industries, having a vital interest and purpose in the school and/or department. The industry advisory board members can also serve as mentors on an industry sponsored

project, as well as to advise the department in the area of curriculum development and research. Our board members include:

David Drabison -- Board Chair
Design Engineer
Babcock & Wilcox Company, Nuclear Operations Group

John Divitto
Business Development Manager
Babcock & Wilcox Company, Power Generation Group

Tony Ghioldi
Vice President Sales
Quality Bridge & Fab, Inc.

Don Helle
Director – Global Process Engineering
The Goodyear Tire & Rubber Company

Patrick Kiraly
Tooling Specialist
V&M Star

Mike Malito
Babcock & Wilcox Company (Retired)

Anthony J Nackino
Engineering Manager
Advanced Recycling Systems, Inc.

Gorman Ng
Regional Manager
O.E.M. and Government
Linde Hydraulics Corporation

David Peterson
Babcock & Wilcox Company (Retired)

Courtney A. Puhl
Delphi Corporation

Richard Ulam
Business Development Manager
ABB Power Systems Power Generation

Douglas Verenski
President and Chief Engineer
Hunter Lift

COURSE	TITLE	S.H.
FIRST YEAR REQUIREMENT -STUDENT SUCCESS		
YSU 1500	Success Seminar	1-2
or SS 1500	Strong Start Success Seminar	
or HONR 1500	Intro to Honors	
General Education Requirements		
ENGL 1550	Writing 1	3-4
or ENGL 1549	Writing 1 with Support	
ENGL 1551	Writing 2	3
CMST 1545	Communication Foundations	3
Mathematics requirement (met with MATH in major)		
Arts and Humanities (2 courses)		
PHIL 2626	Engineering Ethics	3
or PHIL 2625	Introduction to Professional Ethics	
Arts and Humanities elective		3
Social Sciences (2 courses)		
ECON 2610	Principles 1: Microeconomics	3
Social Science elective		3
Natural Sciences (2 courses, 1 with lab) (6-7 s.h.)		
Met with two of the following required courses: CHEM 1515, PHYS 2610, PHYS 2611 and one lab: PHYS 2610L or CHEM 1515L		
Social and Personal Awareness (2 courses)		
SPA elective		3
SPA elective		3
Mechanical Engineering Courses		
MECH 1560	Engineering Communication with CAD	2
MECH 2603	Thermodynamics 1	3
MECH 2604	Thermodynamics 2	3
MECH 2606	Engineering Materials	3
MECH 2641	Dynamics	3
MECH 3708	Dynamic Systems Modeling	4
MECH 3720	Fluid Dynamics	3
MECH 3720L	Fluid Dynamics Laboratory	1
MECH 3725	Heat Transfer 1	3
MECH 3742	Kinematics of Machines	3
MECH 3751	Stress and Strain Analysis 1	3
MECH 3751L	Stress and Strain Analysis 1 Laboratory	1
MECH 3762	Design of Machine Elements	3
MECH 3762L	Design of Machine Elements Laboratory	1
MECH 4808	Mechanical Systems Design 1	2
MECH 4808L	Mechanical Systems Design Laboratory	1
MECH 4809	Mechanical Systems Design 2	3
MECH 4809L	Mechanical Systems Design Laboratory 2	1
MECH 4825L	Heat Transfer and Thermodynamics Laboratory	1
MECH 5881	Mechanical Vibrations	3
MECH 5881L	Mechanical Vibrations Laboratory	1
MECH electives (3)		9
Other Engineering Courses		
ENGR 1500	Engineering Orientation	1
ENGR 1550	Engineering Concepts	2
ENGR 1560	Engineering Computing	2
CEEN 2601	Statics	3
CEEN 2602	Strength of Materials	3
CEEN 2602L	Strength of Materials Lab	1
ECEN 2614	Basics of Electrical Engineering	3
ISEN 3710	Engineering Statistics	3-4
or STAT 3743	Probability and Statistics	
Mathematics courses		
MATH 1571	Calculus 1	4
MATH 1572	Calculus 2	4
MATH 2673	Calculus 3	4
MATH 3705	Differential Equations	3
Chemistry and Physics courses		
CHEM 1515	General Chemistry 1	3
PHYS 2610	General Physics 1	4
PHYS 2610L	General Physics Laboratory 1	1
or CHEM 1515L	General Chemistry 1 Laboratory	
PHYS 2611	General Physics 2	4
Total Semester Hours		**130-133**

Year 1

Fall		S.H.
YSU 1500	Success Seminar	1-2
or SS 1500	or Strong Start Success Seminar	

ENGL 1550 or ENGL 1549	Writing 1 or Writing 1 with Support	3-4
CHEM 1515	General Chemistry 1	3
MATH 1571	Calculus 1	4
ENGR 1500	Engineering Orientation	1
ENGR 1550	Engineering Concepts	2
GER Elective (SPA)		3
	Semester Hours	**17-19**
Spring		
ENGL 1551	Writing 2	3
MATH 1572	Calculus 2	4
PHYS 2610	General Physics 1	4
PHYS 2610L	General Physics Laboratory 1	1
CMST 1545	Communication Foundations	3
ENGR 1560	Engineering Computing	2
	Semester Hours	**17**
Year 2		
Fall		
MECH 1560	Engineering Communication with CAD	2
MECH 2606	Engineering Materials	3
MATH 2673	Calculus 3	4
PHYS 2611	General Physics 2	4
CEEN 2601	Statics	3
	Semester Hours	**16**
Spring		
MECH 2603	Thermodynamics 1	3
MECH 2641	Dynamics	3
MATH 3705	Differential Equations	3
CEEN 2602	Strength of Materials	3
CEEN 2602L	Strength of Materials Lab	1
ECEN 2614	Basics of Electrical Engineering	3
	Semester Hours	**16**
Year 3		
Fall		
MECH 2604	Thermodynamics 2	3
MECH 3720	Fluid Dynamics	3
MECH 3742	Kinematics of Machines	3
MECH 3751	Stress and Strain Analysis 1	3
MECH 3751L	Stress and Strain Analysis 1 Laboratory	1
ECON 2610	Principles 1: Microeconomics	3
	Semester Hours	**16**
Spring		
MECH 3708	Dynamic Systems Modeling	4
MECH 3720L	Fluid Dynamics Laboratory	1
MECH 3725	Heat Transfer 1	3
MECH 3762	Design of Machine Elements	3
MECH 3762L	Design of Machine Elements Laboratory	1
ISEN 3710 or STAT 3743	Engineering Statistics or Probability and Statistics	3-4
	Semester Hours	**15-16**
Year 4		
Fall		
MECH 4808	Mechanical Systems Design 1	2
MECH 4808L	Mechanical Systems Design Laboratory	1
MECH 4825L	Heat Transfer and Thermodynamics Laboratory	1
MECH 5881	Mechanical Vibrations	3
MECH Elective		3
PHIL 2626	Engineering Ethics	3
GER Elective (SS)		3
	Semester Hours	**16**
Spring		
MECH 4809	Mechanical Systems Design 2	3
MECH 4809L	Mechanical Systems Design Laboratory 2	1
MECH 5881L	Mechanical Vibrations Laboratory	1
MECH Elective		3
MECH Elective		3
GER Elective (AH)		3
GER Elective (SPA)		3
	Semester Hours	**17**
	Total Semester Hours	**130-133**

Mechanical Engineering Electives

COURSE	TITLE	S.H.
Heat & Fluid Flow		
MECH 4800	Special Topics	3
MECH 4823	Heating, Ventilation, and Air Conditioning	3
MECH 4835	Thermal Fluid Applications	3
MECH 5825	Heat Transfer 2	3
MECH 5836	Fluid Power and Control	3
MECH 5885	Computational Fluid Dynamics	4
Soild Mechanics		
MECH 4800	Special Topics	3
MECH 5842	Kinetics of Machines	3
MECH 5852	Stress and Strain Analysis 2	3
MECH 5884	Finite Element Analysis	3
MECH 5892	Control of Mechanical Systems	3
MTEN 5868	Failure Analysis Using the SEM	3

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