Department of

MECHANICAL ENGINEERING

Undergraduate Guidebook

Bachelor of Science, Mechanical Engineering

Effective Fall 2015

THE UNIVERSITY OF AKRON

Department of Mechanical Engineering
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Program Overview

Engineering Academics: The undergraduate mechanical engineering program is designed to provide a student with comprehensive knowledge of the fundamental principles of Mechanical Engineering. This includes fluid-thermal systems and mechanical sciences, and the application of these principles to engineering problems.

The undergraduate curriculum (136 credits total) can be divided into four main areas: general studies requirements (28 semester credits), mathematics and science requirements (32 credits), engineering requirements (67 credits), and electives (9 credits).

Cooperative Education: The Mechanical Engineering program has an optional cooperative education component. The coop program shows students the relationship between engineering practice and engineering education. The student gets real-world experience in an industry directly related to their studies. At graduation, the typical coop student already has one year of engineering experience. Not only do our students have opportunities nationwide, but we also have a wealth of opportunity right in our own area of northeast Ohio.

Student Design Teams: Whether it's rockets, race cars, bicycles, airplanes and robots, our students compete with engineering schools from across the nation (and in some cases across the world!). The design competitions are sanctioned by professional engineering societies like SAE, American Society of Mechanical Engineers (ASME) and the American Institute of Aeronautics and Astronautics (AIAA). Students from incoming freshman to seniors are encouraged to participate.

Mechanical Engineering Grade Checklist

	Course	CR	GR	Term/ Year Taken
General Education				
5540	Phys. Ed.	0.5		
5540	Phys. Ed.	0.5		
7600:105	Intro to Public Speaking –or–	3		
7600:106	Effective Oral Communication			
3300:111	English Composition I	3		
3300:112	English Composition II	3		
	Social Science Elective [1]	3		
3400:210	Humanities in Western Tradition I	4		
	Humanities Electives I [2]	3		
	Humanities Electives II [2]	3		
3250:244	Intro to Economic Analysis (Soc. Sci.)	3		
	Area Studies & Cultural Diversity [3]	2		
	Total General Education	**28**		

[1] Social Science Sets 2-7 (see pg 8)

[2] Humanities Sets 1-4 (see pg 9)

[3] Engineering students select one course (see pg 9)

	Course	CR	GR	Term/ Year Taken
Math and Natural Science				
3150:151	Principles of Chemistry I	3		
3150:152	Principles of Chemistry Lab	1		
3150:153	Principles of Chemistry II	3		
3450:221	Analytical Geometry & Calculus I	4		
3450:222	Analytical Geometry & Calculus II	4		
3450:223	Analytical Geometry & Calculus III	4		
3450:335	Differential Equations	3		
3470:401	Probabilities of Statistics	2		
3650:291	Elemental Classical Physics I	4		
3650:292	Elemental Classical Physics II	4		
	Total Math/Natural Science	**32**		

	Course	CR	GR	Term/ Year Taken
Required Engineering				
4300:201	Statics	3		
4300:202	Intro: Mechanics of Solids	3		
4400:307	Basic Electrical Engineering	4		
4600:165	Tools for Mechanical Engineering	3		
4600:203	Dynamics	3		
4600:260	Engineering Analysis I	2		
4600:300	Thermodynamics I	3		
4600:301	Thermodynamics II	2		
4600:310	Fluid Mechanics I	2		
4600:311	Fluid Mechanics II	3		
4600:315	Heat Transfer	3		
4600:321	Kinematics of Machines	2		
4600:336	Analysis of Mechanical Components	3		
4600:337	Design of Mechanical Components	3		
4600:340	System Dynamics and Response	3		
4600:360	Engineering Analysis II	2		
4600:380	Intro. Mater. Sci. & Eng.	2		
4600:400	Thermal Systems Components	3		
4600:402	Senior Seminar	1		
4600:431	Fund. of Mechanical Vibrations	3		
4600:441	Control System Design	3		
4600: 460	Concepts of Design	3		
4600: 461	ME Senior Design Project I	2		
4600: 471	ME Senior Design Project II	2		
4600: 483	Measurements Lab	2		
4600: 484	Mechanical Engineering Lab	2		
	Total Required Engineering	**67**		

	Course	CR	GR	Term/ Year Taken
Approved Electives				
Mechanical Engineering Design Elective		3		
Technical Elective		3		
Mechanical Engineering Technical Elective		3		
	Total Electives	**9**		

TOTAL:	**136**	

Mechanical Engineering (Co-op)

FALL			SPRING			SUMMER		
First Year								
4600:165	Tools for Mechanical Engineering	3	7600:----	Oral Communication Elective (105 or 106)	3			
5540:-----	Physical Education Elective	1	3300:112 or 2020:222	English Composition Elective	3			
3150:151	Principles of Chemistry I	3						
3150:152	Principles of Chemistry I Lab	1	3150:153	Principles of Chemistry II	3			
3300:111	English Composition I	3	3450:222	Analytical Geometry-Calculus II	4			
3450:221	Analytical Geometry-Calculus I	4	-------:----	Social Science Elective	3			
	Total	**15**		**Total**	**16**			
Second Year								
3650:291	Physics I	4	3650:292	Physics II	4	**OPTIONAL Co-op**		
4300:201	Statics	3	3450:335	Intro. to Ordinary Differential Equations	3			
3450:223	Analytical Geometry-Calculus III	4	4600:203	Dynamics	3			
3400:210	Humanities – Western Tradition I	4	4300:202	Mechanics of Solids	3			
3250:244	Intro. to Economic Analysis	3	4600:260	Engineering Analysis I	2			
	Total	**18**		**Total**	**15**			
Third Year								
4600:300	Thermodynamics I	3	**MANDATORY Co-op**			4600:311	Fluid Mechanics II	3
4600:310	Fluid Mechanics I	2				4600:380	Intro. Mater. Sci. & Eng.	2
4600:321	Kinematics of Machines	2				4600:340	Systems Dynamics & Response	3
4600:336	Analysis of Mechanical Components	3						
4600:360	Engineering Analysis II	2						
3470:401	Prob. & Stat. for Engineering	2						
	Total	**14**					**Total**	**8**
Fourth Year								
MANDATORY Co-op			4600:315	Heat Transfer	3	**MANDATORY Co-op**		
			4600:337	Design of Mechanical Components	3			
			4600:431	Fundamentals of Mechanical Vibrations	3			
			4400:307	Basic Electrical Engineering	4			
			4600:483	ME Measurements Lab	2			
			4600:301	Thermodynamics II	2			
				Total	**17**			
Fifth Year								
4600:400	Thermal Systems Components	3	4600:471	ME Senior Design Project II	2			
4600:441	Control Systems Design	3	-------:----	Area Studies & Cultural Diversity Elective	2			
4600:460	Concepts of Design	3	-------:----	Humanities Elective I	3			
4600:484	Mechanical Engineering Lab	2	-------:----	Humanities Elective II	3			
4600:461	ME Senior Design Project I	2	-------:----	Mechanical Engineering Elective*	3			
4600:402	Senior Seminar	1	-------:----	Mechanical Engineering Elective*	3			
-------:----	Mechanical Engineering Elective*	3						
	Total	**17**		**Total**	**16**			

* Electives must include 3 credits Mechanical Engineering design elective, 3 credits technical elective, and 3 credits Mechanical Engineering technical elective.

Mechanical Engineering (Non-Co-op)

FALL			SPRING			SUMMER		
First Year								
4600:165	Tools for Mechanical Engineering	3	7600:----	Oral Communication Elective (105 or 106)	3			
5540:-----	Physical Education Elective	1	3300:112 or	English Composition Elective	3			
3150:151	Principles of Chemistry I	3	2020:----					
3150:152	Principles of Chemistry I Lab	1	3150:153	Principles of Chemistry II	3			
3300:111	English Composition 1	3	3450:222	Analytical Geometry-Calculus II	4			
3450:221	Analytical Geometry-Calculus I	4	-------:----	Social Science Elective	3			
	Total	**15**		**Total**	**16**			
Second Year								
3650:291	Physics I	4	3650:292	Physics II	4			
4300:201	Statics	3	3450:335	Intro. to Ordinary Differential Equations	3			
3450:223	Analytical Geometry-Calculus III	4	4600:203	Dynamics	3			
3400:210	Humanities – Western Tradition I	4	4300:202	Mechanics of Solids	3			
3250:244	Intro. to Economic Analysis	3	4600:260	Engineering Analysis I	2			
	Total	**18**		**Total**	**15**			
Third Year								
4600:300	Thermodynamics I	3	4600:315	Heat Transfer	3	4600:311	Fluid Mechanics II	3
4600:310	Fluid Mechanics I	2	4600:337	Design of Mechanical Components	3	4600:380	Intro. Mater. Sci. & Eng.	2
4600:321	Kinematics	2	4600:340	System Dynamics & Response	3	4600:431	Fundamentals of Mechanical Vibrations	3
4600:336	Analysis of Mechanical Components	3	4600:483	ME Measurements Lab	2			
4600:360	Engineering Analysis II	2	4600:301	Thermodynamics II	2			
3470:401	Prob. & Stat. for Engineering	2	-------:----	Humanities Elective I	3			
	Total	**14**		**Total**	**16**		**Total**	**8**
Fourth Year								
4600:400	Thermal Systems Components	3	4600:471	ME Senior Design Project II	2			
4600:441	Control System Design	3	-------:----	Area Studies & Cultural Diversity Elective	2			
4600:460	Concepts of Design	3	-------:----	Humanities Elective II	3			
4600:484	Mechanical Engineering Lab	2	4400:307	Basic Electrical Engineering	4			
4600:461	ME Senior Design Project I	2	-------:----	Mechanical Engineering Elective*	3			
4600:402	Senior Seminar	1	-------:----	Mechanical Engineering Elective*	3			
-------:----	Mechanical Engineering Elective*	3						
	Total	**17**		**Total**	**17**			

* Electives must include 3 credits ME Design Elective, 3 credits ME Technical Elective, and 3 credits Technical Elective.

Mechanical Engineering Electives

The 9 credits available as Mechanical Engineering electives are divided into three categories:

Technical Elective: The technical elective allows the student to select a topic over a broad range of subjects from engineering, science, mathematics or business. Courses that qualify as technical elective are listed in the Electives table. (3 credits minimum)

ME Technical Elective: The ME technical elective allows a student to study a specific area of interest in mechanical engineering. Courses that qualify as ME technical elective are listed in the Mechanical Engineering section of the Electives table. (3 credits minimum)

ME Design Elective: The ME design elective has a significant design component that involves the solution of an open-ended mechanical engineering design problem. Courses that qualify as ME design elective are indicated with a superscript "1" in the Mechanical Engineering section of the Electives table. (3 credits minimum)

If desired, students with a specific professional objective (e.g., double/dual major, minor or ROTC) will be permitted to use both their ME Technical Elective and Technical Elective in their area of other interest.

Electives

Mechanical Engineering			Basic Science			Math/Statistics		
4600:410	Heating & Air Conditioning	3	3100:130	Principles of Microbiology	3	3450:312	Linear Algebra	3
4600:411	Compressible Fluid Mechanics	3	3100:200, 201	Human Anatomy & Physiology & Lab	4	3450:414	Vector Analysis	3
4600:412	Fundamentals of Flight[1]	3	3100:265	Intro to Human Physiology	4	3450:415	Combinatorics & Graph Theory	3
4600:413	Introduction to Aerodynamics	3	3150:263	Organic Chemistry Lecture I	3	3450:421	Advanced Calculus I	3
4600:414	Intro. to Aerospace Propulsion[1]	3	3150:264	Organic Chemistry Lecture II	3	3450:422	Advanced Calculus II	3
4600:415	Energy Conversion[1]	3	3150:265	Organic Chemistry Lab I	2	3450:425	Complex Variables	3
4600:416	Heat Transfer Processes	3	3150:266	Organic Chemistry Lab II	2	3450:427	Applied Numerical Methods I	3
4600:420	Intro. to Finite Element Methods[1]	3	3370:101	Introductory Physical Geology	4	3450:428	Applied Numerical Methods II	3
4600:422	Experimental Stress Analysis	3	3370:441	Fundamentals of Geophysics	3	3450:430	Num Solutions for Partial Diff. Equations	3
4600:430	Machine Dynamics[1]	3	3370:446	Exploration Geophysics	3	3450:432	Partial Differential Equations	4
4600:432	Vehicle Dynamics[1]	3	3650:301	Elementary Modern Physics	3	3450:435	Sys. of Ordinary Differential Equations	3
4600:442	Industrial Auto Control[1]	3	3650:320	Waves	3	3450:436	Math Models	3
4600:443	Optim Meth. in Mech. Eng.[1]	3	3650:331	Intermediate Astronomy	3	3450:438	Advanced Engineering Math I	3
4600:444	Robot Design, Control and App.[1]	3	3650:340	Thermal Physics	3	3450:439	Advanced Engineering Math II	3
4600:450	Intro. Comp. Fluid Flow & Conv.	3	3650:350	Modeling & Simulation	3	3450:441	Concepts of Geometry	4
4600:462	Pressure Vessel Design[1]	3	3650:406	Optics	3	3470:450	Probability	3
4600:463	Comp Aided Design & Manuf.[1]	3	3650:432	Mechanics II	3	3470:451	Theoretical Statistics I	3
4600:486	Special Topics	1-3	3650:436	Electromagnetism I	3	3470:452	Theoretical Statistics II	3
4600:427	Mold Design[1]	3	3650:437	Electromagnetism II	3	3470:460	Statistical Methods	4
Other Engineering			3650:481	Methods of Mathematical Physics I	3	3470:461	Applied Statistics I	4
4200:463	Pollution Control	3	3650:482	Methods of Mathematical Physics II	3	3470:462	Applied Statistics II	4
4300:306	Theory of Structures	3						
4300:313	Soil Mechanics	3				**Computer Science**		
4300:321	Intro. to Environmental Eng.	3				3460:210	Data Structures & Algorithms I	4
4300:323	Water Supply & Pollution Cntl	3	**Polymer Science**			3460:306	Assy Language Programming	3
4300:341	Hydraulic Engineering	4	9871:401	Intro. to Elastomers	3	3460:307	Applied System Programming	3
4300:361	Transportation Engineering	3	9871:402	Intro. to Plastics	3	3460:316	Data Structures & Algorithms II	3
4300:380	Engineering Materials Lab	3	9871:407	Polymer Science	4	3460:440	Compiler Design	3
4300:401	Steel Design	3	9871:411	Mole Struct. & Physical Prop Polymer I	2	**Management/Business Administration**		
4300:403	Reinforced Concrete Design	3	9871:412	Mole Struct & Physical Prop Polymer II	2	6140:331	Personal Finance	3
4300:423	Chemistry for Environmental Eng.	3	9871:413	Mole Struct & Physical Prop Polymer III	2	6140:300	Introduction to Finance	3
4300:450	Urban Planning	3	**Polymer Engineering**			6200:201	Accounting	3
4300:451	Comp. Meth. of Structural Analysis	3	4700:321	Polymer Fluid Mechanics	3	6200:202	Managerial Accounting	4
4300:471	Construction Admin	3	4700:425	Intro Blend & Compound. of Polymers	3	6200:301	Cost Mgmt. & Enterprise Res. Plan.	3
4450:410	Computer Methods	3	4700:427	Mold Design	3	6200:220	Legal & Social Environment in Bus.	3
4450:432	System Simulation	3	4700:450	Eng. Prop. & Processes of Polymers	3	6400:371	Business Finance	3
4450:441	Expert Systems Design & Dev.	3	4700:499	Polymer Engineering Project	1-3	6400:432	Personal Finance Planning	3
Mechanical Engineering Technology			**Polymer Science & Polymer Engineering**			6400:473	Financial Statement Analysis	3
2870:348	CNC Programming I	3	4700:281	Polymer Science for Engineers	2	6500:221	Quantitative Business Analysis I	3
2870:348	CNC Programming II	3	4700:381	Polymer Morphology for Engineers	3	6500:222	Quantitative Business Analysis II	3
2920:247	Technology of Machine Tools	3	**Military Science**			6600:300	Marketing Principles	3
2920:347	Production Machinery and Processes	3	1500:303,304	Third Year Aero Studies	3,3	6500:324	Data Management for Info Systems	3
Professional Development			1500:453,454	Fourth Year Aero Studies	3,3	6500:301	Management Principles & Concepts	3
2020:222	Tech Report Writing	3	1600:300,301	Advanced Leadership I,II	3,3	6600:475	Business Negotiations	3
3300:489	Seminar in English: Science Writing	3	1600:400,401	Military Management I,II	3,3	6600:490	Marketing Strategy	3

[1] M.E. Design Elective

General Education Electives

The objectives of an engineering education extend beyond the technical requirements needed for the engineering profession. Students are required to take classes in the Social Sciences, Humanities and Area Studies & Cultural Diversity. These courses are intended to make engineers fully aware of their social responsibilities and have the objective of improving your ability to consider related factors in decision-making processes. These electives are part of the General Education requirements of the University College as listed in the Undergraduate Bulletin of the University.

Social Science Electives

Students are required to take a minimum of 6 credits in the Social Sciences. Introduction to Economic Analysis is required. The remaining credits must be taken from another topic.

Economics (required)		
3250:244	Intro. to Econ. Analysis	3 cr
Geography		
3350:100	Intro. To Geography	3 cr
U.S Government/Politics		
3700:100	Govt. & Pol. in the U.S.	4 cr
3700:150	World Politics & Governments	3 cr
2040:242	American Urban Society	3 cr
Psychology		
3750:100	Intro. to Psychology	3 cr
2040:240	Human Relations	3 cr
Sociology/Anthropology/Education		
3850:100	Intro. to Sociology	3 cr
3230:150	Human Cultures	3 cr
5100:150	Democracy in Education	3 cr
2040:244	Death and Dying	2 cr
United States History		
3400:250	U.S. History to 1877	4 cr
3400:251	U.S. History since 1877	4 cr
Science/Technology/Society		
2040:241	Technology & Human Values	2 cr
2040:243	Contemporary Global Issues	3 cr
3240:100	Introduction to Archaeology	3 cr
3600:125	Theory & Evidence	3 cr

Humanities Electives

Students are required to take a minimum of 10 credits in the Humanities from three different sets below. Students are required to take either Humanities in the Western Tradition or Humanities in the World since 1300.

Humanities (One is required, students may take both)			**Prerequisites**
3400:210	Humanities in the Western Tradition	4 cr	32 credits & 3300:112 or equivalent
3400:221	Humanities in the World since 1300	4 cr	32 credits & 3300:112 or equivalent
Fine Arts			
7100:210	Visual Arts Awareness	3 cr	3400:210 or 3400:221
7500:201	Exploring Music	3 cr	3400:210 or 3400:221
7800:301	Introduction to Theatre and Film	3 cr	3400:210 or 3400:221
7900:200	Viewing Dance	3 cr	3400:210 or 3400:221
Philosophy/Classics			
3200:220	Introduction to the Ancient World	3 cr	3400:210 or 3400:221
3200:230	Sports & Society in Ancient Greece	3 cr	
3200:289	Mythology of Ancient Greece	3 cr	
3600:101	Introduction to Philosophy	3 cr	
3600:120	Introduction to Ethics	3 cr	
3600:170	Introduction to Logic	3 cr	
Literature			
3300:250	Classic and Contemporary Literature	3 cr	3400:210 or 3400:221
3300:252	Shakespeare and His World	3 cr	3400:210 or 3400:221
3300:281	Fiction Appreciation	3 cr	3400:210 or 3400:221
3200:361	Literature of Greece	3 cr	3400:210 or 3400:221
3580:350	Literature of Spanish-American in Trans.	3 cr	3400:210 or 3400:221

Area Studies and Cultural Diversity

One course (2 credits) is required.

			Prerequisites
2040:254	The Black Experience: 1619 to 1877	2 cr	2020:121 or 3300:112 or 3300:114
2040:257	The Black Experience: 1877-1954	2 cr	2020:121 or 3300:112 or 3300:114
2040:258	The Black Experience: 1954 to the Present	2 cr	2020:121 or 3300:112 or 3300:114
2040:256	Diversity in American Society	2 cr	2020:121 or 3300:112 or 3300:114
3002:201	Intro: Pan-African Studies	3 cr	2020:121 or 3300:112 or 3300:114
3001:200	Introduction to Women's Studies	3 cr	
3230:251	Human Diversity	3 cr	
7600:325	Intercultural Communication	3 cr	
3350:275	Geography of Cultural Diversity	2 cr	32 credits; 3300:112 or equiv.
3560:210	Japanese Culture through Film	2 cr	32 credits; 3300:112 or equiv.
3501:210	Arabic Culture through Film	2 cr	32 credits; 3300:112 or equiv.
3502:210	Chinese Culture through Film	2 cr	32 credits; 3300:112 or equiv.
3400:285	World Civilizations – China	2 cr	32 credits; 3300:112 or equiv.
3400:286	World Civilizations – Japan	2 cr	32 credits; 3300:112 or equiv.
3400:287	World Civilizations - Southeast Asia	2 cr	32 credits; 3300:112 or equiv.
3400:288	World Civilizations – India	2 cr	32 credits; 3300:112 or equiv.
3400:289	World Civilizations - Middle East	2 cr	32 credits; 3300:112 or equiv.
3400:290	World Civilizations – Africa	2 cr	32 credits; 3300:112 or equiv.
3400:291	World Civilizations - Latin America	2 cr	32 credits