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## BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING 4+1 GRADUATE TRACK

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.

COURSE	TITLE	S.H.
	IREMENT - STUDENT SUCCES	
YSU 1500	Success Seminar	1-2
or YSU 1500S	Youngstown State University 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
Mathematics requi	irement (met with MATH in major)	
Arts and Humaniti	es (2 courses)	
PHIL 2625	Introduction to Professional Ethics	3
Arts and Humaniti	es elective	3
Social Sciences (2	courses)	
ECON 2610	Principles 1: Microeconomics	3
Social Science elec	ctive	3
Natural Sciences (	2 courses, 1 with lab) (6-7 s.h.)	
	e following required courses: CHEM 1515, PHYS 2610, 2610L or CHEM 1515L	
General Education	Elective (9 s.h.)	
CMST 1545	Communication Foundations	3
Select 2 General E	ducation Courses	6
Mechanical Engine	eering Courses	
MECH 1560	Engineering Communication with CAD	2
MECH 2603	Thermodynamics 1	3
MECH 3704	Thermodynamics 2	3
MECH 2606	Engineering Materials	3
MECH 2641	Dynamics	3
MECH 3708	Dynamic Systems Modeling	3
MECH 3720 & 3720L	Fluid Dynamics and Fluid Dynamics Laboratory	4
MECH 3725	Heat Transfer 1	3
MECH 3742	Kinematics of Machines	3
MECH 3751 & 3751L	Stress and Strain Analysis 1 and Stress and Strain Analysis 1 Laboratory	4

MATH 1572Calculus 2MATH 2673Calculus 3MATH 3705Differential EquationsChemistry and Physics coursesCHEM 1515General Chemistry 1& 1515Land General Chemistry 1 LaboratoryPHYS 2610General Physics 1& 2610Land General Physics Laboratory 1			
MECH 4808 Mechanical Systems Design 1 & 4808L and Mechanical Systems Design Laboratory MECH 4809 Mechanical Systems Design Laboratory 2 MECH 4825L Heat Transfer and Thermodynamics Laboratory 2 MECH 4825L Heat Transfer Mechanical Vibrations Laboratory 2 MECH 5881 Mechanical Vibrations Laboratory 2 Other Engineering Courses ENGR 1500 Engineering Concepts ENGR 1550 Engineering Concepts ENGR 1550 Engineering Concepts ENGR 1550 Engineering Computing CEEN 2601 Statics CEEN 2602 Strength of Materials Lab ECEN 2614 Basics of Electrical Engineering STAT 3743 Probability and Statistics MECH 5885 Heat Transfer 2 MECH 5885 Fluid Power and Control MECH 5885 Fluid Power and Control MECH 5884 Finite Element Analysis MECH 5885 Computational Fluid Dynamics MECH 5884 Finite Element Analysis MECH 5885 Computational Fluid Dynamics MECH 5885 Computational Fluid Dynamics MECH 5886 Computational Fluid Dynamics MECH 5887 Fluid Power and Control MECH 5888 Filuire Analysis 2 MECH 5886 Computational Fluid Dynamics MECH 5880 Computational Heat Transfer MECH 6900 Special Topics MECH 6901 ST Engineering Tribology MECH 6902 Advanced Thermodynamics MECH 6903 Advanced Dynamics MECH 6904 Advanced Thermodynamics MECH 6905 Advanced Dynamics MATH 1571 Calculus 1 MATH 1571 Calculus 1 MATH 1572 Calculus 2 MATH 1571 Calculus 3 MATH 3705 Differential Equations Chemistry and Physics courses CHEM 1515 General Chemistry 1 & 25101 General Chemistry 1 & 25101 and General Chemistry 1 & 25101 and General Physics Laboratory 1	DUVS 2611	General Physics 2	
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MECH 4808 Mechanical Systems Design 1			
& 3762L and Design of Machine Elements Laboratory			
MECH 3762 Design of Machine Elements		5	

**Dual Credit Requirements** 

## Accelerated 4+1 Program

Undergraduate Mechanical Engineering students can apply for admission into the accelerated 4+1 MSE in Mechanical Engineering graduate program after completing 78 undergraduate semester hours with a GPA of 3.3 or higher. After being admitted to the accelerated 4+1 MSE program, students will be allowed a maximum of nine semester hours of graduate coursework, specified as 5000 level or higher, to be double counted toward both a Bachelor's and Master's degrees. The courses chosen to count for both undergraduate and graduate coursework must be approved by the Graduate Program Director. An additional three hours of graduate coursework can be completed as an undergraduate and used exclusively for graduate credit. This allows the student to graduate with a Master's degree with one year of additional full-time study beyond the bachelor's degree, as the total hours counted towards the Master's degree is greater than or equal to 30 hours.

Year 1		
Fall		S.H.
YSU 1500	Success Seminar	1-2
or YSU 1500S	or Youngstown State University Success	
or HONR 1500	Seminar	
	or Intro to Honors	0
ENGL 1550	Writing 1	3
CHEM 1515 & 1515L	General Chemistry 1 and General Chemistry 1 Laboratory	4
MATH 1571	Calculus 1	4
ENGR 1500	Engineering Orientation	1
ENGR 1550	Engineering Concepts	2
GER Elective	Engineering concepts	3
	Semester Hours	18-19
Spring		10 15
ENGL 1551	Writing 2	3
MATH 1572	Calculus 2	4
PHYS 2610	General Physics 1	5
& 2610L	and General Physics Laboratory 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 2641	Dynamics	3
MECH 2603	Thermodynamics 1	3
MATH 3705	Differential Equations	3
CEEN 2602	Strength of Materials	4
& 2602L	and Strength of Materials Lab	0
ECEN 2614	Basics of Electrical Engineering	3
Veer 2	Semester Hours	16
Year 3 Fall		
MECH 3704	Thormodynamics 2	2
	Thermodynamics 2	3
MECH 3720 & 3720L	Fluid Dynamics and Fluid Dynamics Laboratory	4
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	17
Spring		
MECH 3708	Dynamic Systems Modeling	3
MECH 3725	Heat Transfer 1	3

	Design of Mashing Flowersh	4
MECH 3762 & 3762L	Design of Machine Elements and Design of Machine Elements Laboratory	4
ISEN 2610	Engineering Statistics	3-4
or STAT 3743	or Probability and Statistics	
	Semester Hours	13-14
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	4
& 5881L	and Mechanical Vibrations Laboratory	
PHIL 2625	Introduction to Professional Ethics	3
MECH Dual Credit		3
GER Elective (SS)		3
	Semester Hours	17
Spring		
MECH 4809	Mechanical Systems Design 2	3
MECH 4809L	Mechanical Systems Design Laboratory 2	1
MECH Dual Credit		3
MECH 5881L	Mechanical Vibrations Laboratory	1
MECH Dual Credit		3
GER Elective (AH)		3
GER Elective		3
	Semester Hours	17
	Total Semester Hours	131-133

Mechanical Engineering Dual Credit Courses

Select 3 courses from the following:

Can select 3 from this list, over the 5000 level, to double count towards Bachelor's and Master's, after acceptance into the MSE program. Can select a 4th that counts only towards Master's Degree.

## COURSE TITLE S.H. **Mechanical Engineering Electives** 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 4 MECH 5885 **Computational Fluid Dynamics** Solid 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 6000 level courses MECH 6900 2-4 **Special Topics** MECH 6900I ST Engineering Tribology 2-4 MECH 6904 Advanced Thermodynamics 3 MECH 6915 Failure Analysis 3

MECH 6925	Computational Heat Transfer	3
MECH 6930	Advanced Fluid Mechanics and Heat Transfer	3
MECH 6945	Advanced Dynamics	3

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