PROGRAM GUIDE

WKU BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

SCHOOL OF ENGINEERING AND APPLIED SCIENCES
WESTERN KENTUCKY UNIVERSITY
ENGINEERING AND BIOLOGICAL SCIENCES BUILDING
BOWLING GREEN, KY 42101
WWW.WKU.EDU/SEAS

JANUARY 2021

The Mechanical Engineering program is accredited by the EAC Accreditation Commission of ABET. The Commission can be contacted at ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700.

Although this handbook is as accurate as we can make it, the WKU Undergraduate Catalog is the final authority on policies and procedures.

Welcome to the Mechanical Engineering (ME) program at Western Kentucky University (WKU). The faculty has assembled this handbook to familiarize you with the policies and standards associated with this program. This handbook will be periodically updated, so check the program home page from www.wku.edu/seas for the latest edition. Although this handbook is as accurate as we can make it, the WKU Undergraduate Catalog is the final authority on policies and procedures. Copies of the catalog are available online in PDF format at the WKU web page at https://www.wku.edu/undergraduatecatalog/index.php.

ABET Accreditation, Mission, and Student Outcomes

The Mechanical Engineering program is accredited by the EAC Accreditation Commission of ABET. The Commission can be contacted at ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202- 4012, telephone: (410) 347-7700.

The Mission Statement for the ME program is shown on page 7, along with the Program Objectives from the ABET ME accreditation plan. Program Objectives are intended to be a concise description of what WKU graduates actually do in their practice 3-5 years after graduation. We survey our graduates on a regular basis to ensure these Objectives are a realistic description of their activities and to determine the graduates' level of preparation for these activities. The Student Outcomes are also listed on page 7. These Student Outcomes are a description of the skills the mechanical engineering graduate should possess at the point of graduation.

Minors

A wide range of minors are available at WKU. The minor most popular for Engineering students is **Systems Engineering**. Some students who complete the ME degree program requirements choose to earn a minor in **Mathematics** with additional Mathematics coursework, see the Mathematics department for details. Other minors are described in the WKU catalog under the appropriate program or department.

Curriculum and Courses

Taking personal responsibility for tracking your progress through the curriculum is key to your academic success. A suggested plan of study is shown on page 8. This form is a template for completing the degree program in eight semesters. **You must recognize that this can only be achieved by taking a relatively aggressive pace of courses.** If you get off sequence or you cannot take the full listed load for a given semester, or if you start in a mathematics course below MATH 136: Calculus I, make sure you work with your academic advisor to select the appropriate courses to minimize prerequisite problems in later semesters.

The table on page 9 documents the prerequisites and corequisites for courses in the ME program. **You must pay very close attention to these requirements, so be cautious in planning and modifying your schedule.** For instance, if you drop a class without considering the prerequisite requirements for the next semester, you may need to add a semester or two to your course of study. Once again, work carefully with your academic advisor.

Academic Advising

If you choose to change your major to Mechanical Engineering, you must use a "Change of Major/Minor/Advisor" form available on TOPNET. **Students declaring ME as their major must use "543P Mechanical Engineering Pre-Major" for the "Major 1" code and name until their records are reviewed by an ME faculty advisor.**

Academic advising for students not yet in MATH 136: Calculus I, is managed solely by the Advising and Career Development Center (AARC) and the Ogden College Dean's office. Student advising for those students in MATH 136 and higher is transitioned to faculty in the mechanical engineering program. Scheduling advising appointments is generally done in TOPNET, select your advisor and choose a 15-minute block for your appointment from the open appointments on the calendar. You may need to contact your academic advisor by email to establish a meeting time.

Academic advisors are usually assigned as follows:
- Students in Math 136, but not yet ME 180: Prof. Henry Joel Lenoir, EBS 2118
- Students currently in/above ME 180, not yet in ME 200: Prof. Kevin Schmaltz, EBS 2112
- Students currently in/above ME 200, not yet in ME 300: Prof. Robert Choate EBS 2114
- Students currently in/above ME 300, not yet in ME400: Prof. Morteza Nurcheshmeh, EBS 2116
- Students currently in/above ME400/ENGR490: Prof. Chris Byrne, EBS 2120

Exceptions to the above advisor plan are sometimes made to balance faculty load.

The iCAP (Interactive Curriculum and Academic Progress) system in TOPNET is used to monitor degree program progress. Be sure to review your iCAP report regularly and always check it before an advising appointment. Go to advising appointment prepared with a course plan for discussion with advisor. The plan will be revised as appropriate.

World Language Proficiency

Foreign language course placement is required. The WKU foreign language requirements change multiple times over the years. For your specific requirements see the page at http://wku.edu/colonnade/worldlanguageproficiency.php for details on the World Language Proficiency policy.

Academic Standards and Graduation Requirements

The individual student is responsible for understanding and following the Academic Standards for the program. Basic admission and academic policies of the program are listed on page 3. Students who enter the ME program are categorized as "pre-majors" until they satisfy the major eligibility standards. **The eligibility standards for transition from pre-major to major are listed on page 3. Pay particular attention to the requirement of a grade of C or better for the courses in the program. All standards are strictly enforced. Your progress towards satisfying these requirements is tracked on the iCAP (Interactive Curriculum and Academic Progress) system found in TOPNET. See your advisor for details.**

WKU Program in Mechanical Engineering: Academic Standards

Pre-Major Status

All students intending to major in mechanical engineering are admitted as pre-majors in the program. Progression from a pre-major status to full enrollment as a major is performance based. After all pre-major requirements have been satisfied, a student "declares a major" by filing a Change of Major/Minor/Advisor Form with the assistance of their faculty advisor.

Eligibility to transition from Pre-Major to Major in the WKU ME Program

In order to transition from the pre-major to major and to graduate with a degree in mechanical engineering, **students must earn a grade of "C" or better in each of these courses:**

- College Composition (F-W1) (e.g. ENG 100)	3 hrs.
- Human Communications (F-OC) (e.g. COMM 145)	3 hrs.
- MATH 136: Calculus I	4 hrs.
- MATH 137: Calculus II	4 hrs.
- PHYS 255/256: University Physics I/LAB	5 hrs.
- CHEM 116 or CHEM 120	3 or 4 hrs.
- EM 222: Statics	3 hrs.
TOTAL HOURS: 25 or 26 hours	

These Pre-Major eligibility requirements MUST be completed before enrolling in ME 200: Sophomore Design. Check iCAP for progress towards meeting these requirements.

Graduation Requirements

After satisfying the requirements to transition from Major to Pre-Major and to graduate with a degree in mechanical engineering, students must satisfy the following three additional requirements:

- Satisfy the graduation requirements of WKU, including a minimum GPA of 2.0 in all coursework.
- **Have a grade of C or better for each course in the Pre-Major list above as well as in all those identified as such in course pre-requisites. For program courses this includes: Math 136, Math 137, Chem 116/106 or Chem 120/121, Phys 255/256, ME176, ME180, ME200, ME220, ME240, EM222, EM303.**
- Follow the academic regulations published in the WKU Undergraduate Catalog.

Note: courses not requiring a C or higher are Math 237, Math 331, Phys 265/266, ME241, ME300, ME310, ME 325/333, ME330, ME344, ME347, ME400, ME412, EM313, EE210, upper level electives.

These academic standards are encoded into iCAP for review by students and faculty advisors as well as for degree certification by the Registrar's office.

Mathematics and Science Elective Courses

The Mechanical Engineering Program requires students to complete four required mathematics courses, three required science courses with labs, and one mathematics/science elective course. **The total number of hours of mathematics and science (MATH 136/137/237/331, PHYS 255/256/265/266, CHEM 116/106 or 120/121, and the math/science elective) must be greater than or equal to 32 hours.** Course credit received in these courses through AP and other WKU approved alternative methods will count towards the total of 32 hours. **The Mathematics and Science Elective may be chosen from the following list:**

- ASTR 214: GENERAL ASTRONOMY
- BIOL 120/121: BIOLOGICAL CONCEPTS: CELLS METABOLISM AND GENETICS
- BIOL 122/123: BIOLOGICAL CONCEPTS: EVOLUTION, DIVERSITY, AND ECOLOGY
- BIOL 207: GENERAL MICROBIOLOGY
- CHEM 222/223: COLLEGE CHEMISTRY II
- PHYS 316: COMPUTATIONAL PHYSICS
- PHYS 318: DATA ACQUISITION USING LABVIEW
- MATH 305: INTRODUCTION TO MATHEMATICAL MODELING
- MATH 307: INTRODUCTION TO LINEAR ALGEBRA (used as prerequisite for a senior elective course)
- MATH 310: INTRODUCTION TO DISCRETE MATHEMATICS
- MATH 370: APPLIED TECHNIQUES IN MATHEMATICS
- STAT 301: INTRODUCTORY PROBABILITY AND APPLIED STATISTICS (used as prerequisite for multiple senior elective courses)

Work with your academic advisor to select an appropriate elective. The elective is intended to broaden your background and help you prepare for the start of your career. **If you are interested in a Mathematics minor or double major, work with the Mathematics department since not all Mathematics courses count towards the minor or major.**

Course Offering Plan

Most of the courses in the ME program are offered in fall and spring terms. At the current time, the following courses are offered only once per year.

ME 310: Engineering Instrumentation & Experimentation	Spring term
ME 347: Mechanical Systems Laboratory	Spring term
ME 330: Fluid Mechanics	Spring term
ME 325: Elements of Heat Transfer	Fall term
ME 333: Thermo-Fluids Laboratory	Fall term

The flow of classes for graduation is shown in graphical form on page 10. This diagram shows the various course pathways through the curriculum to the capstone design course, ENGR 491 (ME 412). This capstone course is typically taken during final semester of study. **Work very carefully with your academic advisor each semester to keep your progress through the curriculum on track.**

Technical Electives

Four Technical Electives (Upper Level electives) are required in the ME program. These are primarily satisfied through a combination of multiple offerings of the ME Selected Topics and Projects courses:

ME 494: WKU – ME Selected Topics	2 credits
ME 495: WKU – ME Selected Projects	1 credit
ME 496: WKU – ME Selected Topics (Fall)	3 credits
ME 497: WKU – ME Selected Topics (Spring)	3 credits

ENGR 360: MODELING AND SIMULATION OF DYNAMIC SYSTEMS
ENGR 400: PRINCIPLES OF SYSTEMS ENGINEERING
EE 460: CONTINUOUS CONTROL SYSTEMS
ME 321: THERMODYNAMICS II
PHYS 318: DATA ACQUISITION USING LABVIEW (unless used for Math/Sci)

ME496 or ME497 Technical Elective topics offered in recent semesters include:

Gas Dynamics (ME220)	Advanced Strength of Materials (ME344)
Advanced Solidworks (ME344)	Energy Conversion & Sustainability (ME220)
Kinematics & Dynamics of Machinery(EM313)	Advanced Dynamics (EM313)
Failure Analysis and Prevention (ME344)	Systems Thermal Management (ME325)
Vibrations (EM313)	Manufacturing Processes (ME240)
Composite Materials (EM303)	Stress Analysis (EM303)
Advanced Engineering CAD (ME344)	System Reliability Engineering (STAT301)

NOTE: the potential course pre-requisites are indicated in parentheses, but others may also be required.

These or similar courses will be offered each year, often including the Winter or Summer terms. Watch TOPNET for scheduled offerings and the ME Program bulletin board for course announcements as they become available.

Note that some of these technical electives are available to students in the third year of the program. Discuss your specific interests in technical electives with your academic advisor to be sure you meet elective pre-requisites.

Student Laptops for Mechanical Engineering

The Mechanical Engineering program has a required laptop initiative beginning in ME 180: Freshman Design II. Course fees are used in this and some subsequent courses to provide software and other resources for student use in class; see TOPNET for specific course fees. The Mechanical Engineering Program recognizes most incoming students purchase laptops for use inside and outside of class. WKU has an easily accessible wireless environment that makes laptops an attractive choice over a desktop computer. **However, not all laptops are suitable for use with engineering software.**

Mac laptops WILL NOT WORK for Mechanical Engineering software such as SolidWorks and Mathcad, even with the ability to boot in Windows. A laptop running native Windows is required to run most engineering software such as AutoCAD, Solidworks, Mathcad, etc. Students are highly advised to purchase a repair and service plan to cover their computer systems. Due to the nature of their usage environment, laptops might need a damage protection plan as well.

Computer Specifications for Mechanical Engineering Laptops

Operating System:
- **Microsoft Windows 10, with Windows 10 PRO preferred**
- **Mac laptops will NOT work for ME software such as SolidWorks!!!**

RAM memory:
- **At least 8 gigabytes of RAM required**
- **For best performance with engineering software, use 16 gigabytes**

Graphics cards:
- **Integrated graphics WILL NOT WORK WITH SOLIDWORKS!!!!**
- **Discrete dedicated graphics card for maximum performance**
- **NVIDIA graphics card preferred, 3 GB or more of video card memory (Quadro cards are superior but hard to find, GeForce cards are usually ok)**
- **Avoid very high resolution displays such as UHD, these resolutions are not supported by SolidWorks and other software**

Hard Drive:
- **500 gigabytes of storage minimum, solid state drives preferred**

Optical Media:
- **DVD reader/burner required, external USB version is sufficient but still required**

Default Software:
- **Microsoft Office: Word, Excel, Powerpoint. Available free to all WKU students**

Security Software:
- **Integrated Windows Defender required.**
- **Packages such as Norton, McAfee, or Webroot must be uninstalled to run SolidWorks**

Pointing device:
- **External mouse is required, Logitech Trackball M570 is preferred and recommended**

Please contact joel.lenoir@wku.edu or the ME 180 instructor (see course listing in Topnet) if you have any questions. The WKU Bookstore stocks a Dell laptop for engineering students that is capable of running SolidWorks. Most of the lower priced machines that meet the requirements are around $1,000 to $1,300 and higher end machine are $1,800+.

WKU Program in Mechanical Engineering

Mission Statement

The Mechanical Engineering program produces graduates who are well prepared for the start of productive, successful careers as practicing engineers. Our graduates will have a strong competitive advantage with their unique background of engineering fundamentals combined with practical knowledge and experience.

The Mechanical Engineering program will provide a project-based, learner-driven environment relevant to the needs of our region. In support of this learning environment, the professional engineering activities of the faculty will create opportunities for the students to practice the art and science of contemporary Mechanical Engineering.

Program Educational Objectives

Within a few years of completing the Mechanical Engineering Program a graduate will:

- Either be contributing to their region's economic development through employment in mechanical engineering or related professions, or pursuing advanced credentials
- Occupy leadership roles in their profession, or in their communities, as their career develops
- Demonstrate professionalism on diverse teams across a range of varied responsibilities
- Be proactive in their professional development and engage in the continuing education needed to maintain and enhance their career

Student Outcomes

1. Mechanical Engineering graduates have an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. Mechanical Engineering graduates have 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. Mechanical Engineering graduates have an ability to communicate effectively with a range of audiences.
4. Mechanical Engineering graduates have an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. Mechanical Engineering graduates have 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. Mechanical Engineering graduates have an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.
7. Mechanical Engineering graduates have an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

WKU Bachelor of Science
Program in Mechanical Engineering

Curriculum and Suggested Plan of Study

FALL SEMESTER			SPRING SEMESTER		
ME 176	Freshman Design	1	ME 180	Freshman Design II	3
CHEM 116/106 or 120/121	Chemistry & LAB	4 or 5	MATH 137	Calculus II	4
MATH 136	Calculus I	4	PHYS 255/256	Physics I & LAB	5
College Composition (F-W1)		3	EM 222	Statics	3
Human Communications (F-OC)		3			**15**
		15/16			
MATH 237	Multivariable Calculus	4	MATH 331	Differential Equations	3
ME 240/241	Mats./Meth. & LAB	4	EM 303	Mech. Def. Solids	3
PHYS 265/266	Physics II & LAB	5	EE 210	Circuits/Networks I	3.5
HIST 101 or 102	World History I or II	3	ME 200	Sophomore Design	3
		16	ENG 200	Introduction to Literature	3
					15.5
ME 220	Eng. Thermo I	3	ME 300	Junior Design	2
EM 313	Dynamics	3	ME 330	Fluid Mechanics	3
ME 344	Mechanical Design	3	ME 310/347	Instrumentation & LAB	4
MATH/SCIENCE ELECTIVE		3	ME ---	ME Tech Elective 1 of 4	3
ARTS & HUMANITIES (E-AH)		3	SOCIAL & BEHAVIORAL STUDIES (E-SB)		3
		1**5**			**15**
ME 325/333	Heat Transfer & LAB	5	ENGR491 (ME412)	ME Senior Project	3
ENGR490 (ME400)	Mech. Engr. Design	2	ME ---	ME Tech Elective 3 of 4	3
ME ---	ME Tech Elective 2 of 4	3	ME ---	ME Tech Elective 4 of 4	3
ENG 300	Writing Discip. (F-W2)	3	CONNECTIONS: LOCAL TO GLOBAL (K-LG)		3
CONNECTIONS: SOCIAL AND CULTURAL (K-SC)		3	CONNECTIONS: SYSTEMS (K-SY)		3
		16			**15**

PROGRAM TOTAL = 122.5 or 123.5 hours

Notes:
- Review the WKU Undergraduate Catalog for the current policies concerning World Language Proficiency.
- The mathematics and science elective must be chosen from the approved list, for a total of 32 hours of approved mathematics and science courses.
- Consult the WKU Undergraduate Catalog and ICAP for General Education courses.
- Technical electives and other required courses are often offered in Winter and Summer terms, watch TOPNET for specific offerings.

January 2, 2021

WKU Program in Mechanical Engineering

Pre-requisite: required before taking a course, Co-requisite: a course required at the same time,

COURSE	PREREQUISITES	CO-REQUISITES
ME 176: University Experience Mech. Engr.	none	**MATH 117 or higher**
ME 180: Freshman Design II	ME 176 ≥ C, MATH 136 ≥ C	none
ME 200: Sophomore Design	ME 180 ≥ C, **Pre-Major requirements satisfied in iCAP**	none
ME 220: Engineering Thermodynamics I	EM 222, MATH 331 (may be taken concurrently)	none
ME 240: Materials and Methods of Mfg.	CHEM 116 **≥ C** or 120 **≥ C**, MATH 136 ≥ C	ME 241
ME 241: Materials and Methods of Mfg. Lab	CHEM 106 or Chem 121	ME 240
ME 300: Junior Design	ME 200 ≥ C, ME220**,** ME 344	none
ME 310: Engineering Instrumentation & Exp.	EE210**,** EM 303	ME 347
ME 325: Heat Transfer	ME 330	ME 333
ME 330: Fluid Mechanics	MATH 331, Math237, ME 220 **≥ C**	none
ME 333: Thermo-Fluids Laboratory	ME310, ME 330	ME 325
ME 344: Mechanical Design	EM 303 ≥ C, ME 240 **≥ C**	none
ME 347: Mechanical Systems Laboratory	ME 241. MATH 331 (may be taken concurrently)	ME 310
ENGR 490/ME400: Mech. Eng. Design	ME 300	none ENGR490 & ENGR491 are back to back
ENGR 491/ME412: ME Senior Project	ME 400, ME 325 (may be taken concurrently)	none ENGR490 & ENGR491 are back to back
ME 496: WKU ME Selected Topics (Fall)	Course Dependent	
ME 497: WKU ME Selected Topics (Spring)	Course Dependent	
ENGR 400: Principles of Systems Engineering	Either EE 210 or EM 222, and STAT 301	
EM 222: Statics	MATH 137 and PHYS 255 (may be taken concurrently)	none
EM 303: Mech. of Deformable Solids	MATH 137 ≥ C, EM 222 ≥ C, PHYS 255 ≥ C	none
EM 313: Dynamics	EM 222 ≥ C, PHYS 255 **≥ C** MATH 331 (may be taken concurrently)	none
EE 210: Circuits & Networks I	MATH 137 ≥ C, PHYS 265 (may be taken concurrently)	none
CHEM 116/106 or 120/121: Chemistry / LAB	Placement, refer to Chemistry Department website	
MATH 136: Calculus I	Placement or ACT score	
MATH 137: Calculus II	MATH 136 ≥ C	
MATH 237: Multivariable Calculus	MATH 137 ≥ C	
MATH 331: Differential Equations	MATH 137 ≥ C	
PHYS 255/256: University Physics I / LAB	MATH 136 ≥ C, MATH 137 (may be taken concurrently)	
PHYS 265/266: University Physics II / LAB	PHYS 255 ≥ C, MATH 137 ≥ C	

Mechanical Engineering

Critical Path to Graduation

(F = Fall Term, S = Spring Term)