# MECHATRONICS ENGINEERING - B.S.

**College of Aeronautics and Engineering**
www.kent.edu/cae

## About This Program

Are you passionate about robotics, automation and the intersection of mechanical, electrical and computer engineering? Do you want to be at the forefront of innovation in these exciting fields? If so, the B.S. degree in Mechatronics Engineering may be just what you're looking for. Read more...

## Contact Information

- cae@kent.edu | 330-672-2892
- Speak with an Advisor
- Chat with an Admissions Counselor

## Program Delivery

- **Delivery:**
  - In person
- **Location:**
  - Kent Campus

## Examples of Possible Careers and Salaries*

### Electrical engineers

- 4.6% about as fast as the average
- 193,100 number of jobs
- $100,830 potential earnings

### Electronics engineers, except computer

- 1.4% slower than the average
- 134,900 number of jobs
- $107,540 potential earnings

### Mechanical engineers

- 3.9% about as fast as the average
- 316,300 number of jobs
- $90,160 potential earnings

* Source of occupation titles and labor data comes from the U.S. Bureau of Labor Statistics' Occupational Outlook Handbook. Data comprises projected percent change in employment over the next 10 years; nation-wide employment numbers; and the yearly median wage at which half of the workers in the occupation earned more than that amount and half earned less.

## Admission Requirements

The university affirmatively strives to provide educational opportunities and access to students with varied backgrounds, those with special talents and adult students who graduated from high school three or more years ago.

Admission to the Mechatronics Engineering major is selective.

**New Students:** Admission into this major requires:

- Minimum 3.0 high school GPA
- Minimum 24 ACT composite score (minimum 24 ACT sub-scores in both English and mathematics) or a minimum 1160 SAT composite score (mathematics, critical reasoning and writing) *effective for fall 2024 admission, scores are no longer required*
- Clear demonstration of an ability to be placed directly into MATH 12002 (or its equivalent); this will occur if the student is currently taking or has taken a calculus, pre-calculus or trigonometry course with a minimum C grade

**Note:** Admission to this program is contingent on students successfully placing into MATH 12002. Those who do not will have their major changed to **Mechatronics Engineering Technology** prior to their freshman year.

Students who do not meet these requirements will be admitted to the Mechatronics Engineering Technology major, provided that they meet those major requirements.

**Current Students:** Students accepted into the Mechatronics Engineering Technology major may request a change in major to Mechatronics Engineering as soon as placement into MATH 12002 has been demonstrated (prior to the beginning of freshman year). Otherwise, students may request to change their major to Mechatronics Engineering after their freshman year if they meet the following criteria:

- Minimum 3.200 overall Kent State GPA *(effective for fall 2024 admission, minimum 3.000 GPA will be required)*
- Minimum B grade in both MATH 12002 and PHY 23101 *(effective for fall 2024 admission, minimum C grade will be required)*

**International Students:** All international students must provide proof of English language proficiency unless they meet specific exceptions. For more information, visit the admissions website for international students.

**Transfer Students:** Admission into this major requires:

- Minimum 12 credit hours in college-level coursework
- Minimum 3.200 overall GPA *(effective for fall 2024 admission, minimum 3.000 GPA will be required)*
- Minimum B grade in both MATH 12002 and PHY 23101 (or their equivalents) *effective for fall 2024 admission, minimum C grade will be required*

Transfer students who have completed less than 12 credit hours of college-level coursework will be evaluated on both collegiate and high school records and must submit a final high school transcript.

## Program Requirements
### Major Requirements

| Code | Title | Credit Hours |
|---|---|---|
| **Major Requirements (courses count in major GPA)** | | |
| ENGR 11000 | INTRODUCTION TO ENGINEERING | 3 |
| ENGR 13585 | COMPUTER AIDED ENGINEERING GRAPHICS | 3 |
| ENGR 15300 | INTRODUCTION TO ENGINEERING ANALYSIS USING MATLAB® | 2 |

| ENGR 15301 | INTRODUCTION TO ENGINEERING ANALYSIS USING MATLAB® LAB | 1 |
| ENGR 20000 | PROFESSIONAL DEVELOPMENT IN ENGINEERING | 1 |
| ENGR 20002 | MATERIALS AND PROCESSES | 3 |
| ENGR 23585 | ADVANCED COMPUTER AIDED DESIGN | 3 |
| ENGR 25200 | STATICS (min C grade) | 3 |
| ENGR 25400 | DYNAMICS (min C grade) | 3 |
| ENGR 33031 | PROGRAMMABLE LOGIC CONTROLLERS | 3 |
| ENGR 33041 | CONTROL SYSTEMS | 3 |
| ENGR 33222 | DIGITAL DESIGN FOR COMPUTER ENGINEERING | 3 |
| ENGR 33440 | ELECTRONIC DEVICES | 3 |
| ENGR 33442 | ELECTRONIC DEVICES LABORATORY | 1 |
| ENGR 35500 | SIGNALS AND CIRCUITS | 3 |
| ENGR 35501 | SIGNALS AND CIRCUITS LABORATORY | 1 |
| ENGR 42111 | STRENGTH OF MATERIALS FOR ENGINEERS | 3 |
| ENGR 42363 | MATERIALS SELECTION IN DESIGN AND APPLICATIONS | 3 |
| ENGR 43030 | MECHATRONICS | 3 |
| ENGR 43099 | MECHATRONICS CAPSTONE (ELR) (WIC) [1] | 3 |
| ENGR 43220 | ELECTRICAL MACHINERY | 3 |
| ENGR 43580 | COMPUTER-AIDED MACHINE DESIGN | 3 |
| ENGR 47200 | SYSTEMS ENGINEERING | 3 |
| Programming Elective(s), choose from the following: | | 3-4 |
| CS 13001 | COMPUTER SCIENCE I: PROGRAMMING AND PROBLEM SOLVING | |
| CS 13011 & CS 13012 | COMPUTER SCIENCE IA: PROCEDURAL PROGRAMMING and COMPUTER SCIENCE IB: OBJECT ORIENTED PROGRAMMING | |
| ENGR 26220 & ENGR 26222 | PROGRAMMING FOR ENGINEERS and PROGRAMMING FOR ENGINEERS LABORATORY | |
| **Additional Requirements (courses do not count in major GPA)** | | |
| COMM 15000 | INTRODUCTION TO HUMAN COMMUNICATION (KADL) | 3 |
| MATH 12002 | ANALYTIC GEOMETRY AND CALCULUS I (KMCR) [2] | 5 |
| MATH 12003 | ANALYTIC GEOMETRY AND CALCULUS II | 5 |
| MATH 21001 | LINEAR ALGEBRA | 3 |
| MATH 22005 | ANALYTIC GEOMETRY AND CALCULUS III | 4 |
| MATH 32044 | ORDINARY DIFFERENTIAL EQUATIONS | 3 |
| PHY 23101 | GENERAL UNIVERSITY PHYSICS I (KBS) (KLAB) [3] | 5 |
| PHY 23102 | GENERAL UNIVERSITY PHYSICS II (KBS) (KLAB) [3] | 5 |
| UC 10001 | FLASHES 101 | 1 |
| Kent Core Composition | | 6 |
| Kent Core Humanities and Fine Arts (minimum one course from each) | | 9 |
| Kent Core Social Sciences (must be from two disciplines) | | 6 |
| Kent Core Additional | | 3 |
| **Minimum Total Credit Hours:** | | **121** |

[1] A minimum C grade must be earned to fulfill the writing-intensive requirement.

[2] Applicants to this program should understand that this is a math-intensive program. Students admitted to the program must demonstrate prerequisite knowledge on a math placement exam (the ALEKS exam) prior to starting their first semester. Students who do not to obtain the minimum score required to place into MATH 12002 prior to the start of their first semester will be moved into the Mechatronics Engineering Technology program.

[3] Calculus-based physics is a requirement for this program. No credit will be given to students who take other physics courses. Students who change their major to Mechatronics Engineering should understand that choosing to take a different physics sequence may result in up to 10 additional credit hours of required work.

# Graduation Requirements

| Minimum Major GPA | Minimum Overall GPA |
| --- | --- |
| 2.750 | 2.500 |

# Roadmap

This roadmap is a recommended semester-by-semester plan of study for this major. However, courses designated as critical (!) must be completed in the semester listed to ensure a timely graduation.

| | Semester One | | Credits |
| --- | --- | --- | --- |
| | ENGR 20002 | MATERIALS AND PROCESSES | 3 |
| ! | MATH 12002 | ANALYTIC GEOMETRY AND CALCULUS I (KMCR) | 5 |
| | UC 10001 | FLASHES 101 | 1 |
| | Kent Core Requirement | | 3 |
| | Kent Core Requirement | | 3 |
| | | **Credit Hours** | **15** |
| | **Semester Two** | | |
| | ENGR 11000 | INTRODUCTION TO ENGINEERING | 3 |
| | ENGR 15300 | INTRODUCTION TO ENGINEERING ANALYSIS USING MATLAB® | 2 |
| | ENGR 15301 | INTRODUCTION TO ENGINEERING ANALYSIS USING MATLAB® LAB | 1 |
| ! | MATH 12003 | ANALYTIC GEOMETRY AND CALCULUS II | 5 |
| ! | PHY 23101 | GENERAL UNIVERSITY PHYSICS I (KBS) (KLAB) | 5 |
| | | **Credit Hours** | **16** |
| | **Semester Three** | | |
| ! | ENGR 25200 | STATICS (min C grade) | 3 |
| | MATH 21001 | LINEAR ALGEBRA | 3 |
| | MATH 22005 | ANALYTIC GEOMETRY AND CALCULUS III | 4 |
| ! | PHY 23102 | GENERAL UNIVERSITY PHYSICS II (KBS) (KLAB) | 5 |
| | | **Credit Hours** | **15** |
| | **Semester Four** | | |
| ! | ENGR 25400 | DYNAMICS (min C grade) | 3 |
| | MATH 32044 | ORDINARY DIFFERENTIAL EQUATIONS | 3 |
| | Programming Elective(s) | | 3-4 |
| | Kent Core Requirement | | 3 |
| | Kent Core Requirement | | 3 |
| | | **Credit Hours** | **15** |
| | **Semester Five** | | |
| | COMM 15000 | INTRODUCTION TO HUMAN COMMUNICATION (KADL) | 3 |
| | ENGR 13585 | COMPUTER AIDED ENGINEERING GRAPHICS | 3 |
| | ENGR 20000 | PROFESSIONAL DEVELOPMENT IN ENGINEERING | 1 |
| ! | ENGR 35500 | SIGNALS AND CIRCUITS | 3 |
| ! | ENGR 35501 | SIGNALS AND CIRCUITS LABORATORY | 1 |

| | | | |
|---|---|---|---|
| **!** | ENGR 42111 | STRENGTH OF MATERIALS FOR ENGINEERS | 3 |
| | | **Credit Hours** | **14** |
| | **Semester Six** | | |
| | ENGR 23585 | ADVANCED COMPUTER AIDED DESIGN | 3 |
| | ENGR 33031 | PROGRAMMABLE LOGIC CONTROLLERS | 3 |
| | ENGR 33041 | CONTROL SYSTEMS | 3 |
| | ENGR 33440 | ELECTRONIC DEVICES | 3 |
| | ENGR 33442 | ELECTRONIC DEVICES LABORATORY | 1 |
| | ENGR 42363 | MATERIALS SELECTION IN DESIGN AND APPLICATIONS | 3 |
| | | **Credit Hours** | **16** |
| | **Semester Seven** | | |
| | ENGR 33222 | DIGITAL DESIGN FOR COMPUTER ENGINEERING | 3 |
| | ENGR 43030 | MECHATRONICS | 3 |
| | ENGR 43580 | COMPUTER-AIDED MACHINE DESIGN | 3 |
| | Kent Core Requirement | | 3 |
| | Kent Core Requirement | | 3 |
| | | **Credit Hours** | **15** |
| | **Semester Eight** | | |
| | ENGR 43099 | MECHATRONICS CAPSTONE (ELR) (WIC) | 3 |
| | ENGR 43220 | ELECTRICAL MACHINERY | 3 |
| | ENGR 47200 | SYSTEMS ENGINEERING | 3 |
| | Kent Core Requirement | | 3 |
| | Kent Core Requirement | | 3 |
| | | **Credit Hours** | **15** |
| | | **Minimum Total Credit Hours:** | **121** |

# University Requirements

All students in a bachelor's degree program at Kent State University must complete the following university requirements for graduation.

**NOTE:** University requirements may be fulfilled in this program by specific course requirements. Please see Program Requirements for details.

| | |
|---|---|
| Flashes 101 (UC 10001) | 1 credit hour |
| Course is not required for students with 30+ transfer credits (excluding College Credit Plus) or age 21+ at time of admission. | |
| Diversity Domestic/Global (DIVD/DIVG) | 2 courses |
| Students must successfully complete one domestic and one global course, of which one must be from the Kent Core. | |
| Experiential Learning Requirement (ELR) | varies |
| Students must successfully complete one course or approved experience. | |
| Kent Core (see table below) | 36-37 credit hours |
| Writing-Intensive Course (WIC) | 1 course |
| Students must earn a minimum C grade in the course. | |
| Upper-Division Requirement | 39 credit hours |
| Students must successfully complete 39 upper-division (numbered 30000 to 49999) credit hours to graduate. | |
| Total Credit Hour Requirement | 120 credit hours |

# Kent Core Requirements

| | |
|---|---|
| Kent Core Composition (KCMP) | 6 |
| Kent Core Mathematics and Critical Reasoning (KMCR) | 3 |
| Kent Core Humanities and Fine Arts (KHUM/KFA) (min one course each) | 9 |
| Kent Core Social Sciences (KSS) (must be from two disciplines) | 6 |
| Kent Core Basic Sciences (KBS/KLAB) (must include one laboratory) | 6-7 |
| Kent Core Additional (KADL) | 6 |
| **Total Credit Hours:** | **36-37** |

# Program Learning Outcomes

Graduates of this program will be able to:

1. Identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics.
2. 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. Communicate effectively with a range of audiences.
4. 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. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives.
6. Develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions.
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

# Full Description

The Bachelor of Science degree in Mechatronics Engineering integrates mechanical, electrical, computer and controls engineering to understand automated machinery, specifically, how to design it and how to make it work. Mechatronics engineering revolves around the design, construction and operation of automated systems, robots and intelligent products, which result from the integration of software and hardware.

Using automated systems is becoming more popular for operating equipment or machinery on manufacturing lines, boilers and aircraft to reduce labor costs, increase precision and accuracy and provide quality and safety for workers. Mechatronic devices can be found in agriculture, hospitals, buildings, homes, automobiles, manufacturing plants, the toy and entertainment industry and in aids for the elderly and disabled.

Applicants to this program should understand that this is a math-intensive program.

Information on the program's education objectives and student enrollment and graduation data can be found on the college website.

Students may apply early to the M.S. degree in Mechatronics Engineering and double count 9 credit hours of graduate courses toward both degree programs. See the Combined Bachelor's/Master's Degree Program policy in the University Catalog for more information.