MECHATRONICS ENGINEERING MAJOR

Program Coordinator: Anna Moiseeva

Mechatronics Engineering can be concisely described as the combination of mechanical, electrical, and information systems engineering. The Bachelor of Science in Mechatronics Engineering will provide students with a fundamental understanding of mechatronic systems analysis, the knowledge of how these systems are developed and deployed, and the practical experience required to implement mechatronic systems in real-world applications. Graduates of the program are expected to be highly sought after in fields such as aerospace & defense, energy, infrastructure, manufacturing & automation, robotics, and biomedical engineering. In their senior year, students can focus their electives in one of two tracks: Robotics or Autonomous Air Vehicles.

Mechatronics engineers design, develop, and test automated production systems, transportation and vehicle systems, robotics, computer-machine controls, and many other integrated systems. Mechatronics engineers develop new technologies for use in the automotive and aviation industry, advanced manufacturing operations, and often specialize in areas such as robotics, autonomous vehicles, and manufacturing systems.

Program Educational Objectives

1. Understand and utilize mechatronics component and system integration; tooling and assembly (with respect to digital and analog electrical components and circuits; embedded systems and control; mechanics (statics and dynamics); pneumatic, hydraulic, industrial controls; automation and PLCs);
2. Utilize systems software analysis tools, programming and control systems engineering; connectivity, industrial communication protocols and information security.
3. Design, select, set-up, and calibrate measurement tools, instrumentation and sensors;
4. Troubleshoot a mechatronics system including test and adjust, maintenance or repair;
5. Prepare laboratory reports and systems integration, drawings associated with development, installation, or maintenance of mechatronics components and systems;
6. Become familiar with and use industry codes, specifications, and standards;
7. Employ statistics, quality and continuous improvement techniques, and industrial organization and management
8. Create and present a capstone or integrating experience that illustrates skills acquired in the program applying both technical and non-technical skills in successfully solving industrial mechatronics problems.

Student Learning Outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. 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 economics factors
3. An ability to communicate effectively with a range of audiences
4. 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. 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. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

REQUIREMENTS

Prior Study

Prior to being admitted to the Mechatronics Engineering major, students should have completed the Engineering LEP gateway courses, basic math/science courses, lower-level General Education requirements, and at least 60 applicable degree credits.

Course	Title	Credits
ENGL101	Academic Writing	3
MATH140	Calculus I	4
MATH141	Calculus II	4
MATH241	Calculus III	4
MATH246	Differential Equations for Scientists and Engineers	3
MATH240	Introduction to Linear Algebra	4
CHEM135	General Chemistry for Engineers	3
PHYS161	General Physics: Mechanics and Particle Dynamics	3
PHYS260	General Physics: Electricity, Magnetism and Thermodynamics	3
PHYS261	General Physics: Mechanics, Vibrations, Waves, Heat (Laboratory)	1
PHYS270	General Physics: Waves, Optics, Relativity and Modern Physics	3
PHYS271	General Physics: Electrodynamics, Light, Relativity and Modern Physics (Laboratory)	1
ENES100	Introduction to Engineering Design	3
ENES102	Mechanics I	3
ENES220	Mechanics II	3
ENES232	Thermodynamics	3
ENME202	Computing Fundamentals for Engineers	3
or ENAE202	Computing Fundamentals for Engineers	
Lower-Level general education requirements or A.A./A.S. degree from a Maryland public institution		Varies

Required Courses

Course	Title	Credits
Required Foundation Courses		**54**
ENMT301	Structural Dynamics	3
ENMT313	(Real Time Software Systems and Microprocessors)	3
ENMT322	Discrete Signal Analysis	3

ENMT332	(Classical Control Theory)	3
ENMT361	Mechatronics and Controls I (Mechatronics and Controls Lab I)	3
ENMT362	(Mechatronics and Controls Lab II)	3
ENMT372	(Robotic Systems)	3
ENMT380	Intro to Robotics (Intro to Robotics)	3
ENMT450	(Robotics Programming)	3
ENMT471	(Manufacturing and Automation)	3
ENMT473	(Motion Planning for Autonomous Systems)	3
ENMT477	(Machine Learning in Mechatronics Engineering)	3
ENMT483	(Mechatronic Systems I)	3
ENGL39X	(Professional Writing)	3
ENMT484	(Mechatronic Systems II)	3
TECHNICAL ELECTIVE	(Any approved 300 or 400 level course)	3
TECHNICAL ELECTIVE	(Any approved 300 or 400 level course)	3
PROGRAM ELECTIVE	(Program-Specific Elective)	3
Transfer Credits (Consult with academic advisor) [1]		**60-90***
Total Credits [2]		**121**

1 May vary depending on previous coursework
2 Students must have a minimum of 120 credits to complete the program

GRADUATION PLANS

Click here (https://eng.umd.edu/advising/four-year-plans/) for roadmaps for graduation plans in the A. James Clark School of Engineering.

Additional information on developing a graduation plan can be found on the following pages:

- http://4yearplans.umd.edu
- the Student Academic Success-Degree Completion Policy (https://academiccatalog.umd.edu/undergraduate/registration-academic-requirements-regulations/academic-advising/#success) section of this catalog