Prerequisites for Mobile Robotics Undergraduate Course

Compiled by: David Malawey, 2018.07, Updated notes on 2025.05

MXET 300, Mobile Robotics, is a junior or senior level course with ongoing improvements.

[Background]

► These two tables include proposed prerequisite courses for MXET 300, some of which were existing prerequisites due to students' junior/senior level status.

► MXET = multidisciplinary engineering technology, ESET = electronic systems engineering technology, MMET = mechanical & manufacturing engineering technology.

► MXET300 was first offered in 2017 fall, with 12-18 students, all from the ESET undergrad program

► This document is a study of the existing student's prerequisite knowledge, plus proposed knowledge, including courses that are sub-requisites the key courses.

► Tables are populated from existing courses in the ESET and MMET programs. (Electronic Systems Engineering Technology, Mechanical & Manufacturing Engineering Technology)

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Courses from ESET

This table describes the prerequisite courses for Mobile Robotics & Industrial robotics (MXET 300 & 400) as of 2018.07 at Texas A&M University

Grade	ESET	Title	Course Objectives	Prof
pass	210	Circuit Analysis	Understand DC and AC voltage, current, power 2) Understand resistance, capacitance, inductance, and impedance 3) Apply complex algebra to the analysis of AC circuits. 4) Analyze DC and AC circuits using formal analysis techniques and network theorems 5) Use standard laboratory equipment to measure DC and AC voltages, currents, resistances, and impedances.	Porter
indirect	219	Digital electronics	Ability to use digital design principles including binary codes, the binary, octal, and hexadecimal number systems, and unsigned and signed binary arithmetic. Design, implement, test combinatorial + sequential logic circuits using standard design methods and computer-based design and analysis tools. Design, build, test, optimize and document a complete digital system in a small team environment. Prepare detailed technical reports including test data for design validation.	Morgan
indirect	269	Embeded system development in c	fundamentals of the C programming language with specific emphasis on its features that are most often used when programming microcontrollers. (We will use the Texas Instruments MSP430 16-bit RISC microcontroller as the primary object of study.)	Burke
indirect	349	microcontroller Architecture	understanding of the technical aspects of microcontroller architectures and assembly programming techniques. Ability to: (1) Write assembly language programs for a microcontroller, (2) Design programs for microcontroller systems, (3) Design and understand core elements of microcontrollers, (4) Test and debug mcu based systems, and (5) Document mcu system designs	Hur
pass	350	Analog electronics	1. Use chemistry and physics concepts to discuss and analyze the operation of semiconductor devices. 2. Analyze and design circuits with basic semiconductor components including diodes, operational amplifiers, and transistors. 3. Design circuits for electronics applications including switches, amplifiers, power supplies, filters, clippers, and clampers using basic semiconductor devices. 4. Use advanced mathematics to analyze electronics circuits such as filters. 5. Investigate, troubleshoot, and improve electronics circuits (course project).	Fink
C	369	Embedded systems Software	Understand technical aspects of embedded systems including Hardware and Software methods, Advanced C and Assembly programming techniques, and Embedded OS concepts. Ability to: (1) Write C language programs for mcu's, (2) Design C programs for mcu systems, (3) Design an interface between a mcu and a peripheral device, (4) Test and debug mcu hardware and software systems, (5) Document mcu system designs	Hur
C	359	Instrumentation	1) Apply sampling theorem and design anti-aliasing filters; Abilities to: 2) select and analyze sensors for measurement systems; 3) analyze and design signal conditioning circuits and 4)digital filters. 5)Design virtual instrumentation using LabVIEW; 6) Use Excel to do engineering calculations; 7) Conduct basic statistic analysis for a given set of test data; 8) Develop software for measurement and control systems; 9) Analyze and design Modbus communication protocol in LabVIEW. 10) Write a technical report	Zhan

Courses from MMET

This table includes the recommended MMET-based required courses for Mobile Robotics.

Grade	MMET	Title	Course Objectives	Prof
indirect	275	mechanics for tech	Students will be able to apply the concepts and procedures enabling them to identify, idealize and analyze mechanical force systems via sketches and free-body diagrams. (ABET outcomes: a, b, f, l, m, n) Students will be able to apply 2D/3D equations of equilibrium to particle/rigid-body systems for solving problems involving trusses, frames, machines and other structural and mechanical systems. (ABET outcomes: a, b, f, l, m, n) Students will be able to find geometric and mass properties of collections of areas/volumes, to find internal forces developed in structural members, and to apply the concepts of dry friction. (ABET outcomes: a, b, f, l, m, n)	Obeidat
pass	303	Fluid mech & power	Understand principles of fluid mechanics and power with applications. Topics include: fluid properties, conservation of energy, momentum, incompressible flow in pipes, standard symbols, components and control of hydraulic and pneumatic systems. (2) To provide the student the necessary analytical skills to solve and analyze a variety of fluid mechanics and fluid power related problems.	Alvarado
pass	376	Strength of Materials	Fundamental principles and problem solving skills for stress analysis and design of structural and machine members. Abilities to: 1. Analyze the stresses due to normal force, shear force, torsion, and bending; 2. Determine combined stresses at critical locations; 3. Use Mohr's circle for stress transformation and principal stresses calculation; 4. Interpret experimental results and identify probable sources of experimental errors.	Wang
pass	361	product design and solid modeling	1. explain product development terms and roles such as human factors engineer, industrial designer, green design, etc. 2. demonstrate the covered product development concepts such as green design, brainstorming methodologies, and other tools. 3. demonstrate and solve problems using material and shape selection methodologies and analyze the results in real design problems. 4. Be able to construct cost models for manufacturing processes. 5. Be able to appraise designs based on manufacturability and ease of assembly. 6. use PTC Creo software to create parts, assemblies, and detailed designs of intermediate complexity. 7. Be able to use DFMA software in the design for manufacturing and design for assembly.	Obeidat
pass	370	Thermo for Tech	To learn and understand the principles of thermal and mechanical energy. This includes the study of energy transformations and thermodynamic relationships applied to flow and non-flow processes in power and refrigeration cycles. Equipment studied includes compressors, steam turbines, gas turbines, heat exchangers, nozzles, diffusers, pumps and piston-cylinder devices. (2) To provide the student the necessary analytical skills to solve and analyze a variety of energy related problems.	Alvarado
C	375	Dynamics	Describe dynamic systems and derive dynamics equations for basic industrial applications; Explain the mathematical model for mechanical, electrical, fluid power, and electro-mechanical system dynamics; Build dynamic models using Matlab Simulink; Design mechatronic systems with optimized system dynamic responses. Prepare technical reports on all labs and course project including simulation data necessary for modeling validation.	Song
pass	363	Mechanical Design I	Understand theory of the fundamentals of mechanical design. Ability to select and apply failure theories/criteria for mechanical design. 2. To provide the procedures and decision making techniques required to design and analyze mechanical components. Ability to design part geometry, identify loads, calculate stresses, and use failure theories to select materials. 3. Understand critical concerns in the design and selection of common machine elements. Design and select fasteners and springs to meet the performance requirements.	Wang

Admitted Students in MXET program

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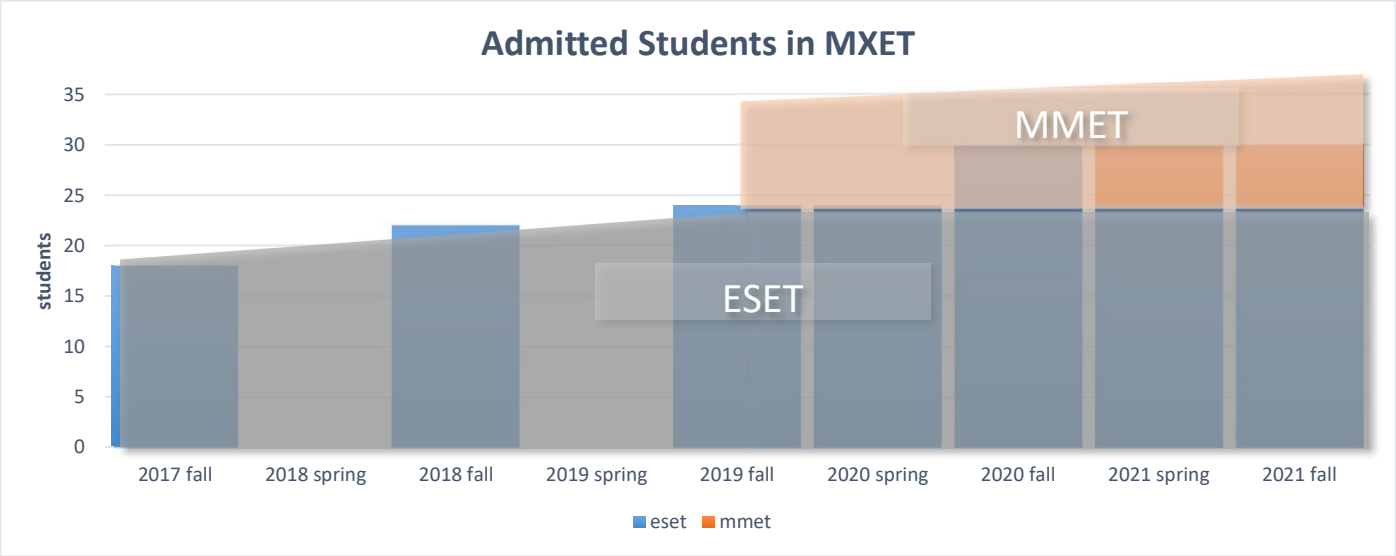
Key Points

- ► majority of students in Mobile Robotics come from the ESET Background of courses
- ► For the initial offering of MXET program, ESET students transferred to MXET during junior & senior years
- ► Mobile Robotics course relies more heavily on ESET courses than MMET (electronics > mechanical)
- ► ESET students are slightly more prepared than MMET students for successful MXET labs
- ► Ideally, the capacity of MXET program is filled with 50/50 students who formerly enrolled in ESET/MMET



	students	
year	eset	mmet
2017 fall	18	0
2018 spring	0	0
2018 fall	22	0
2019 spring	0	0
2019 fall	24	0
2020 spring	24	0
2020 fall	30	0
2021 spring	24	6
2021 fall	24	6