MECHANICAL ENGINEERING TECHNOLOGY, BS

Program Description

The Engineering Technology Council of the American Society for Engineering Education defines Engineering Technology as the profession in which knowledge of mathematics and natural sciences gained by higher education, experience, and practices is devoted primarily to the implementation and extension of existing technology for the benefit of humanity. Engineering technology focuses on the applied aspects of science and engineering to prepare graduates for practice in product improvement, manufacturing, and engineering operational functions. Engineering technologists are suited for industries that deal with application, manufacturing, implementation, engineering operation, sales, and production.

The Mechanical Engineering Technology degree is offered in both the traditional face-to-face format and an online format for the upper-division courses. The fully-online courses form a competency-based education program in which students receive credit for courses when specific competencies are demonstrated, and receive the degree when all degree-level competencies are demonstrated. In some cases, students may be able to take traditional courses for credit in the competency-based education program.

The goal of Engineering Technology is to prepare well educated, highly skilled, and socially and professionally responsible engineering technologists from a diverse population of students to create productive and rewarding careers. Graduates will be well grounded in the fundamentals of engineering, mathematics, science, communications, and problem solving. To create continuous improvement, the program uses input from employers, alumni, and the Industrial Advisory Committee. Engineering Technology is accredited by the Engineering Technology Accreditation Commission (ETAC) of ABET, www.abet.org (http://www.abet.org).

Contact Information

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Mechanical Engineering Technology

Mechanical Engineering Technology graduates will exemplify the attributes previously described.

Student Learning Outcomes

By the time of graduation, students in the Mechanical Engineering Technology program will have demonstrated

1. an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline;
2. an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;
3. an ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;
4. an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and
5. an ability to function effectively as a member as well as a leader on technical teams.

Program Educational Objectives

1. Within two years of graduation from TAMU-CC, our graduates who have chosen to pursue a career in mechanical engineering technology or a related field will be working in industry, government, construction, or other professional service in the areas of design, manufacture, sales, installation, operation and/or maintenance of complex, high-value systems.
2. Within five years of graduation from TAMU-CC our graduates who have chosen to pursue a career in mechanical engineering technology or a related field will have

    - advanced in their careers as indicated by obtaining promotions and positions of leadership, awards, recognitions as subject matter experts, and/or registration as professional engineers or in other professional disciplines; or by entrepreneurial activities, products or processes developed, or patents;
    - demonstrated the ability to increase their knowledge and expertise through continuing education or advanced degrees; and
    - contributed to the improvement of the profession and of society through participation and service in professional and public organizations and through mentoring.

Academic advisors and faculty mentors are available to assist students with their academic endeavors.

Competency-Based Education Program for BS Mechanical Engineering Technology (CBE MCET)

A competency-based education (CBE) program is one in which specific, concrete competencies are defined. The top-level competencies are the ABET student learning outcomes listed above. Subject-specific sub-competencies are identified and assessed in each of the CBE MCET courses. When a student demonstrates the competencies for a specific course, the student passes the course. When all of the competencies for the degree have been demonstrated, the student receives the degree. The CBE MCET program is being offered for the upper-division (3000- and 4000-level) courses. Once a student has completed the first two years of the traditional MCET BS program as described below, the student may opt for the CBE MCET program. Each of the courses in the CBE MCET program, with the exception of certain laboratory classes described below, may be completed online.

A student must apply for the CBE program in MCET. The student

- Must be admitted as a student to TAMU-CC.
- Must indicate a positive decision to apply for the CBE MCET program, either through ApplyTexas or a change of major form if student is already at TAMU-CC.
- Must have completed all core courses and all lower-division courses as listed below under “Prior Course Completion.”
- Must have a 2.5 GPA in all coursework that applies to the program (core courses and lower-division courses that will be counted towards the program), whether taken at TAMU-CC or elsewhere.

Credit By Examination: Some courses will have an online pre-test that students can take to earn college credit for that course. The test will be the equivalent of a comprehensive final exam that will test students on all competencies related to the course. The pre-test will be proctored according to the same standard as all other tests taken in the course. If students pass the pre-test, they will receive credit and not be required to take the course. The fee for taking the pre-test in each course must be paid by the student and may range up to $300 per exam. The student should contact the office of the Department of Engineering or the Office of Distance Education and Learning Technologies at TAMU-CC to determine the exact cost of the pre-test.

Credit By Portfolio: For the courses listed below, it is possible that through experience on the job (such as running a process unit in a plant or working in a machine shop), the student might have acquired the competencies in a particular course and therefore be able to obtain credit by submitting examples of work, certified by a supervisor, that illustrate the competencies in the course. The competencies for these courses may be found on the program website, and students given the opportunity to submit portfolios for evaluation (at the cost of an evaluation fee up to $300). The supervisor must be approved by the Engineering faculty as having the necessary qualifications to validate the work submitted by the student. The portfolio(s) submitted by the student must demonstrate that the student has mastered the competencies in the class, as published on the program website.

Code	Title	Hours
ENTC 3220	Thermal-Fluids Laboratory	2
ENTC 3302	Manufacturing Processes	3
ENTC 4210	Solid Mechanics Laboratory	2
ENTC 4415	Project Justification and Management	4
ENTC 4350	Capstone Projects	3

Because of the nature of the last two courses, credit by portfolio must be obtained for both courses and cannot be obtained for each course individually.

Student Learning Outcomes

The student learning outcomes for the CBE MCET program are the same as for the traditional BS in MCET. These student outcomes will be met by the demonstration of specific competencies in each of the courses in the CBE MCET program.

General Requirements

A summary of the hours necessary for graduation follows:

The specific requirements for each aspect of the Bachelor of Science degree in Mechanical Engineering Technology are indicated below.

Requirements	Credit Hours
Core Curriculum Program (http://catalog.tamucc.edu/undergraduate/university-college/programs/core-curriculum-program/)	42
First-Year Seminars (when applicable)[1]	0-2
Fundamental Science, Math, and Engineering Courses	13
Required Engineering and Mechanical Engineering Technology Courses	53
Technical Elective Block	12-13
Total Credit Hours	**120-123**

1

Full-time, first time in college students are required to take the first-year seminars.

- UNIV 1101 University Seminar I (1 sch)
- UNIV 1102 University Seminar II (1 sch)

Transfer students with 24 or more hours are exempt from First-Year Seminar.

Program Requirements

The courses that are considered to be in the major field of study are all MATH, CHEM, PHYS, COSC, ENTC, ENGR, EEEN, and MEEN courses in the curriculum listed below (any ENGR, MEEN, or EEEN courses taken to fulfill MCET degree requirements must be approved by the program coordinator and the department chair).

The specific requirements for each aspect of the Bachelor of Science degree in Mechanical Engineering Technology are indicated below. Students are encouraged to take the NCEES (National Council of Examiners for Engineering and Surveying) Fundamentals of Engineering (FE) exam during their senior year. The FE exam, http://ncees.org/exams/fe-exam/, is the first step in the process that leads to the P.E. license.

Code	Title	Hours
Full-time, First-year Students		
UNIV 1101	University Seminar I	1
UNIV 1102	University Seminar II	1
Core Curriculum Program		
University Core Curriculum		42
Engineering Technology students must take: [1]		
MATH 2413	Calculus I (3-hour lecture math component)	
PHYS 2425	University Physics I (3-hour lecture natural science component)	
PHYS 2426	University Physics II (3-hour lecture natural science component)	
MATH 2414	Calculus II (3-hour lecture component area option)	
Fundamental Science, Math, and Engineering Courses		
MATH 2413	Calculus I (1 hour laboratory component)	
PHYS 2425	University Physics I (1 hour laboratory component)	
PHYS 2426	University Physics II (1 hour laboratory component)	
MATH 2414	Calculus II (1 hour laboratory component)	1
ENGR 1201	Introduction to Engineering	2
ENGR 1312	Engineering Graphics I	3
COSC 1330	Programming for Scientists, Engineers, and Mathematicians	3
CHEM 1411	General Chemistry I	4
Required Engineering and Mechanical Engineering Technology Courses		
ENGR 2325	Statics	3
ENGR 2326	Dynamics	3

ENTC 2414	Circuit Analysis I	4
ENGR 3316	Thermodynamics	3
ENGR 3322	Materials Science	3
ENTC 3302	Manufacturing Processes	3
or ENGR 3350	Manufacturing Processes	
ENTC 3220	Thermal-Fluids Laboratory	2
ENTC 3306	Fluid Mechanics	3
or ENGR 3315	Fluid Mechanics	
ENTC 3308	Strength of Materials	3
or ENGR 3320	Strength of Materials	
ENTC 3455	Solid Modeling and Finite Elements	4
ENTC 4210	Solid Mechanics Laboratory	2
ENTC 4320	Heat Transfer	3
ENTC 4330	Design of Machine Elements	3
ENTC 4360	Mechanical System Design	3
ENTC 4446	Control Systems I	4
ENTC 4415	Project Justification and Management	4
ENTC 4350	Capstone Projects	3
Technical Electives		
Four courses or 12-13 sem. hrs.		12-13
Students choose one from any upper-division (3000-level or 4000-level) 3-hour credit Math, Science, or Engineering courses.		
Students must complete at least 9 hours of technical elective courses. These may include any upper-division (3000-level or 4000-level) Engineering (CEEN, EEEN, IEEN, MEEN) or Engineering Technology (ENTC) courses outside of the required courses in the Mechanical Engineering Technology degree plan, or any 4000-level MATH, COSC, BIOL, CHEM, or PHYS courses.		
Total Hours		**122-123**

[1]

Engineering Technology students must take two courses in Physics even if the natural science portion of the core curriculum is satisfied by other means. Students transferring to A&M-Corpus Christi from other institutions may have various means for fulfilling the core curriculum. Please refer to the "General Education Requirement" in the catalog section entitled "Undergraduate Programs (http://catalog.tamucc.edu/undergraduate/undergraduate-programs/)." Three hours of the Component Area Option of the University Core Curriculum are satisfied by the fourth (lab) hour of each of MATH 2413 Calculus I (4 sch), PHYS 2425 University Physics I (4 sch), and PHYS 2426 University Physics II (4 sch) (the first three lecture hours of each are used to satisfy the mathematics and natural science components of the Core). The other three hours of the Component Area Option of the Core are satisfied by the three lecture hours of MATH 2414 Calculus II (4 sch).

Competency-Based Education Program for BS Mechanical Engineering Technology (CBE MCET)

Prior Course Completion

A student must apply for admission to the CBE MCET program. Prior to being admitted to the program, the student must complete all TAMU-CC core curriculum requirements and the following courses or their equivalents (those courses which satisfy the core requirements for mathematics, life and physical sciences, and the component area option (CAO) are also listed, for completeness).

Code	Title	Hours
CHEM 1411	General Chemistry I	4
ENGR 1201	Introduction to Engineering	2
ENGR 1312	Engineering Graphics I	3
ENGR 2325	Statics	3
ENGR 2326	Dynamics	3
ENTC 2414	Circuit Analysis I	4
or ENGR 2460	Circuit Analysis	
MATH 2413	Calculus I	4
MATH 2414	Calculus II	4
PHYS 2425	University Physics I	4
PHYS 2426	University Physics II	4
COSC 1330	Programming for Scientists, Engineers, and Mathematicians	3

Program Requirements

Code	Title	Hours
Required Mechanical Engineering Technology Courses - CBE		
ENTC 3306	Fluid Mechanics	3
ENTC 3308	Strength of Materials	3
ENGR 3316	Thermodynamics	3
ENGR 3322	Materials Science	3
ENTC 3455	Solid Modeling and Finite Elements	4
ENTC 4320	Heat Transfer	3
ENTC 4330	Design of Machine Elements	3
ENTC 4360	Mechanical System Design	3
ENTC 4415	Project Justification and Management	4
ENTC 4446	Control Systems I	4
Chemical Process Industry Elective Block - CBE [1]		
ENTC 4331	Unit Processes	3
ENTC 4332	Process Modeling and Control	3
ENTC 4333	Chemical Reaction Engineering	3
ENTC 4335	Energy Conversion	3
On-Campus Block [2]		
ENTC 3220	Thermal-Fluids Laboratory	2
ENTC 3302	Manufacturing Processes	3
ENTC 4210	Solid Mechanics Laboratory	2
ENTC 4350	Capstone Projects	3
Total Hours		**55**

[1]

Or, the student may select 4 courses from upper-division, traditional format ENTC and MEEN courses.

2

Because of their nature, these courses must be completed in a traditional face-to-face format on campus or have a face-to-face component, if credit is not obtained by portfolio (see above). The two lab classes will be taught during the same five-week summer school term, in the first term of the summer. ENTC 3302 Manufacturing Processes (3 sch) and ENTC 4350 Capstone Projects (3 sch) courses will be taught as hybrids, with online and face-to-face components. The face-to-face laboratory component of ENTC 3302 Manufacturing Processes (3 sch) will be taught during a five-week summer term. Because of the team nature of capstone projects, the online CBE version of ENTC 4350 Capstone Projects (3 sch) will last 14 weeks and will be synchronized with spring and fall semester offerings of the traditional face-to-face version of ENTC 4350 Capstone Projects (3 sch). The capstone project in ENTC 4350 Capstone Projects (3 sch) will be completed as subsystems by subgroups or individuals off campus and integrated on campus at the end of the semester, with arrangements made for team presentations.

Course Sequencing

First Year		
Fall		**Hours**
UNIV 1101	University Seminar I	1
ENGL 1301	Writing and Rhetoric I	3
ENGR 1201	Introduction to Engineering	2
CHEM 1411	General Chemistry I	4
MATH 2413	Calculus I	4
HIST 1301	U.S. History to 1865	3
	Hours	**17**
Spring		
UNIV 1102	University Seminar II	1
ENGL 1302 or COMM 1311	Writing and Rhetoric II or Foundation of Communication	3
ENGR 1312	Engineering Graphics I	3
MATH 2414	Calculus II	4
PHYS 2425	University Physics I	4
HIST 1302	U.S. History Since 1865	3
	Hours	**18**
Second Year		
Fall		
ENGR 2325	Statics	3
POLS 2305	U.S. Government and Politics	3
PHYS 2426	University Physics II	4
COSC 1330	Programming for Scientists, Engineers, and Mathematicians	3
Creative Arts Core Requirement		3
	Hours	**16**
Spring		
ENGR 2326	Dynamics	3
ENTC 2414	Circuit Analysis I	4
ENGR 3322	Materials Science	3
ENGR 3316	Thermodynamics	3
	Hours	**13**
Third Year		
Fall		
ENTC 3306 or ENGR 3315	Fluid Mechanics or Fluid Mechanics	3
ENTC 4446	Control Systems I	4
ENTC 3308 or ENGR 3320	Strength of Materials or Strength of Materials	3
POLS 2306	State and Local Government	3
	Hours	**13**
Spring		
ENTC 3302 or ENGR 3350	Manufacturing Processes or Manufacturing Processes	3
ENTC 4320	Heat Transfer	3
ENTC 3455	Solid Modeling and Finite Elements	4
ENTC 4330	Design of Machine Elements	3
ENTC 4210	Solid Mechanics Laboratory	2
ENTC 3220	Thermal-Fluids Laboratory	2
	Hours	**17**
Fourth Year		
Fall		
ENTC 4415	Project Justification and Management	4
Technical elective for MCET		3
Technical elective for MCET		3
Upper Level Math, Science or Engineering Elective		3
ENTC 4360	Mechanical System Design	3
	Hours	**16**
Spring		
ENTC 4350	Capstone Projects	3
Technical elective for MCET		3
Language, Philosophy & Culture Core Requirement		3
Social and Behavioral Sciences Core Requirement		3
	Hours	**12**
	Total Hours	**122**

Courses

ENTC 2414 Circuit Analysis I
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
Fundamental aspects of DC circuit analysis: charge, voltage, resistance, current, and power; Ohm's Law; methods of analysis; series and parallel circuits; Kirchhoff's voltage and current laws; Thevenin and Norton Theorems; electrical measurement instruments; and use of analysis software. Offered: Fall/Spring.
Prerequisite: MATH 2413 and PHYS 2426.
Co-requisite: SMTE 0099.
TCCNS: ENGT 1401

ENTC 2490 Special Topics
1-4 Semester Credit Hours (1-4 Lecture Hours, 3 Lab Hours)
Subject material variable. May be repeated for different topics.

ENTC 3220 Thermal-Fluids Laboratory
2 Semester Credit Hours (4 Lab Hours)
Application of measurement instrumentation and experimental techniques utilized in thermodynamics and fluid mechanics. Experiments and project in hydrostatics, hydrodynamics, and thermodynamics. Offered in Spring.
Prerequisite: (ENTC 3306 and 3320*).
* May be taken concurrently.
Co-requisite: SMTE 0099.

ENTC 3302 Manufacturing Processes
3 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
Introduction to metal and non-metallic manufacturing processes; casting, forging, rolling, extrusion, sheet metal forming, cutting tools turning and milling operations, abrasive machining, welding and joining, powder compaction, molding, forming of plastics, surface treatment, human factors and safety. Offered: Fall/Spring.
Prerequisite: ENGR 1312 and 3322.
Co-requisite: SMTE 0099.

ENTC 3306 Fluid Mechanics
3 Semester Credit Hours (3 Lecture Hours)
Fluid properties, fluid statics, dynamics, and kinematics, conservation of energy and momentum incompressible, laminar and turbulent flow. Similitude and dimensional analysis, and viscous flow. Offered: Fall (Spring as needed).
Prerequisite: (ENTC 2326 or ENGR 2326).

ENTC 3308 Strength of Materials
3 Semester Credit Hours (3 Lecture Hours)
Concepts in strength of materials, stress, strain; torsion; deformation under load; direct, shear, and combined stresses; shear and moment diagrams; Mohr's circle; stress concentrations, bending stresses and torsional shear stresses, deflection in beams and shafts; columns, connections, and pressure vessels. Offered: Fall (Spring as needed).
Prerequisite: (ENTC 2325 or ENGR 2325) and ENGR 3322.

ENTC 3320 Thermodynamics
3 Semester Credit Hours (3 Lecture Hours)
Theory and application of energy methods in engineering; conservation of mass and energy; energy transfer by heat, work and mass; thermodynamic properties; analysis of open and closed systems; the second law of thermodynamics and entropy; gas, vapor and refrigeration cycles. Offered: Fall/Spring.
Prerequisite: PHYS 2425 and MATH 2414.

ENTC 3350 Human Factors Engineering
3 Semester Credit Hours (3 Lecture Hours)
Application of human factors engineering principles utilized in mechanical system and product design. Overview of human characteristics and research and design techniques.
Prerequisite: (ENTC 3302 or 3302*).
* May be taken concurrently.

ENTC 3455 Solid Modeling and Finite Elements
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
Use of computer aided design and solid modeling tools in engineering design and manufacturing including: solid modeling, stress, flow and heat transfer analysis using finite element methods, and rapid prototyping. Offered: Spring.
Prerequisite: ENTC 3308.

ENTC 4210 Solid Mechanics Laboratory
2 Semester Credit Hours (4 Lab Hours)
Experimental principles from Strength of Materials, and experiments and computer-based analysis of machine elements and structures for Strength of Material and Solid Mechanics.
Prerequisite: (ENTC 4330*).
* May be taken concurrently.
Co-requisite: SMTE 0099.

ENTC 4320 Heat Transfer
3 Semester Credit Hours (3 Lecture Hours)
Fundamental study of convection, conduction and radiation as applied to heat transfer, heat exchangers, boilers, other heat transfer equipment. Offered: Spring.
Prerequisite: ENTC 3306 and ENGR 3316.

ENTC 4322 Programmable Logic Controllers
3 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
Introduction to PLCs and their use in industrial automation. Topics include programming, counters, timers, interrupts, and process control applications. Offered: As needed.
Prerequisite: ENTC 3416.
Co-requisite: SMTE 0099.

ENTC 4330 Design of Machine Elements
3 Semester Credit Hours (3 Lecture Hours)
Stress analysis of deformable bodies and mechanical elements; stress transformation; combined loading; failure modes; material failure theories; fracture and fatigue; deflections and instabilities; thick cylinders; curved beams; design of structural/mechanical members; design processes for shafts, bearings, springs, fasteners, and mechanical joints.
Prerequisite: ENTC 3308.

ENTC 4331 Unit Processes
3 Semester Credit Hours (3 Lecture Hours)
Principles and methods for staged separation processes including distillation, absorption and stripping, extraction, and adsorption systems. Offered in Fall and Spring
Prerequisite: ENTC 4320.

ENTC 4332 Process Modeling and Control
3 Semester Credit Hours (3 Lecture Hours)
Process modeling, dynamics, and feedback control. Linear control theory. Application of Laplace transforms and frequency response to the analysis of open-loop and closed-loop process dynamics. Dynamic response characteristics of processes. Stability analysis and gain/phase margins. Design and tuning of systems for control of level, flow, and temperature. Offered Fall and Spring.
Prerequisite: ENTC 3306.

ENTC 4333 Chemical Reaction Engineering
3 Semester Credit Hours (3 Lecture Hours)
Fundamental principles of chemical reaction engineering and application to design and analysis of basic chemical reactors containing both homogeneous and heterogeneous reactions. Offered Fall and Spring.
Prerequisite: ENTC 4331 and 4332.

ENTC 4335 Energy Conversion
3 Semester Credit Hours (3 Lecture Hours)
Installation, design characteristics, operational performance, and maintenance of motors, turbines, pumps and compressors. Introduction to global energy concerns; fossil and nuclear fuels; energy consumption analysis; energy management and conservation techniques; renewable and alternative energy sources. Modern energy conversion devices such as fuel cells, photovoltaic cells, and micro-power turbines.
Prerequisite: ENGR 3316.

ENTC 4350 Capstone Projects
3 Semester Credit Hours (1 Lecture Hour, 5 Lab Hours)
This course allows students to employ the knowledge attained in other courses to implement (including building, testing, and documenting) the project approved in ENTC 4415 - Project Justification and Management , within budget and on schedule. Course requirements include a written report and oral presentations. Normally taken in the student's last semester.
Prerequisite: ENTC 4415.
Co-requisite: SMTE 0099.

ENTC 4360 Mechanical System Design
3 Semester Credit Hours (3 Lecture Hours)
Analysis, management and cost, team work, optimal design, and computer simulation of mechanical systems and components; Applications in fluid flow and heat transfer, machine elements, and stress analysis. Selected course topics are assigned as projects.
Prerequisite: ENTC 4330.

ENTC 4415 Project Justification and Management
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
Foundations of engineering economy, cash flow and equivalence, and project justification. Introduction to project management, planning, scheduling, and control, use of project management software, GANTT charts, PERT charts, critical path. Students prepare proposals, including specifications, timelines, schedule, and budget, for projects to be implemented in ENTC 4350 - Capstone Projects .
Co-requisite: SMTE 0099.

ENTC 4446 Control Systems I
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
Introduction to control systems; open and feedback; Laplace transform and frequency response; control valves; electric motors; P, PI, and PID modes of control; analog and digital controllers Process characteristics; analysis of control systems; gain and phase margin; stability.
Prerequisite: ENTC 2414.

ENTC 4490 Selected Topics
1-4 Semester Credit Hours (1-4 Lecture Hours)
Subject material variable. May be repeated for different topics.

ENTC 4496 Directed Independent Study
1-4 Semester Credit Hours
Requires a formal proposal of study to be completed in advance of registration, approval of supervising faculty and chairperson.