UNMANNED AIRCRAFT SYSTEMS APPLICATIONS, CERTIFICATE

Program Description

The Certificate in Unmanned Aircraft Systems Applications is designed to provide students with a basic background in the technologies and applications of unmanned aircraft systems that will prepare them to work in various fields related to unmanned aircraft. Candidates are required to complete 16 credit hours, including 10 hours of required courses and 6 hours chosen from a list of designated electives. All students admitted into the UAS certificate program must meet the undergraduate admission requirements for TAMU-CC and must satisfy all prerequisites for courses in the certificate program. Students working toward an undergraduate degree in engineering, computer science, or geospatial information science may obtain this certificate while completing their degrees, but this may require completing more credit hours than those required for the undergraduate degree. Transfer credit for some required courses may be considered, as may credit for previous experience. Students are expected to meet all other academic standards. Students must apply for the certificate and complete a Certificate Plan approved by the Director of the School of Engineering and Computing Sciences or a designee.

For Additional Information

Website:
http://encs.tamucc.edu

Mailing Address:
School of Engineering and Computing Sciences, Unit 5797
College of Science and Engineering
Texas A&M University - Corpus Christi
6300 Ocean Drive
Corpus Christi, TX 78412-5797

Program Requirements

Code	Title	Hours
Required Courses		
MEEN 3335	Introduction to Unmanned Aircraft Systems	3
COSC 3335	Programming for Unmanned Aircraft Systems	3
GISC 4431	Remote Sensing and Photogrammetry	4
Electives		
Select two of the following:		6
MEEN 4335	Introduction to Aircraft Aerodynamics and Performance	
MEEN 4345	Sensors and Systems ^	
EEEN 3330	Control Systems I	
COSC 3360	Human-computer Interaction	
COSC 4330	Introduction to Artificial Intelligence	
MEEN 4336	Introduction to UAS for Agricultural Applications	
IEEN 3324	Human Systems Interface	
IEEN 4324	Human Factors and Autonomous Systems	
IEEN 4326	Airborne Design of Experiments	
Total Hours		**16**

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Blended offering

Note:

Students must earn at least a 2.5 overall grade point average in certificate courses.

Course Sequencing

Certificate Coordinator: Dr. David Bridges

Students should take the courses in the following sequence to complete in the most timely manner:

First Year		
Fall		**Hours**
MEEN 3335	Introduction to Unmanned Aircraft Systems	3
COSC 3335	Programming for Unmanned Aircraft Systems	3
	Hours	**6**
Spring		
Elective 1		3
	Hours	**3**
Second Year		
Fall		
GISC 4431	Remote Sensing and Photogrammetry	4
	Hours	**4**
Spring		
Elective 2		3
	Hours	**3**
	Total Hours	**16**

Note: Nothing prevents a student from taking elective courses whenever they are offered, in semesters other than the ones listed above.

Courses

MEEN 3230 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: MEEN 3330 or 3330[*].
[*] May be taken concurrently.
Co-requisite: SMTE 0099.

MEEN 3310 Engineering Analysis for Mechanical Engineering
3 Semester Credit Hours (3 Lecture Hours)
Applications of fundamentals of linear algebra, vector analysis, numerical methods, computer programming, and probability and statistics for mechanical engineering. (Cross-listed with MATH 3310 - Mathematical Analysis for Mechanical Engineering)
Prerequisite: MATH 3315.

MEEN 3330 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: ENGR 3320.

MEEN 3335 Introduction to Unmanned Aircraft Systems
3 Semester Credit Hours (3 Lecture Hours)
Overview of unmanned aerial systems: history, platforms, operations, command and control, sensor systems, payloads, regulations, policy. Current developments in unmanned aerial systems.

MEEN 3340 Solid Modeling and Finite Elements
3 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
Use of computer aided design and solid modeling tools in engineering design, and analysis, and manufacturing including: solid modeling, stress, flow, and heat transfer analysis using finite element methods.
Prerequisite: MEEN 3310 and ENGR 3320.

MEEN 3345 Heat Transfer
3 Semester Credit Hours (3 Lecture Hours)
Steady and unsteady conduction in one- and two-dimensions; forced convection, internal and external flows; heat exchangers; introduction to radiation; elements of thermal system design.
Prerequisite: (ENGR 3316 and 3315).

MEEN 4325 Energy Conversion
3 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
Natural resources: fuels, solar, wind, geothermal, wave, and ocean thermal; thermodynamics of power cycles and processes: Rankine, Brayton, gas turbine, IC engines, fuel cell; nuclear power; direct energy conversion: photovoltaic, thermoelectric, thermionic, magnetohydrodynamics; non-reactive processes: wind, wave/tidal, ocean thermal energy, solar thermal; concept of life cycle assessments of carbon foot print. Student teamwork of a class term paper is expected.
Prerequisite: ENGR 3316.

MEEN 4330 Introduction to Plasma Engineering and Applications
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
Physical, electrical, chemical properties of plasmas; differences in properties of thermal and non-thermal plasmas, direct and alternating current plasma sources, inductive and capacitive coupled plasma sources, diagnostics and applications of plasmas.
Prerequisite: ENGR 2322 and (ENGR 2460 or PHYS 2426).
Co-requisite: SMTE 0099.

MEEN 4331 Compressible Flow and Introduction to Jet Propulsion
3 Semester Credit Hours (3 Lecture Hours)
Introduction to compressible flows: isentropic flow, normal shocks, oblique shocks, expansion fans, internal flows. Flows with friction and heat addition. Introduction to gas turbine engine cycle and components. Derivation of thrust equation for turbojet engines.
Prerequisite: (ENGR 3315 or ENTC 3306) and (ENGR 3316 or ENTC 3320).

MEEN 4335 Introduction to Aircraft Aerodynamics and Performance
3 Semester Credit Hours (3 Lecture Hours)
Forces on aircraft; standard atmosphere; steady-state cruise, climb, and turn performance; performance optimization; introduction to aircraft longitudinal stability.
Prerequisite: ENGR 2326 and COSC 1330.

MEEN 4336 Introduction to UAS for Agricultural Applications
3 Semester Credit Hours (3 Lecture Hours)
Provides the foundations to acquire remote sensing data using Unmanned Aircraft Systems (UAS) and to interpret, process, and apply remotely sensed data for agricultural applications. Principles of remote sensing, digital image processing, and geospatial analysis will be covered. Emphasis will be on the use of UAS remote sensing technology for various disciplines in agricultural sciences including plant breeding, plant physiology, crop scouting, pest management and entomology. Offered Spring.
Prerequisite: MEEN 3335.

MEEN 4345 Sensors and Systems
3 Semester Credit Hours (3 Lecture Hours)
This course covers sensors and sensing systems where sensing modalities, analysis of sensed data, data transmission and reception are discussed. Filtering and estimation in sensing systems are considered. The course covers sensors at component level to develop subsystems and more complex sensing systems that monitor physical phenomena in laboratory or marine/terrestrial environments. Other topics include multidimensional signal and image processing, object tracking, multisensory data fusion, applications in environmental monitoring, remote sensing and surveillance.
Prerequisite: MATH 2414, PHYS 2426 and ENGR 2460.

MEEN 4350 Controls, Automation and Robotics
3 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
Automation in a manufacturing and assembly setting for ocean and marine environments, material handling systems, remote guided vehicles, automated storage and retrieval systems, computer numerical machine tools, robotics.
Prerequisite: MATH 3315, ENGR 2326 and 2460.
Co-requisite: SMTE 0099.

MEEN 4351 Dynamical Systems Analysis and Modeling
3 Semester Credit Hours (3 Lecture Hours)
Modeling and analysis of systems that have a time-based response. Transient as well as steady state solutions for SDOF and MDOF systems and computational solutions including time response, Bode plots, phase plots, and other plots relevant to the system. Linear and non-linear modeling of systems will be studied. Modeling of mechanical systems (vibrations), electrical circuits, and thermal/fluid systems will be covered.
Prerequisite: COSC 1330, ENGR 2460, 2326 and MEEN 3310.

MEEN 4355 Marine Fabrication
3 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
Advanced topics in manufacturing and fabrication related to ships and offshore platforms and construction.
Prerequisite: ENGR 3350.
Co-requisite: SMTE 0099.

MEEN 4356 Micro-Electronical & Mechanical Manufacturing
3 Semester Credit Hours (3 Lecture Hours)
Basic principles and techniques in microelectronics manufacturing (semiconductor manufacturing and micro-electrical mechanical systems (MEMS). Emphasis will on process descriptions, terminology, equipment requirements, and process controls. Basic micro-fabrication including semiconductor and MEMS physics and process chemistry will be combined with control schemes to arrive at overall systems descriptions.

MEEN 4360 Thermal Systems Design
3 Semester Credit Hours (3 Lecture Hours)
Analysis, management and cost, optimal design, and computer simulation of thermal systems and components; Applications in fluid flow and heat transfer, pumps, turbines and heat exchangers. Selected course topics are assigned as projects.
Prerequisite: MEEN 3345.

MEEN 4365 Mechanical Systems Design
3 Semester Credit Hours (3 Lecture Hours)
Analysis, management and cost, optimal design, and computer simulation of mechanical systems and components; machine elements, and stress analysis. Selected course topics are assigned as projects.
Prerequisite: (MEEN 3330 and ENGR 3350).

MEEN 4375 Fuel Cells
3 Semester Credit Hours (3 Lecture Hours)
Students will acquire an understanding of thermodynamics, transport phenomena and reaction fundamentals that are required to understand the processes and phenomena that pose limits on fuel cell performance.
Prerequisite: ENGR 3316, MEEN 3345 and CHEM 1411.

MEEN 4380 Renewable Energy
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
Renewable and alternative energy sources and fuels; modern energy conversion devices, such as offshore wind farms, marine current turbines, fuel cells, photovoltaic cells, and micro-power turbines. Cost and environmental analysis of renewable sources. 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.
Prerequisite: ENGR 3316, 2460 and MEEN 4325.
Co-requisite: SMTE 0099.

MEEN 4385 Offshore Energy Management
3 Semester Credit Hours (3 Lecture Hours)
Topics related to the design and energy management of ships and offshore platforms will be covered. Such topics may include oil and gas exploration, wind and marine energy systems, and environmental protection.
Prerequisite: MEEN 3345.

MEEN 4390 Introduction to Computational Fluid Dynamics
3 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
Introduction to numerical, computational, modeling and simulation of thermo-fluid systems. Applications related to ships and offshore platforms and structures will be presented.
Prerequisite: MEEN 3345.

MEEN 4395 Offshore Water Exploration and Desalination Systems
3 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
Advanced and future applications of sea floor mapping, under-water acoustics and GIS for fresh water exploration and mining. Renewable energy driven coastal, near-shore, and offshore desalination systems.
Prerequisite: ENGR 3316.

MEEN 4396 Directed Independent Study
3 Semester Credit Hours
Requires a formal proposal of study to be completed in advance of registration, approval of supervising faculty and chairperson.