

SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS CAREER CLUSTER ENDORSEMENT

SOUTH DAKOTA STATE UNIVERSITY

Endorsement coursework requirements must include courses from each Strand totaling 15 or more credits

Strand 1	Robotics (3 or more credits)										
Strand 2	Engineering (3 or more credits)										
Strand 3	Nine credits in one or more of the following										
<i>Option 1</i>	<i>Aviation</i>										
<i>Option 2</i>	<i>Computer science/programming</i>										
<i>Option 3</i>	<i>Energy</i>										
<i>Option 4</i>	<i>Electronics</i>										
Courses Meeting the Requirement	ME 441 3 Credits	GE Prefix 1-3 Credits	EE 422 2 Credits	AVIS Prefix 1-3 Credits	CSC Prefix 1-3 Credits	EE 222/L 4 Credits	ME 416 3 Credits	ET 210/L 4 Credits	ET 220/L 4 Credits	ET 232/L 4 Credits	EE 320/L 4 Credits
Strand 1	X										
Strand 2		X	X								
Strand 3 (<i>Option 1</i>)				X							
Strand 3 (<i>Option 2</i>)					X						
Strand 3 (<i>Option 3</i>)						X	X				
Strand 3 (<i>Option 4</i>)								X			

Total Required Credits through University: 15

Course Number	Course Name	University Course Description	Method	Sessions Offered	Total Credits
ME 441	Robotic Systems	This course develops understanding of the kinematic and dynamic modeling, design, and control of robots functioning in both terrestrial and aerial environments. Topics include inertial and body reference frames, rigid body motion, homogeneous transformations, Denavit-Hartenberg representation, forward and inverse kinematics, Lagrangian dynamics, modeling in Simulink, linear control design, introduction to advanced controllers, optimal control of a quadrotor. Students conduct hands-on experiments with mobile robots, manipulators and quadrotors.	In-Person	Spring	3
GE 101	Introduction to Engineering and Technical Professions	Introduction to the professional disciplines in the college of engineering. Topics include engineering problem solving, success strategies, tools and resources, ethics, and overview of professional careers.	In-Person Online	Fall, Spring	1
GE 121	Engineering Design Graphics	A course in graphical communication, expression and interpretation. The ability to visualize in three dimensions is developed through shape description, sketching and multi-view projection exercises. The emphasis is on visualization and free hand sketching. Also includes Engineering, Mechanical, and Architectural scales, geometric constructions, use of instruments, dimensioning, and sectional views.	In-Person	Fall, Spring	1
EE 422	Engineering Economics and Management	Economic aspects of engineering, annual cost and present worth calculations, and decisions among alternatives are treated. Management of life cycle, requirements generation, risk management, project management, and systems engineering are also covered.	In-Person	Fall	2
AVIA 101	Introduction to Aviation	This course will provide an overview of the aviation industry and awareness of the magnitude of aviation activity in the world. The student will discover a multitude of career opportunities and recognize the role aviation education holds in support of the nation's commerce and air transportation. The student will study the evolution of the industry and recognize general economic, social, and political factors affecting the future of aviation industry.	In-Person	Fall	1

Course Number	Course Name	University Course Description	Method	Sessions Offered	Total Credits
AVIA 300	Human Factors in Aviation	This course will cover a basic, broad overview of human factors as they affect pilot and passenger safety. Topics will include pilot physiological and psychological issues as they relate to aviation safety, and the impact of the external environment upon these issues. The course will introduce the topic of crew resource management (CRM) and the importance of CRM to aviation safety, as well as specific physiological training.	In-Person	Spring	3
AVIA 305	Introduction to Aviation Administration	This course is designed to familiarize the student with the organization and conduct of aviation operations involving the use of general, corporate, and transport aviation aircraft and services. The course will cover aspects of management involved in aviation operations. Topics include security, accounting, regulations, national and global economics, flight line operations, administrative considerations, aircraft maintenance operations, and decision-making. Technological advances pertaining to management operations will be discussed throughout the course.	Online	Fall	3
CSC 150	Computer Science I	An introduction to computer programming. Focus on problem solving, algorithm development, design, and programming concepts. Topics include sequence, selection, repetition, functions, and arrays.	In-Person	Fall, Spring	3
CSC 250	Computer Science II	Problem solving, algorithm design, standards of program style, debugging and testing. Extension of the control structures and data structures of the high-level language introduced in CSC 150. Elementary data structures and basic algorithms that include sorting and searching. Topics include more advanced treatment of functions, data types such as arrays and structures, and files.	In-Person	Spring, Summer	3
CSC 346	Object Oriented Programming	The study of object oriented methodologies using a modern language such as C++ or Java. Advanced data structures, I/O and file management will be implemented using polymorphism, inheritance, overloading and encapsulation.	In-Person	Spring	3
CSC 354	Introduction to Systems Programming	The study of macros, subroutines, subroutine linkage, conditional assembly, input-output, interrupt processing, assemblers, loaders and linkers.	In-Person	Fall	3

Course Number	Course Name	University Course Description	Method	Sessions Offered	Total Credits
EE 222/L	Energy Conversion and Lab	This course is designed to provide the electrical engineering student with an understanding of the basic concepts of the profession. Topics covered include resistive, capacitive and inductive circuits, transient and sinusoidal analysis. Other topics include magnetically coupled devices, such as transformers, DC and AC motors, as well as alternative energy conversion technologies. Students also investigate essential principles by conducting laboratory experiments related to the topics studied in the classroom. Software tools are used to analyze electrical circuits.	In-Person	Spring	4
ME 416	Renewable Energy Systems	Students will learn to apply the principles of energy conversion, energy conservation, and value engineering to the analysis of energy conversion systems, renewable energy generation equipment and systems. Students will become familiar with energy consumption requirements for conventional systems and the applications of renewable energy systems to provide alternative energy sources. Energy efficiency and global environmental sustainability are emphasized. A background in basic thermodynamics is assumed.	In-Person	Fall	3
ET 210/L	Introduction to Electronic Systems	Introduction to electronic systems and circuits. Direct current and alternating current circuits including Ohm's law and Kirchhoff's laws. Measurement and characterization of electronic systems at the block diagram level. Introduction to semiconductors, including diodes, BJTs and MOSFETs. Introduction to digital circuitry, including basic logic gates. Laboratory practice includes the proper use of standard test instruments in troubleshooting. A study in the operation of active devices and their applications. Troubleshooting methods, measurement techniques, introductory circuit board design and soldering fundamentals are also explored.	In-Person	Fall, Spring	4
ET 220/L	Analog Electronics and Lab	Introduction to analog circuits, including amplifiers, oscillators, and filters, using diodes, bipolar transistors, field-effect transistors, and operational amplifiers. Laboratory practice includes analog circuit measurement techniques and troubleshooting techniques.	In-Person	Fall	4

Course Number	Course Name	University Course Description	Method	Sessions Offered	Total Credits
ET 232/L	Digital Electronics and Microprocessors and Lab	Development of digital logic and circuit building blocks, number systems, Boolean algebra, combinational and sequential logic, and integrated logic families. Introduction to the architecture, programming, application and troubleshooting of programmable logic device (PLD) electronic systems, including VHDL programming. Exploration of the basic architecture of microprocessors and applications. Laboratory practice includes digital circuit measurement and troubleshooting techniques. Laboratory to accompany ET 232.	In-Person	Fall	4
EE 320/L	Electronics I	Presents concepts of electronic devices and circuits including modeling of semiconductor devices, analysis and design of transistor biasing circuits, and analysis and design of linear amplifiers. Use of computer simulation tools and breadboarding as part of the circuit design process is emphasized. Students are introduced to methods for designing circuits that still meet specifications even when there are statistical variations in the component values.	In-Person	Fall	4