



**SOUTH DAKOTA BOARD OF REGENTS
ACADEMIC AFFAIRS FORMS**

New Specialization

UNIVERSITY:	SDSU
TITLE OF PROPOSED SPECIALIZATION:	Aerospace Engineering
NAME OF DEGREE PROGRAM IN WHICH SPECIALIZATION IS OFFERED:	Mechanical Engineering (B.S.)
INTENDED DATE OF IMPLEMENTATION:	2021-2022 Academic Year
PROPOSED CIP CODE:	14.0201
UNIVERSITY DEPARTMENT:	Mechanical Engineering
BANNER DEPARTMENT CODE:	SMEC
UNIVERSITY DIVISION:	Jerome J. Lohr College of Engineering
BANNER DIVISION CODE:	3E

Please check this box to confirm that:

- The individual preparing this request has read [AAC Guideline 2.6](#), which pertains to new specialization requests, and that this request meets the requirements outlined in the guidelines.
- This request will not be posted to the university website for review of the Academic Affairs Committee until it is approved by the Executive Director and Chief Academic Officer.

University Approval

To the Board of Regents and the Executive Director: I certify that I have read this proposal, that I believe it to be accurate, and that it has been evaluated and approved as provided by university policy.

Institutional Approval Signature
President or Chief Academic Officer of the University

12/15/2020

Date

1. Level of the Specialization:

Baccalaureate Master's Doctoral

2. What is the nature/purpose of the proposed specialization? Please include a brief (1-2 sentence) description of the academic field in this specialization.

South Dakota State University (SDSU) requests authorization to offer a specialization in Aerospace Engineering for the B.S. in Mechanical Engineering. Aerospace Engineering is the primary field of engineering concerned with design and development of aircraft and spacecraft. Applications include traditional piloted fixed-wing and rotary-wing aircraft, as well as unmanned aircraft of various types. Satellites and other spacecraft are also among the applications of this field. Graduates will be prepared to work in design of aircraft, spacecraft, propulsion systems and related components.

The University does not request new state resources.

3. Provide a justification for the specialization, including the potential benefits to students and potential workforce demand for those who graduate with the credential.

The specialization designates a sequence of courses that provide the required depth of knowledge in concepts important to solving design problems in aerospace applications. Surveys taken in the Introduction to Engineering and Technical Professions course consistently reveal at least 30 students each semester with strong interest in aerospace engineering applications.

New versions of aircraft, especially autonomous fixed-wing and rotary wing types of various sizes are being continuously developed. The autonomous versions are becoming ubiquitous in a variety of applications, including production agriculture. Engineering expertise in aerospace systems design is required for development and refinement of these new designs.

Based on Bureau of Labor Statistics the expected growth in aerospace engineering jobs is about 3% from 2019 to 2029.¹ Another resource reported expected growth of about 6% from 2016 to 2026². The median income for an aerospace engineer was listed as \$116,500.¹

There are at least six companies involved in aerospace/defense manufacturing in SD, accounting for a total of \$61 million in sales.³⁴ In addition, South Dakota is home to Ellsworth Air Force Base with approximately 3600 military and civilian employees and the South Dakota Air National Guard 114th Fighter Wing with nearly 1100 assigned service members.

South Dakota State University hosts Detachment 780 of the Air Force Reserve Officers Training Corps. Engineering students in the AFROTC program would be able to enhance their career preparation with the Aerospace Engineering specialization.

4. List the proposed curriculum for the specialization (including the requirements for completing the major – *highlight courses in the specialization*):

Mechanical Engineering – Aerospace Engineering Specialization	Credit Hours	Credit Hours	Percent
System General Education Requirements	33		
Subtotal, Degree Requirements		33	25%
Major Requirements	54		
Supporting Coursework	43		
Subtotal, Program Requirements		97	75%
General Electives		0	0%
Degree Total ⁵		130	100%

¹ Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook*, Aerospace Engineers, on the Internet at <https://www.bls.gov/ooh/architecture-and-engineering/aerospace-engineers.htm> (visited October 15, 2020).

² <https://www.careerexplorer.com/careers/aerospace-engineer/job-market/>

³ <https://www.zoominfo.com/companies-search/location-usa--south-dakota-industry-aerospace-defense>

⁴ <https://www.aia-aerospace.org/research-center/statistics/state-level-data/>

⁵ Board Policy 2:29 requires each baccalaureate level degree program to require 120 credit hours and each associate degree program to require 60 credit hours. Exceptions to this policy require documentation that programs must comply with specific standards established by external accreditation, licensure, or regulatory bodies or for other compelling reasons and must receive approval by the Executive Director in consultation the President of the Board of Regents.

System General Education Requirements

Prefix	Number	Course Title	Credit Hours	New (yes, no)
ENGL	101	Composition I (SGR #1)	3	No
ENGL	277	Technical Writing in Engineering (SGR #1)	3	No
CMST	101	Fundamentals of Speech (SGR #2)	3	No
ECON	201	Principles of Microeconomics (SGR #3)	3	No
		Social Sciences/Diversity (SGR #3)	3	No
		Arts & Humanities/Diversity (SGR #4)	3	No
		Arts & Humanities/Diversity (SGR #4)	3	No
MATH	123	Calculus I (SGR #5)	4	No
CHEM	112-112L	General Chemistry I & Lab (SGR #6)	4	No
PHYS	211-211L	University Physics I & Lab (SGR #6)	4	No
Subtotal			33	

Major Requirements

Prefix	Number	Course Title	Credit Hours	New (yes, no)
Major Core			39	
ME	121-121L	Production and Fabrication Processes & Lab	2	No
ME	212-212L	Mechanical Engineering Design Technologies & Lab	2	No
ME	230-230L	Engineering Design Methods & Lab	2	No
ME	241	Engineering Materials	3	No
ME	311	Thermodynamics I	3	No
ME	312	Thermodynamics II	3	No
ME	321	Fundamentals of Machine Design	3	No
ME	323	Vibrations	3	No
ME	376-376L	Measurements and Instrumentation & Lab	2	No
ME	415	Heat Transfer	3	No
ME	421	Design of Machine Elements	3	No
ME	451	Automatic Controls	3	No
ME	452	Dynamic Systems Lab	1	No
ME	476	Thermo-Fluids Lab	1	No
ME	478	Mechanical Systems Design I	2	No
ME	479-479L	Mechanical Systems Design II & Lab	2	No
ME	490	Seminar	1	No
Aerospace Engineering Specialization			15	
ME	413	Turbomachinery	3	No
ME	431	Aerodynamics	3	No
Select 9 credits from the following list:				
ABE	350-350L	Hydraulic and Pneumatic Systems & Lab	3	No
ME	341-341L	Metallurgy & Lab	3	No
ME	417-417L	Computer-Aided Engineering & Lab	3	No
ME	433-433L	Non-Destructive Testing & Evaluation & Lab	3	No
ME	437	Gas Dynamics I	3	No
ME	441	Robotic Systems	3	No
ME	442	Applications of Computational Fluid Dynamics	3	No
Subtotal			54	

Supporting Coursework

Prefix	Number	Course Title	Credit Hours	New (yes, no)
EE	300	Basic Electrical Engineering I	2	No
EE	300L	Basic Electrical Engineering I Lab	1	No
EE	302	Basic Electrical Engineering II	2	No
EE	302L	Basic Electrical Engineering II Lab	1	No
EM	214	Statics	3	No
EM	215	Dynamics	3	No
EM	321	Mechanics of Materials	3	No
EM	331	Fluid Mechanics	3	No
GE	101	Introduction to Engineering and Technical Professions	1	No
GE	231	Technology, Society, and Ethics	3	No
MATH	125	Calculus II	4	No
MATH	225	Calculus III	4	No
MATH	321	Differential Equations	3	No
MATH OR MATH	331 471	Advanced Engineering Math Numerical Analysis I	3	No
PHYS	213-213L	University Physics II & Lab	4	No
STAT	381	Introduction to Probability and Statistics	3	No
Subtotal			43	

Total number of hours required for completion of specialization	15
Total number of hours required for completion of major	54
Total number of hours required for completion of degree	130

The SDSU B.S. in Mechanical Engineering program was granted an exception to the 120-credit rule (BOR Policy 2:29) by the BOR in 2012. The Engineering Accreditation Commission (EAC) of ABET requires programs to meet program educational objectives and student learning outcomes that cannot be met with less than 130 credits. SDSU must maintain EAC of ABET accreditation for graduates to be eligible to take the professional licensing examinations.

5. Delivery Location

Note: The accreditation requirements of the Higher Learning Commission (HLC) require Board approval for a university to offer programs off-campus and through distance delivery.

A. Complete the following charts to indicate if the university seeks authorization to deliver the entire program on campus, at any off campus location (e.g., UC Sioux Falls, Capital University Center, Black Hills State University-Rapid City, etc.) or deliver the entire specialization through distance technology (e.g., as an on-line program)?

	Yes/No	Intended Start Date
On campus	Yes	2021-2022 Academic Year

	Yes/No	If Yes, list location(s)	Intended Start Date
Off campus	No		

	Yes/No	<i>If Yes, identify delivery methods</i> <i>Delivery methods are defined in AAC Guideline 5.5.</i>	<i>Intended Start Date</i>
Distance Delivery (online/other distance delivery methods)	No		

B. Complete the following chart to indicate if the university seeks authorization to deliver more than 50% but less than 100% of the specialization through distance learning (e.g., as an on-line program)? This question responds to HLC definitions for distance delivery.

	Yes/No	<i>If Yes, identify delivery methods</i>	<i>Intended Start Date</i>
Distance Delivery (online/other distance delivery methods)	No		

49% of the coursework for the Mechanical Engineering (B.S.) – Aerospace Engineering Specialization will be delivered online. The major courses are not delivered online, however students may complete online sections for MATH, STAT, PHYS, EM, GE, and other SGR coursework.

6. Additional Information:

Academic Requirements

- A combined average of “C” or better in the mechanical engineering courses.
- A combined average of “C” or better in the mathematics courses.
- A minimum grade of “C” in each of the following courses: MATH 123, MATH 125, PHYS 211, ME 311, ME 312, and all EM designated courses
- Students who fail to earn a “C” or better in any of these courses, will be required to repeat them in each subsequent semester until the requirement is met.