

**SOUTH DAKOTA BOARD OF REGENTS**

**Academic and Student Affairs**

**AGENDA ITEM: 5 – F (2)**

**DATE: May 11-12, 2016**

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**SUBJECT: New Program: SDSU AS in Manufacturing Technology**

South Dakota State University (SDSU) requests authorization to offer an Associate of Science (AS) in Manufacturing Technology at the University Center-Sioux Falls. Students in the program will study the technical content in processes, materials, quality and engineering design concepts with the liberal arts content of the system general education requirements. The program will prepare students for entry-level technical positions in advanced manufacturing and its supply chain. In addition, program graduates will have fulfilled the first 60 credits for the existing BS in Operations Management at SDSU.

The Executive Director waived the intent to plan for the program as the curriculum closely aligns with the pre-existing BS in Operations Management at SDSU.

**University Mission and Priorities**

The proposed program fits with SDSU’s statutory mission in SDCL 13-58-1 to “*provide undergraduate and graduate programs of instruction in the liberal arts and sciences and professional education in agriculture, education, engineering, home economics, nursing and pharmacy, and other courses or programs as the Board of Regents may determine.*”

**System Strategic Goals**

The proposed program supports the South Dakota Board of Regents Strategic Plan 2014-2020 by promoting student success through growing the number of undergraduate degrees awarded, improving retention rates, and aligning programs with workforce development needs.

**Workforce Need, Student Demand, Projected Graduates**

SDSU notes that the job outlook for first line supervisors in manufacturing is expected to see considerable growth through 2024 in South Dakota. An aging workforce within the State will increase the need for replacement manufacturing technologists. SDSU anticipates graduating 10 students per year after full implementation.

(Continued)

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**DRAFT MOTION 20160511\_5-F(2):** I move approval of the Associate of Science in Manufacturing Technology at South Dakota State University, including authorization to offer the program at the University Center-Sioux Falls, as provided in Attachment I.

**Development**

The curriculum is designed to prepare graduates to enter or be promoted in the manufacturing industry and to encourage additional education through the existing BS in Operations Management.

**Board Policy**

SDSU is not requesting exceptions to Board policy.

**Off Campus and Distance Delivery**

SDSU requests authorization to deliver the program at the University Center-Sioux Falls in Fall of 2016. The University of South Dakota (USD) serves as the lead institution at the University Center-Sioux Falls and has recommended the addition of this program.

**Budget and Resources**

SDSU is not requesting new State resources to implement or maintain the proposed program.

**South Dakota Board of Regents  
New Undergraduate Degree Program**

<b>University:</b>	<b>South Dakota State University</b>
<b>Major:</b>	<b>Manufacturing Technology</b>
<b>Existing or New Major (s):</b>	<b>New</b>
<b>Degree:</b>	<b>Associate of Science (A.S.)</b>
<b>Existing or New Degree (s):</b>	<b>Existing</b>
<b>Intended Term of Implementation</b>	<b>Fall 2016</b>
<b>Proposed CIP code:</b>	<b>15.0613</b>
<b>University Department</b>	<b>Construction and Operations Management</b>
<b>University Division</b>	<b>College of Engineering</b>

**University Approval**

To the Board 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.

*David L. Chicoine*

\_\_\_\_\_  
President of the University

April 29, 2016

\_\_\_\_\_  
Date

After approval by the President, a signed copy of the proposal should be transmitted to the Executive Director. Only after the Executive Director's review should the proposal be posted on the university web site and the Board staff and the other universities notified of the URL.

**1. What are the purposes of the proposed program?**

South Dakota State University (SDSU) requests authorization to offer an Associate of Science (A.S.) in Manufacturing Technology. The Manufacturing Technology program incorporates technical content in processes, materials, quality and engineering design concepts with the liberal arts content of the system general education requirements. The Manufacturing Technology major will prepare students for entry-level technical positions in advanced manufacturing and its supply chain.

SDSU offers a B.S. degree in Operations Management. The A.S. degree will prepare graduates for entry-level production support positions in manufacturing as well as provide the option to articulate to the bachelor's program. The curriculum for the associate's degree has been designed to allow students to transfer 60 credits of coursework seamlessly towards the baccalaureate degree.

The University does not request new State resources.

*Workforce Demand for Graduates*

The Bureau of Labor Statistics projects the growth in first line supervisors in manufacturing 5% for the period 2014-2024. Manufacturing / industrial engineering technicians are not projected to grow nationally, but South Dakota manufacturing has gained workers at a 2.3% rate over the past

South Dakota State University  
New Program: Associate of Science in Manufacturing Technology

year and shows continued growth for the foreseeable future.<sup>1</sup> Coupled with increasing number of retirements of the 55 to 65 age group, the need for replacement manufacturing technologists in the workforce will grow.

*University Mission and Priority*

The University's mission is to "provide undergraduate and graduate programs of instruction in the liberal arts and sciences and professional education in agriculture, education, engineering, human science, nursing and pharmacy, and other courses or programs as the Board of Regents may determine." (SDCL 13-58-1)

Furthermore, Board-approved programs currently include "baccalaureate programs in the agricultural sciences, aviation, education, engineering and technology, human sciences, humanities and liberal arts, nursing, performing and visual arts, pharmaceutical sciences, physical and biological sciences, and social sciences." (Board Policy 1:10:2)

An Associate of Science major in Manufacturing Technology supports the South Dakota Board of Regents Strategic Plan 2014-2020:

*Goal 1: Student Success*

- Grow the number of undergraduate and graduate degrees awarded.
- Increase first-year and overall retention rates of current Department students by more closely aligning curriculum with student career goals.

*Goal 2: Academic Quality and Performance*

- Review academic degree programs for quality, responsiveness, and productivity.
- Promote high standards for student learning, quality instruction, and research.
- Grow the number of students participating in experiential learning.

*Goal 3: Research and Economic Development*

- Contribute to economic development through technology transfer & incubation of new commercial ventures.

An Associate of Science major in Manufacturing Technology also supports South Dakota State University's strategic plan, IMPACT 2018<sup>2</sup>, specifically in:

*Goal 1: Academic Excellence*

- Promote academic excellence through quality programs, engaged learners and an innovative teaching and learning environment.
- Cultivate aware, engaged and active citizens well prepared to work in local, state, national and global communities.

*Goal 3: Outreach*

- Extend the reach and depth of the university by developing strategic programs and collaborations.
- Use emerging technologies and institutional collaboration to provide undergraduate, graduate, professional and continuing education focused on traditional and adult learners across the state, in the region, the nation and globally.

<sup>1</sup> SD Department of Labor and Regulation, December 2015 E-Labor Bulletin.

<sup>2</sup> <http://www.sdstate.edu/impact2018>

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## 2. Rationale

### A. What is the rationale for the curriculum?

The curriculum is designed to prepare graduates to enter or be promoted in the manufacturing industry in such positions as production scheduler, maintenance planner, product sales representative, or first line supervisor/foreman. Mathematics, applied science, technical content in processes, materials, systems, and engineering design fundamentals prepare the graduate to be successful in the industry. This proposed program is tailored to be completed in two to three years and open the door to completing a Bachelor of Science in Operations Management for students seeking managerial positions.

Three new courses were proposed for the program. The three courses will be applied as technical electives in the B.S. in Operations Management. It is important for individuals who elect not to go on for the bachelor's degree to have plant safety, a survey course in manufacturing processes, and quality assurance. This content will be reinforced in higher level courses in the Operations Management program.

### B. Demonstrate that the curriculum is consistent with current national standards.

Complete the tables below and explain any unusual aspects of the proposed curriculum.

The Manufacturing Technology program was developed on accreditation criteria put forth by ABET – Applied Science Accreditation Commission (ASAC). There are no program criteria specified for associates degree programs in this field, however the proposed curriculum is planned to enable students who complete the AS degree to articulate seamlessly to the B.S. in Operations Management which is seeking ABET-ASAC accreditation. The requirements for the major specifically address ABET student outcomes under Criterion 3 (i) an ability to use the techniques, skills, and modern applied science tools necessary for professional practice.<sup>3</sup> Students in the Manufacturing Technology program will be expected to work within a budget, manage plant resources, and assure a safe work environment. The program has also been designed as a ‘stand-alone’ program for individuals who elect not to pursue the bachelor's degree.

### C. If a new degree is proposed, what is the rationale?

This is not a new degree. SDSU is already authorized to deliver an Associate of Science degree.

### D. Summary of the Degree Program

Manufacturing Technology	Credit Hours	Credit Hours	Percent
System General Education Requirements	25		
Subtotal, Degree Requirements		25	42%

<sup>3</sup> ABET – Applied Sciences Accreditation Commission. [General Criteria for 2016-2017 reviews.](#)

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Required Support Courses	9		15%
Major Requirements	26		43%
Subtotal, Program Requirements		35	58%
Degree Total	60	60	100%

### System General Education Requirements

Prefix	Number	Course Title	Credit Hours	New (yes, no)
ENGL	101	Composition I (SGR #1 Written Communication)	3	No
		SGR #1 Written Communication	3	No
SPCM	101	Fundamentals of Speech (SGR #2 Oral Communication)	3	No
		(SGR #3 Social Sciences/Diversity)	3	No
		(SGR #4 Humanities and Arts/Diversity)	3	No
MATH	102	College Algebra (SGR #5 Mathematics)	3	No
CHEM	106-106L	Chemistry Survey and Lab (SGR #6 Natural Sciences)	3, 1	No
		SGR #6 Natural Sciences	3	No
		Subtotal	25	

### Required Support Courses outside the Major

Prefix	Number	Course Title	Credit Hours	New (yes, no)
ACCT	210	Principles of Accounting I	3	No
ACCT	211	Principles of Accounting II	3	No
MGMT	325	Management Information Systems	3	No
		Subtotal	9	

### Major Requirements

Prefix	Number	Course Title	Credit Hours	New (yes, no)
GE	101	Introduction to Engineering & Technology	1	No
GE	121	Engineering Design Graphics I	1	No
GE	123	Computer Aided Drawing	1	No
GE	210	Geometric Dimensioning and Tolerancing	2	No
GE	231	Technology, Society, and Ethics	3	No
GE	265	Industrial Safety	3	Yes
MNET	150	Intro to Manufacturing Processes	3	Yes
MNET	243	Introduction to Materials Science	3	No
MNET	251	Electricity and Electronics I	3	No
MNET	265	Quality Assurance	3	Yes
MNET	367	Production Strategy	3	No
		Subtotal	26	

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### 3. Student Outcomes & Demonstration of Individual Achievement

**A. What specific knowledge and competencies, including technology competencies, will all students demonstrate be able to demonstrate before graduation?** *The knowledge and competencies should be specific to the program and not routinely expected of all university graduates. Complete Appendix A – Outcomes using the system form. Outcomes discussed below should be the same as those in Appendix A. The knowledge and competencies specific to the program must be related to the proposed assessments in B and C below.*

See Appendix A.

The Manufacturing Technology program will adopt the following ABET-ASAC student outcomes from the General Criteria:

SDSU Manufacturing Technology graduates will have:

- (a) an ability to apply knowledge of mathematics, and science
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to formulate or design a system, process, or program to meet desired needs
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of solutions in a global and societal context
- (i) a recognition of the need for and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice

**B. What national instruments (examinations) are available to measure individual student achievement in this field?**

Not applicable.

**C. How will mastery by individual students be demonstrated?** Describe the specific examinations or processes to be used. This is to include external measures.<sup>4</sup> **What will be the consequences for students who do not demonstrate mastery?**

Students will demonstrate mastery through using course assignments, exams, and projects. Successful of the major program coursework is required for graduation from the program. Students who do not achieve a 2.0 grade point average within the program and/or fail any of the major courses (i.e. have not demonstrated mastery) will be advised as to how remedy the failing. This would include repeating coursework as necessary. Standard university policy regarding repeating coursework would apply. If the student fails to elevate the grade point average to 2.0 or above, the student will be suspended.

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<sup>4</sup> What national examination, externally evaluated portfolio or student activity, etc will be used to verify that individuals have attained a high level of competence and identify those who need additional work?

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Students will be monitored using Starfish and the Student Success Collaborative platforms for progress. Students failing to meet minimum standards may be required to retake course work. Additionally, mentoring and tutoring will be made available to all students, and those falling behind will require one-on-one counseling from academic advisors. Enrollment and retention in the program also will be monitored.

**4. What instructional approaches and technologies will be used to teach courses in the program?** *This refers to the instructional technologies used to teach courses and NOT the technology applications students are expected to learn.*

The following approaches and technologies will be used:

- Traditional lectures and discussions
- Laboratory and Studio based learning (individual and small groups)
- Experiential learning
- Desire2Learn classroom management software
- Online and hybrid course delivery

**5. Did the University engage any developmental consultants<sup>5</sup> to assist with the development of the curriculum? Were any professional or accrediting associations consulted during the development of the curriculum? What were the contributions of the consultants and associations to the development of curriculum?**

No.

**6. Are students in the program expected to be new to the university, redirected from other programs or both? Complete the table and explain how the estimates were developed. If authorization for off-campus or distance delivery is requested in Section 9, add lines to the table for off-campus/distance students, credit hours, and graduates.**

It is expected students will be drawn to the program from industry employers and newly graduated high school students in the region. These estimates are based on 5% of the number of incoming SDSU B.S. in Operations Management students plus estimated number of matriculating high school students plus estimated regional employment needs over the timeframe. The University projected there may be some pent-up demand within the region for this kind of program at the start, thus the numbers may flatten out after year three. A 50% retention rate was calculated from first to second year which is consistent with national trend data.<sup>6</sup>

	Fiscal Years*			
	1st	2nd	3rd	4th
Estimates	FY17	FY18	FY19	FY20

<sup>5</sup> Developmental consultants are experts in the discipline are hired by the university to assist with the development of a new program (content, courses, experiences, etc). Universities are encouraged to discuss the selection of developmental consultants with Board staff.

<sup>6</sup> <http://www.act.org/research/policymakers/reports/graduation.html>



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Students new to the university	4	6	10	14
Students from other university programs	1	1	2	2
Continuing students		2	3	5
= Total students in the program (fall)	5	9	15	21
Program credit hours (major courses)**	70	151	287	422
Graduates	0	5	7	10

\* Do not include current fiscal year.

\*\* This is the total number of credit hours generated by students in the program in the required or elective program courses. The same numbers are used in Appendix B – Budget.

**7. If program accreditation is available, identify the organization and explain whether accreditation is required or optional, the resources required, and the University’s plans concerning the accreditation of this program.**

Accreditation by ABET – ASAC is available although there are no associate’s degree manufacturing-related programs currently accredited in the U.S. This is an optional accreditation and, depending on the outcome of the Operations Management program site visit in fall 2016, the University will determine if ABET accreditation is a viable option for the Manufacturing Technology program.

**8. Does the University request any exceptions to any Board policy for this program? Explain any requests for exceptions to Board Policy. If no exceptions are requested, enter “None.”**

None.

**9. Program Delivery**

**A. Does the University request authorization to deliver this entire program at any off-campus locations? If yes, list location(s) and intended start date(s).**

Yes. University Center – Sioux Falls. Fall 2016.

**B. Does the University request authorization to deliver this entire program by distance technology? If yes, identify delivery method(s) and intended start date(s).**

No.

**C. Include off-campus tuition and site or delivery costs in the next section and in Appendix B. If off-campus or distance delivery authorization is not requested, enter “None.”**

See Appendix B.

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## **10. Costs, Budget and Resources**

**Explain the amount and source(s) of any one-time and continuing investments in personnel, professional development, release time, time redirected from other assignments, instructional technology & software, other O&M, facilities, etc needed to implement the proposed major. Address off-campus or distance delivery separately. Complete Appendix B Budget and Resources and briefly summarize.**

A program budget is provided in Appendix B. The program will be supported by existing resources and projected second year tuition revenue.

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**Appendix A**  
**Individual Student Outcomes and Program Courses**

Individual Student Outcomes	Program Courses that Address the Outcomes													
	GE 101	GE 121	GE 123	GE 210	GE 265	MNET 150	MNET 243	MNET 251	MNET 265	MNET 367	ACCT 210	ACCT 211	MGMT 325	SGRs
(a) an ability to apply knowledge of mathematics, and science							X	X						X
(b) an ability to design and conduct experiments, as well as to analyze and interpret data				X			X							X
(c) an ability to formulate or design a system, process, or program to meet desired needs					X			X	X	X				
(f) an understanding of professional and ethical responsibility					X				X		X	X		
(g) an ability to communicate effectively								X						X
(h) the broad education necessary to understand the impact of solutions in a global and societal context	X													X
(i) a recognition of the need for and an ability to engage in life-long learning									X	X				
(j) a knowledge of contemporary issues					X	X			X	X				
(k) an ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice	X	X	X			X		X	X	X	X	X	X	

Appendix B  
Budget & Resources

South Dakota State University, Associate of Science in Manufacturing Technology

**1. Assumptions**

		1st FY17	2nd FY18	3rd FY19	4th FY20
<i>Headcount &amp; hours from proposal</i>					
Fall headcount (see table in proposal)		5	9	15	21
Program FY cr hrs, State-Support		0	0	0	0
Program FY cr hrs, Self-Support		70	151	287	422
Faculty, Regular FTE	See p. 2	0.10	0.30	0.30	0.40
Faculty Salary & Benefits, average	See p. 2	\$64,573	\$64,573	\$64,573	\$64,573
Faculty, Adjunct - number of courses	See p. 2	5	11	11	11
Faculty, Adjunct - per course	See p. 2	\$4,000	\$4,000	\$4,000	\$4,000
Other FTE (see next page)	See p. 2	0.00	0.00	0.00	0.00
Other Salary & Benefits, average	See p. 2	\$8,622	\$8,622	\$8,622	\$8,622

**2. Budget**

<i>Salary &amp; Benefits</i>					
Faculty, Regular		\$6,457	\$19,372	\$19,372	\$25,829
Faculty, Adjunct (rate x number of courses)		\$20,000	\$44,000	\$44,000	\$44,000
Other FTE		\$0	\$0	\$0	\$0
	S&B Subtotal	\$26,457	\$63,372	\$63,372	\$69,829
<i>Operating Expenses</i>					
Travel		\$0	200	\$200	\$200
Contractual Services		\$0	\$0	\$0	\$0
Supplies & materials		\$5,000	\$3,000	\$3,000	\$3,000
Capital equipment		\$0	\$0	\$0	\$0
	OE Subtotal	\$5,000	\$3,200	\$3,200	\$3,200
	<b>Total</b>	<b>\$31,457</b>	<b>\$66,572</b>	<b>\$66,572</b>	<b>\$73,029</b>

**3. Program Resources**

SELF-support tuition/hr, net of HEF	UG	\$242.20	\$242.20	\$242.20	\$242.20
Self-support tuition revenue	hrs x amt	\$16,954	\$36,451	\$69,390	\$102,087
STATE-support tuition/hr, net of HEFF	UG	\$115.76	\$115.76	\$115.76	\$115.76
State-support tuition revenue	hrs x amt	\$0	\$0	\$0	\$0
Program fee, per cr hr (if any)	\$0.00	\$0	\$0	\$0	\$0
Delivery fee, per cr hr (if any)	\$0.00	\$0	\$0	\$0	\$0
University redirections		\$14,503	\$30,121	\$0	\$0
Community/Employers		\$0	\$0	\$0	\$0
Grants/Donations/Other		\$0	\$0	\$0	\$0
	<b>Total Resources</b>	<b>\$31,457</b>	<b>\$66,572</b>	<b>\$69,390</b>	<b>\$102,087</b>

**Resources Over (Under) Budget**

	<b>\$0</b>	<b>\$0</b>	<b>\$2,818</b>	<b>\$29,058</b>
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Appendix B  
Budget & Resources

South Dakota State University, Associate of Science in Manufacturing Technology

Provide a summary of the program costs and resources in the new program proposal.

Estimated Salary & Benefits per FTE	Faculty	Other
Estimated salary (average) - explain below	\$49,054	\$0
University's variable benefits rate (see below)	0.1406	0.1406
Variable benefits	\$6,897	\$0
Health insurance/FTE, FY16	\$8,622	\$8,622
<i>Average S&amp;B</i>	\$64,573	\$8,622

Explain faculty used to develop the average salary & fiscal year salaries used. Enter amount above.

The FY16 salaries of Instructor in the General Engineering program were averaged. One course in Year 1 and two courses in Year 2 - beyond will be taught by SDSU faculty. An SDSU faculty member will also serve as academic advisor and, ultimately, program coordinator when program enrollment reaches 20 students.

Explain adjunct faculty costs used in table:

A market estimate was used.

Explain other [for example, CSA or exempt] salary & benefits. Enter amount above.

Summarize the operating expenses shown in the table:

We will need access to a computer lab with SolidWorks and AutoCAD software. May need to add graphics cards if they are standard issue computer workstations. We will NOT require students to have their own laptop as this is counterproductive to CAD instruction. \$200 per year to take classes to local/regional manufacturing facilities for tours.

Summarize resources available to support the new program (redirection, donations, grants, etc).

Appendix B  
Budget & Resources

South Dakota State University, Associate of Science in Manufacturing Technology

*State-support: Change cell on page 1 to use the UG or GR net amount.*

<b>Self-Support Tuition, HEFF &amp; Net</b>	<b>FY16 Rate</b>	<b>HEFF</b>	<b>Net</b>
Undergraduate	\$325.25	\$27.80	<b>\$297.45</b>
Graduate	\$431.25	\$42.16	<b>\$389.09</b>
Externally Supported	\$40.00		

*Change cell on page 1*

*State-support: Change cell on page 1 to use the UG or GR net amount for your university.*

<b>State-Support Tuition, HEFF &amp; Net</b>	<b>FY16 Rate</b>	<b>HEFF</b>	<b>Net</b>
UG Resident - BHSU, DSU, NSU	\$139.00	\$27.80	<b>\$111.20</b>
UG Non-Resident - BHSU, DSU, NSU	\$208.60	\$41.72	<b>\$166.88</b>
UG Resident - SDSU, USD	\$144.70	\$28.94	<b>\$115.76</b>
UG Non-Resident - SDSU, USD	\$217.05	\$43.41	<b>\$173.64</b>
UG Resident SDSMT	\$151.00	\$30.20	<b>\$120.80</b>
UG Non-Resident SDSMT	\$253.00	\$50.60	<b>\$202.40</b>
GR Resident - BHSU, DSU, NSU	\$210.80	\$42.16	<b>\$168.64</b>
GR Non-Resident - BHSU, DSU, NSU	\$446.25	\$89.25	<b>\$357.00</b>
GR Resident - SDSU, USD	\$219.35	\$43.87	<b>\$175.48</b>
GR Non-Resident - SDSU, USD	\$464.25	\$92.85	<b>\$371.40</b>
GR Resident - SDSMT	\$224.65	\$44.93	<b>\$179.72</b>
GR Non-Resident - SDSMT	\$500.10	\$100.02	<b>\$400.08</b>

*Change cell on page 1 to point to your net.*

Variable Benefits Rates

University	FY16
BHSU	14.27%
DSU	13.84%
NSU	14.00%
SDSM&T	13.87%
SDSU	14.06%
USD	13.99%

*Change the benefits rate cell in the table on page 2 to point to the rate for your university.*