SOUTH DAKOTA BOARD OF REGENTS

Academic and Student Affairs
Consent

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AGENDA ITEM: 6 – C (3)
DATE: June 26-27, 2024

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SUBJECT
> **New Graduate Certificate Request – SDSU – Surface Mount Technology**

CONTROLLING STATUTE, RULE, OR POLICY
> [BOR Policy 2.3.2](#) – New Programs, Program Modifications, and Inactivation/Termination

BACKGROUND / DISCUSSION
> South Dakota State University (SDSU) requests authorization to offer a graduate certificate in Surface Mount Technology (SMT). The proposed graduate certificate will provide knowledge and skills in lean manufacturing methods, materials and equipment for production of printed circuit boards, quality management, statistical control, inspection of processes and products, and SMT processes and methods. The curriculum has been reviewed by the Surface Mount Technology Education Consortium and the national Surface Mount Technology Association.

IMPACT AND RECOMMENDATION
> SDSU plans to offer the proposed certificate on campus. SDSU does not request new state resources. Two new courses will be required.
>
> Board office staff recommends approval.

ATTACHMENTS
> Attachment I – New Certificate Request Form: SDSU – Surface Mount Technology

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DRAFT MOTION 20240626_6-C(3):
> I move to authorize SDSU to offer a graduate certificate in Surface Mount Technology, as presented.

SOUTH DAKOTA BOARD OF REGENTS
ACADEMIC AFFAIRS FORMS

New Certificate

UNIVERSITY:	SDSU
TITLE OF PROPOSED CERTIFICATE:	**Surface Mount Technology**
INTENDED DATE OF IMPLEMENTATION:	**Fall 2024**
PROPOSED CIP CODE:	15.0616
UNIVERSITY DEPARTMENT:	**Construction and Concrete Industry Management**
BANNER DEPARTMENT CODE:	SCCM
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 2.3.2.2.C, which pertains to new certificate 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.
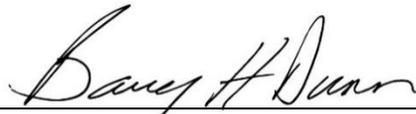
Institutional Approval Signature	4/25/24
President or Chief Academic Officer of the University	Date

1. **Is this a graduate-level certificate or undergraduate-level certificate?**
   Undergraduate Certificate ☐   Graduate Certificate ☒

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

   South Dakota State University (SDSU) requests authorization to offer a graduate certificate in Surface Mount Technology. The graduate certificate in Surface Mount Technology (SMT) will provide knowledge and skills in lean manufacturing methods, materials and equipment for production of printed circuit boards, quality management, statistical control, inspection of processes and products, and SMT processes and methods. The curriculum has been reviewed by the Surface Mount Technology Education Consortium and the national Surface Mount Technology Association.

3. **If you do not have a major in this field, explain how the proposed certificate relates to your university mission and strategic plan, and to the current Board of Regents Strategic Plan 2014-2020.**

   SDBOR Policy 1.2.5 states South Dakota State University's mission is to offer academic programs in the liberal arts and sciences and professional education in agriculture, education, engineering, home economics, business economics, nursing, and pharmacy. The Surface Mount Technology graduate certificate supports the educational mission of SDSU by providing a needed area of professional education in a necessary engineering technique utilized in regional manufacturing. The certificate aligns with the South Dakota Board of Regents Strategic Plan 2022-2027 Goal 4: Workforce and Economic Development and SDSU's Strategic Plan Pathway to Premier 2030 Goal 1: Achieve Excellence through Transformative Education. The program would be unique in the region and would meet a present need expressed by industry.

4. **Provide a justification for the certificate program, including the potential benefits to students and potential workforce demand for those who graduate with the credential.** *For workforce related information, please provide data and examples. Data may include, but are not limited to the South Dakota Department of Labor, the US Bureau of Labor Statistics, Regental system dashboards, etc. Please cite any sources in a footnote.*

   Surface Mount Technology is the process used to manufacture printed circuit boards. Surface Mount Technology is a $6 Billion business of which the United States has a 28% share. The trend in smaller consumer electronics, SMART (Self-Monitoring, Analysis, and Reporting Technology), and the increase in Internet of Things (IoT) devices is driving manufacturers to incorporate more and smaller printed circuits into products. Surface Mount Technology makes it possible to manufacture these (Research Nester, 2024).[1] At present, Indeed has more than 700 positions being advertised for Surface Mount Technician and over 250 for Surface Mount Engineer. Salaries for Technicians range from $15 to over $65 per hour and for Engineers the range is $80,000 to over $250,000 per year.[2]

   There is one school in the United States that teaches Surface Mount Technology, Rochester Institute of Technology, as a minor (RIT, 2024).[3] Local industry approached SDSU to ask if the university could offer something similar to Rochester's program as they have only been able to hire one individual, a Rochester Institute of Technology graduate, with this education or experience and prior to hiring that person, they were unaware that there were any educational programs offered in the content area. Presently, the industries hire Mechanical and Electrical Engineering students then provide training on the job. A recent meeting was held to determine interest in forming a Surface Mount Technology Technical Education

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[1] Research Nester – Surface Mount Technology market report (2024) https://www.researchnester.com/reports/surface-mount-technology-market/5253?gad_source=1&gclid=Cj0KCQjwwYSwBhDcARIsAOyL0fhORCxHEJIdvJUh2saIBYQG7LsWbzFlVJgoyV3wKkIRxJ3DB9GYPYsaAu5GEALw_wcB Accessed March 25, 2024
[2] Indeed.com (2024) SMT Technician search https://www.indeed.com/q-smt-technician-jobs.html?aceid=&gad_source=1&gclid=Cj0KCQjwwYSwBhDcARIsAOyL0fhekV41Ij4j7mVTxC8XYhqN3VsijuFMgwZSpOegivM3Q49o4QOntWkaAs2nEALw_wcB&gclsrc=aw.ds&vjk=7babf12f016cab44 Accessed March 1, 2024
Indeed.com (2024) SMT Engineer search
https://www.indeed.com/jobs?q=smt+engineer&l=&vjk=dcd8a04cfa199f5f Accessed March 1, 2024.
[3] Rochester Institute of Technology Surface Mount Electronics Manufacturing Minor (2024) https://www.rit.edu/study/surface-mount-electronics-manufacturing-minor Accessed March 1, 2024.

consortium among the regional companies that would benefit from this training with the effort being spearheaded by Daktronics. There were over 25 people in attendance representing 8 regional companies and the national Surface Mount Technology Association with additional companies noting that they support the idea but were unable to attend the meeting on short notice. From this meeting, there was an estimate of at least 50 employees needed among the regional industries to meet their present needs. With the current move in the United States to domesticate circuit board and semiconductor manufacturing through the CHIPS act, there will be an increase in need.

5. **Who is the intended audience for the certificate program (including but not limited to the majors/degree programs from which students are expected)?**

    The Surface Mount Technology Certificate will aid those entering or already working in the field of component manufacturing especially in companies that manufacture printed circuit boards. The certificate is open to graduates of Electrical Engineering, Electronics Engineering Technology, Mechanical Engineering, and Operations Management programs and others as appropriate. The proposed certificate will assist students in connecting their present knowledge of manufacturing processes to current practices in printed circuit board manufacturing, including materials, processes, and methods including quality assessment and control.

6. **Certificate Design**
    A. **Is the certificate designed as a stand-alone education credential option for students not seeking additional credentials (i.e., a bachelor's or master's degree)? If so, what areas of high workforce demand or specialized body of knowledge will be addressed through this certificate?**

        Yes. The certificate would be offered as a stand-alone certificate for those already holding a bachelor's degree in electrical engineering, electronics engineering technology, mechanical engineering, or related fields from a regionally accredited institution. As noted in #2 and #4, the curriculum has been reviewed by the Surface Mount Technology Education Consortium and the national Surface Mount Technology Association.

    B. **Is the certificate a value added credential that supplements a student's major field of study? If so, list the majors/programs from which students would most benefit from adding the certificate.**

        Yes. The certificate would be a value-added credential to students enrolled in Electrical Engineering, Mechanical Engineering, and the Operations Management programs. This credential will benefit students who plan to work in printed circuit board manufacturing.

    C. **Is the certificate a stackable credential with credits that apply to a higher level credential (i.e., associate, bachelor's, or master's degree)? If so, indicate the program(s) to which the certificate stacks and the number of credits from the certificate that can be applied to the program.**

        Yes. Up to 12 credits can be toward the Master of Engineering (M.Eng.).

7. **List the courses required for completion of the certificate in the table below (if any new courses are proposed for the certificate, please attach the new course requests to this form).** *Certificate programs by design are limited in the number of credit hours required for completion. Certificate programs consist of nine (9) to twelve (12) credit hours, including*

prerequisite courses. In addition, certificates typically involve existing courses. If the curriculum consists of more than twelve (12) credit hours (including prerequisites) or includes new courses, please provide explanation and justification below.

Prefix	Number	Course Title	Prerequisites for Course *Include credits for prerequisites in subtotal below.*	Credit Hours	New (yes, no)
MNET	567	Principles of Surface Mount Technology	None	3	Yes
MNET	568	Manufacturing Plant Management	None	3	No
MNET	569	Immersive Experience in Surface Mount Technology	MNET 567	3	Yes
OM	562	Quality Management	None	3	No
			Subtotal	12	

Twelve credits will be required for the graduate certificate to allow students the opportunity to demonstrate core competencies in printed circuit board manufacturing materials, processes, and methods including LEAN manufacturing concepts.

MNET 567 Principles of Surface Mount Technology (3 cr.) will provide students an understanding of modern printed circuit board manufacturing methods, processes and machines, quality control methods and procedures.

MNET 568 Manufacturing Plant Management (3 cr.) will provide students experience with integrating the technical, managerial, analytical and communications skills necessary to operate a manufacturing process line.

MNET 569 Immersive Experience in Surface Mount Technology (3 cr.) will provide students a practical hands-on experience in working with surface mount technology equipment, methods and processes.

OM 562 Quality Management (3 cr.) will provide students with an understanding of modern manufacturing managerial philosophies and techniques of quality planning and control.

8. **Student Outcome and Demonstration of Individual Achievement.**
   Board Policy 2:23 requires certificate programs to "have specifically defined student learning outcomes.
   A. **What specific knowledge and competencies, including technology competencies, will all students demonstrate before graduation**? *The knowledge and competencies should be specific to the program and not routinely expected of all university graduates.*

   Students will be expected to demonstrate how to efficiently design, set up, and manage a printed circuit board manufacturing process. After completion of this certificate, students should be able to:
   - Describe the Institute of Printed Circuits (IPC) standards and printed circuit board structure and materials.
   - Describe manufacturing processes and methods including LEAN, Screen Printing, Component Pick and Place, Soldering and Test procedures.

- Demonstrate quality control methods and processes used in Printed Circuit board manufacture.
- Identify different types of machines used in manufacturing printed circuit boards.

B. Complete the table below to list specific learning outcomes – knowledge and competencies – for courses in the proposed program in each row.

	Program Courses that Address the Outcomes			
Individual Student Outcome	MNET 567	MNET 568	MNET 569	OM 562
Students will be able to describe the Institute of Printed Circuits (IPC) standards and printed circuit board structure and materials.	x			
Students will be able to describe manufacturing processes and methods including LEAN, Screen Printing, Component Pick and Place, Soldering and Test procedures.	x	x		x
Students will be able to demonstrate quality control methods and processes used in Printed Circuit board manufacture.			x	
Students will be able to identify different types of machines used in manufacturing printed circuit boards.	x		x	

9. 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., USD Community College for Sioux Falls, Black Hills State University-Rapid City, Capital City Campus, etc.) or deliver the entire program through distance technology (e.g., as an on-line program)?

	Yes/No	*Intended Start Date*
On campus	Yes	2024-2025 Academic Year

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

	Yes/No	*If Yes, identify delivery methods* *Delivery methods are defined in AAC Guideline 5.5.*	*Intended Start Date*
Distance Delivery (online/other distance delivery methods)	No		
Does another BOR institution already have authorization to offer the program online?	No	**If yes, identify institutions:**	

B. Complete the following chart to indicate if the university seeks authorization to deliver more than 50% but less than 100% of the certificate through distance learning

(e.g., as an on-line program)? *This question responds to HLC definitions for distance delivery.*

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

10. Additional Information:

Additional Admission Requirements
TOEFL: 71 Internet-based
TOEFL Essentials: 7.5
IELTS: 6.0
Duolingo: 100

Appendix A
Corresponding Curriculum Requests – New Course Requests

SOUTH DAKOTA BOARD OF REGENTS
ACADEMIC AFFAIRS FORMS

New Course Request

SDSU	Jerome J. Lohr College of Engineering/Department of Construction and Concrete Industry Management
Institution	**Division/Department**
Dennis D. Hedge	4/24/2024
Institutional Approval Signature	**Date**

Section 1. Course Title and Description

Prefix & No.	Course Title	Credits
MNET 467	Principles of Surface Mount Technology	3
MNET 567	Principles of Surface Mount Technology	3

Course Description
This course introduces students to automated surface mount technology circuit board assembly. Students will be provided an overview of the print, placement, reflow, and inspections processes involved. In depth discussion of process parameters, typical defects and how to correct them will be presented.

MNET 467 Pre-requisites or Co-requisites

Prefix & No.	Course Title	Pre-Req/Co-Req?
MNET 367	Production Strategy	Pre-Req
OM 462	Quality Management	Pre-Req

Registration Restrictions

None

Section 2. Review of Course

2.1. Will this be a unique or common course?

☒ **Unique Course**

Prefix & No.	Course Title	Credits
MNET 231	Manufacturing Processes	3
MNET 367	Production Strategy	3

Provide explanation of differences between proposed course and existing system catalog courses below:

MNET 231 and MNET 367 are introductory courses that cover a wide range of manufacturing processes and strategies. The proposed course, MNET 467-567 Principles of Surface Mount Technology, will introduce students to automated surface mount technology circuit board assembly.

Section 3. Other Course Information

3.1. Are there instructional staffing impacts?

☒ No. Schedule Management, explain below: The Surface Mount Technology Education consortium will be providing guest speakers and access to an industrial manufacturing process line for course activities. SDSU will provide an instructor to coordinate the course.

3.2. Existing program(s) in which course will be offered: Surface Mount Technology Graduate

Certificate, Surface Mount Technology Minor

3.3. Proposed instructional method by university (*as defined by* [AAC Guideline 5.4](#))**:** R - Lecture

3.4. Proposed delivery method by university (*as defined by* [AAC Guideline 5.5](#))**:** 001 – Face to Face

3.5. Term change will be effective: fall 2024

3.6. Can students repeat the course for additional credit? ☐ Yes, total credit limit: ☒ No

3.7. Will grade for this course be limited to S/U (pass/fail)? ☐Yes ☒ No

3.8. Will section enrollment be capped? ☒ Yes, max per section: 20 ☐ No

3.9. Will this course equate (i.e., be considered the same course for degree completion) with any other unique or common courses in the common course system database in Colleague and the Course Inventory Report? ☐Yes ☒ No

3.10. Is this prefix approved for your university? ☒ Yes   ☐ No

Section 4. Department and Course Codes (Completed by University Academic Affairs)

4.1. University Department: Construction and Concrete Industry Management

4.2. Banner Department Code: SCCM

4.3. Proposed CIP Code: 15.0616

Is this a new CIP code for the university?   ☒ Yes ☐ No

NEW COURSE REQUEST
Supporting Justification for On-Campus Review

Suzette Burckhard	Suzette Burckhard	3/26/2024
Request Originator	**Signature**	**Date**
Suzette Burckhard	Suzette Burckhard	3/26/2024
Department Chair	**Signature**	**Date**
Suzette Burckhard	Suzette Burckhard	3/26/2024
School/College Dean	**Signature**	**Date**

1. Provide specific reasons for the proposal of this course and explain how the changes enhance the curriculum.
   The proposed course, MNET 467-567 Principles of Surface Mount Technology, will introduce students to automated surface mount technology circuit board assembly. The use of Surface Mount Technology is increasing due to the increase in printed circuit boards in consumer electronics and SMART (Self-Monitoring, Analysis, and Reporting Technology), devices. The MNET 467-567 course will allow students to gain knowledge of this process which will enhance their employment opportunities.
2. Note whether this course is: ☒ Required   ☐ Elective
3. In addition to the major/program in which this course is offered, what other majors/programs will be affected by this course?
   None
4. If this will be a dual listed course, indicate how the distinction between the two levels will be made.
   Graduate students will have different assessments compared to undergraduate students as well as more robust projects.
5. Desired section size: 20
6. Provide qualifications of faculty who will teach this course. List name(s), rank(s), and degree(s).
   Carrie Steinlicht, Senior Lecturer, PhD
7. Note whether adequate facilities are available and list any special equipment needed for the course.
   This lecture course does not require special equipment or facilities.
8. Note whether adequate library and media support are available for the course.
   Library and media support is adequate for this course as the topic is contained in IEEE journals and other journals presently available through the library.
9. Will the new course duplicate courses currently being offered on this campus? ☐ Yes   ☒ No

10. If this course may be offered for variable credit, explain how the amount of credit at each offering is to be determined.
N/A

SOUTH DAKOTA BOARD OF REGENTS
ACADEMIC AFFAIRS FORMS

New Course Request

SDSU	Jerome J. Lohr College of Engineering/Department of Construction and Concrete Industry Management
Institution	**Division/Department**
Dennis D. Hedge	4/24/2024
Institutional Approval Signature	**Date**

Section 1. Course Title and Description

Prefix & No.	Course Title	Credits
MNET 469	Immersive Experience in Surface Mount Technology	3
MNET 569	Immersive Experience in Surface Mount Technology	3

Course Description
This course provides hands-on experiences in using state of the art automated surface mount technology circuit board assembly. Students will be provided an opportunity to learn about printing, placement, reflow, and inspection processes. Control of process parameters, typical defects and how to correct them will be practiced.

MNET 469 Pre-requisites or Co-requisites

Prefix & No.	Course Title	Pre-Req/Co-Req?
MNET 467	Principles of Surface Mount Technology	Pre-Req

MNET 569 Pre-requisites or Co-requisites

Prefix & No.	Course Title	Pre-Req/Co-Req?
MNET 567	Principles of Surface Mount Technology	Pre-Req

Registration Restrictions

None

Section 2. Review of Course

2.1. Will this be a unique or common course?

☒ **Unique Course**

Prefix & No.	Course Title	Credits
MNET 231	Manufacturing Processes	3
MNET 367	Production Strategy	3

Provide explanation of differences between proposed course and existing system catalog courses below:

MNET 231 and MNET 367 are introductory courses that cover a wide range of manufacturing processes and strategies. They are prerequisites to MNET 467-567 Principles of Surface Mount Technology, the prerequisite course to the proposed course which will focus on modern surface mount printed circuit board manufacturing. MNET 469-569 will provide hands-on experience in using state of the art automated surface mount technology circuit board assembly.

Section 3. Other Course Information

3.1. Are there instructional staffing impacts?

☒ No. Schedule Management, explain below: The Surface Mount Technology Education consortium will be providing guest speakers and access to an industrial manufacturing process line for course activities. SDSU will provide an instructor to coordinate the course.

3.2. Existing program(s) in which course will be offered: Surface Mount Technology Graduate Certificate, Surface Mount Technology Minor

3.3. Proposed instructional method by university *(as defined by* AAC Guideline 5.4*)***:** L - Laboratory

3.4. Proposed delivery method by university *(as defined by* AAC Guideline 5.5*)***:** 001 – Face to Face

3.5. Term change will be effective: fall 2024

3.6. Can students repeat the course for additional credit? ☐ Yes, total credit limit: ☒ No

3.7. Will grade for this course be limited to S/U (pass/fail)? ☐Yes ☒ No

3.8. Will section enrollment be capped? ☒ Yes, max per section: 20 ☐ No

3.9. Will this course equate (i.e., be considered the same course for degree completion) with any other unique or common courses in the common course system database in Colleague and the Course Inventory Report? ☐Yes ☒ No

3.10. Is this prefix approved for your university? ☒ Yes   ☐ No

Section 4. Department and Course Codes (Completed by University Academic Affairs)

4.1. University Department: Construction and Concrete Industry Management

4.2. Banner Department Code: SCCM

4.3. Proposed CIP Code: 15.0616

Is this a new CIP code for the university?   ☒ Yes ☐ No

NEW COURSE REQUEST
Supporting Justification for On-Campus Review

Suzette Burckhard	Suzette Burckhard	3/26/2024
Request Originator	**Signature**	**Date**
Suzette Burckhard	Suzette Burckhard	3/26/2024
Department Chair	**Signature**	**Date**
Suzette Burckhard	Suzette Burckhard	3/26/2024
School/College Dean	**Signature**	**Date**

1. Provide specific reasons for the proposal of this course and explain how the changes enhance the curriculum.
   The proposed course, MNET 469-569 Immersive experience in Surface Mount Technology, will introduce students to automated surface mount technology circuit board assembly. The use of Surface Mount Technology is increasing due to the increase in printed circuit boards in consumer electronics and SMART (Self-Monitoring, Analysis, and Reporting Technology), devices. The MNET 469-569 course will allow students to gain knowledge of this process which will enhance their employment opportunities.

2. Note whether this course is: ☒ Required   ☐ Elective

3. In addition to the major/program in which this course is offered, what other majors/programs will be affected by this course?
   None

4. If this will be a dual listed course, indicate how the distinction between the two levels will be made.
   Graduate students will have different assessments compared to undergraduate students as well as more robust projects.

5. Desired section size: 20

6. Provide qualifications of faculty who will teach this course. List name(s), rank(s), and degree(s).
   Carrie Steinlicht, Senior Lecturer, PhD

7. Note whether adequate facilities are available and list any special equipment needed for the course.
   Surface Mount Technology requires access to industrial equipment not at SDSU. Given the cost and rapidly changing technology, SDSU will partner with the Surface Mount Technology Education Consortium to use equipment at operating surface mount facilities. Daktronics has pledged to provide access to an operating manufacturing line at least one day per week for course activities.
8. Note whether adequate library and media support are available for the course.
   Library and media support is adequate for this course as the topic is contained in IEEE journals and other journals presently available through the library.
9. Will the new course duplicate courses currently being offered on this campus? ☐ Yes   ☒ No
10. If this course may be offered for variable credit, explain how the amount of credit at each offering is to be determined.
    N/A