

Minnesota State University, Mankato
Strategic Priority Funding
Step 2: Invited Full Proposal

Sub-Meet Use Only
4
Proposal Tracking Number

Proposal Name: DEVELOP A CERTIFICATE IN ADDITIVE MANUFACTURING

Total Strategic Priority Funding Requested for Expenditure in FY16 (2015-2016) \$ 27,000.00

Does the proposed project address one of the high priority funding areas? If yes, check all that apply.

- Extended Learning** - Greatly expand the reach of our extended learning programs.
- Applied Doctoral Institution** - Foster the thriving and robust academic culture of a university with applied doctoral programs.

Does the proposed project address any of the following 2010-2015 Strategic Priorities? If yes, check all that apply.

- Global Solutions** - Change the world by collaboratively addressing our planet's most challenging problems.
- Campus of the Future** - Reinvigorate our physical home and build the campus of the future.
- Quality and Excellence** - Measure and continuously improve our work to ensure excellence in all that we do.

Do the proposed project outcomes address any of the following Institutional Priority Measures?
If yes, check all that apply:

- Student Persistence and Completion
- Student Persistence and Completion for Students of Color
- Student Degree Completion
- Student Degree Completion for Students of Color
- Licensure Exam Pass Rates**
- Grants (Grant Revenue)
- Customized Training & Continuing Education Enrollment**

Has any portion of this project been previously supported by Strategic Priority Funds? Yes **No**

Will any portion of this project require funding after the conclusion of Strategic Priority Funds (June 30, 2016) to be sustained? Yes **No** If yes, please explain.

Are funds from any other sources needed to initiate and complete the project as proposed? (Check all that apply)

- Institutional Equipment \$ _____
- Repair and Replacement (R&R) \$ _____
- Departmental Funds \$5,000.00**
- College or Divisional Funds \$ _____
- External/Grant Funds \$ _____
- Other: _____ \$ _____
- Other: _____ \$ _____

Proposal Contact Information and Review Signatures:

Primary Contact Name Kuldeep Agarwal Campus Mailing Address TE205

Primary Email Address Kuldeep.agarwal@mnsu.edu Phone Number 6157

Please note:

- Upon notification of funding, the primary contact recipient will work with the Assessment and Evaluation Sub-Meet to prepare an assessment plan. Funds will only be released upon successful completion and approval of the assessment plan.
- A Mid-Year Report will be due January 13, 2016, and an Annual Report will be due June 30, 2016.

Primary Contact Signature *K.A.* Date 1/7/15

***Signatures are needed for all affected units, departments and colleges (remember to include units such as Extended Education, Graduate Studies, Institutional Research, Information Technology, etc.). Attach additional cover/signature sheets as needed.**

*Co-Applicant Name(s) and Signature(s):

Name WINSTON SEALY Signature *[Signature]* Date 1/8/15

Name _____ Signature _____ Date _____

*I have **reviewed** and **support** the following proposal:

Department Director/Chair Name Bruce Jones Signature *[Signature]* Date 1/7/15

Department Director/Chair Name _____ Signature _____ Date _____

*I have **reviewed** and **support** the following proposal:

Dean Signature* *[Signature]* Date 1/9/15

Do you have any reservations or concerns about the project being proposed?

Dean Signature* *[Signature]* S.FEE, U.EXT.FED. Date 12 JAN 2015

Do you have any reservations or concerns about the project being proposed?

Dean Signature* _____ Date _____

Do you have any reservations or concerns about the project being proposed?

RECEIVED
JAN 13 2014

Date Received by Institutional Research, Planning, and Assessment: _____
(Deadline is January 14, 2015) Office of the Provost
Minnesota State University, Mankato

***Signatures are needed for all affected units, departments and colleges (remember to include units such as Extended Education, Graduate Studies, Institutional Research, Information Technology, etc.). Attach additional cover/signature sheets as needed.**

Strategic Priority Funding Proposal
Full Proposal: Step 2

(Please limit the proposal narrative and attachments to 10 pages)

Proposal Name: Develop a Certificate in Additive Manufacturing

(Increase space between questions or add pages as needed)

1. Provide a clear description of the project being proposed. (10 points)

Additive Manufacturing has become the most important technological advancement in the field of manufacturing engineering in the last decade. This technology is seen as one of the major employer and growth field in the next 20 years. Society of Manufacturing Engineers (SME) estimates this industry to be \$40-50 billion in the next 15 years.

There has been a lot of push from government and private industry to train workforce, which can utilize this technology. It is estimated that close to 200,000 new jobs will be created in this field in the next 20 years. Minnesota has close to 200 companies who are utilizing Additive Manufacturing in one form or the other and this number will only go up in the next few years.

The present Government and the President has also put in a lot of effort into making this technology available for industry. Under a special directive, the first National Additive Manufacturing Innovation Institute (NAMII), also known as America Makes, was set up in 2012 in Youngstown, OH. This is a public-private partnership with member organizations from industry, academia, government, and workforce development resources all collaborating with a singular, shared vision. NAMII's goal is to transition additive manufacturing technology to the mainstream U.S. manufacturing sector and create an adaptive workforce capable of not only meeting industry needs but also increasing domestic manufacturing competitiveness.

We propose to develop a Certificate in Additive Manufacturing which would serve the needs of the industry and life long learners and also serve as stepping stone for undergraduates/graduates to pass Society of Manufacturing Engineers' Additive Manufacturing Certificate Program. This will connect the university to America Makes (a National Manufacturing Institute through White House directive) by virtue of industry connection already established in the department.

Some of the features of this certificate include:

- a) Provide both transferable college and continuing education credits.
- b) Industry, current students and K-12 educators and teachers all will be able to take advantage of this certificate.
- c) Program will be set up to be both theory and hands-on
- d) Faculty will travel to sites including: 7700 France; Normandale; St. Paul College and outstate.

2. Identify the 2010-2015 Strategic Priorities advanced by this project and explain the direct connection between the strategic priority and project. In addition, discuss how Strategic Priority Action Item(s) (http://www.mnsu.edu/planning/strategic_plan_progress_7_1_13.pdf) are addressed by the proposed project. (15 points)

This project will directly advance the strategic priority "Grow Extended Learning". The strategic priority action items that will be addressed are:

Successfully meet time to market demands with new certificates and other offerings to compliment and not compete with degree programs

Additive manufacturing is one of the key components of STEM education and a rapidly growing segment of manufacturing. There is no such certificate being offered in the state. There is a nationwide

group being formed and is developing the criteria for the certificate and members of the AMET department are representatives of this group already. By developing this certificate we will create a unique niche for MSU and offer a certificate for all the partners in the state.

Become another support mechanism to the global solutions strategic effort by fulfilling identified non-credit needs of business and industry

A lot of industry in the region has been asking for a program that would help them in getting in touch with this new technology. This will help the local industry to grow and compete worldwide. AMET department already has a strong connection with local industry and this certificate will enhance that partnership as well as create new partnerships that will help grow the university.

Seek out & build relationships with external public & private organizations, businesses, individuals, & groups for purpose of expanding access to education opportunities leading to certificate and diploma programs.

The proposed certificate fits directly in this strategic priority by providing businesses, individuals and groups a mechanism to connect to the university. The certificate will also help in creating new partnerships with organizations such as Society of Manufacturing Engineers (SME), National Additive Manufacturing Institute (America Makes) etc. We also intend to submit proposals to NSF based on the success of this certificate to create a National Research Experience for Undergraduates (REU) site in the college for the upcoming years.

3. Describe how the project will have a significant impact on students and deliver a significant return on investment to the university. If applicable, please indicate how the project will address our Institutional Priority Measures. (15 points)

Impact on students:

- a) Students will be trained on the latest technology in the field of manufacturing. This will increase their employment rate. They will be prepared to successfully complete the nationally recognized certificate exam and after passing that exam. We will track the completion percentage of participants in this exam.
- b) Industry will get training and experience using this technology. This will strengthen the regions position regionally, nationally and globally.
- c) The program will enhance industry-university partnership, resulting in new internships and job opportunities for students.
- d) The fact that the program will be designed for both traditional students and practicing engineers we anticipate the generation of new research ideas that will help attract new federal and state funding (both research and training).

ROI for university:

- a) Create a certificate program which is unique to the state and help in increasing the visibility of the University in industry in the region
- b) Help in generating future revenues through external funding (state and federal).
- c) Connect the university to America Makes (a National Manufacturing Institute through White House directive) by virtue of industry connection already established in the department.
- d) Create multiple partnerships with 2-year colleges in the state to increase student enrollment and retention.

Institutional Priority Measures:

- a) Licensure Exam Pass Rates: The certificate will enable the participants to appear and clear the nationally recognized Certificate in Additive Manufacturing offered by the Society of Manufacturing Engineers (SME).
- b) Customized training and continuing education enrollment: This is the only certificate of its kind to be offered in the state of Minnesota and will help industry, students and educators take continuing education credits through the university.

4. Identify the outcomes that will be used to measure the impact of the proposed project. Outcomes must be specific, measurable, achievable within the one-year of strategic priority funding, and relevant to the 2010-2015 Strategic Priorities and/or Institutional Priority Measures the project addresses. (10 points)

- a) Improve the infrastructure of the Additive Manufacturing Lab in the AMET Department. Three additional pieces of portable equipment will be purchased to complement the already available state of the art equipment in the lab. Current equipment is not portable which requires students to be on the MSU campus to utilize it. Specifically we would buy the equipment, which have limited availability in the state and which will help the participants understand the concepts in greater details.
- b) Development of the certificate program material including the labs, lectures and hands on workshops. The program will be based on the National Additive Manufacturing standards developed by White House Directive.
- c) A pilot course will be offered by the end of Spring 2016 to improve the material developed. The course will address the needs of the certificate in a three step process as follows:

S.No.	Deliverables	Measures	Outcome/Impact
1.	Training on Computer Aided Design techniques including Drafting, Geometric Dimensioning, Solid Modeling using Pro-E	Lectures, Assignments and Quizzes, Workshop on 3D Modeling	Participants will create a product's 3D model with dimensioning and assembly.
2.	Training on Finite Element Analysis (FEA) techniques including stress analysis, thermal deformations and assembly issues.	Workshop on FEA.	Participants will do FEA analysis on the product created during the CAD workshop in (1) above.
3.	Training on Additive Manufacturing Techniques including plastic based techniques (FDM, SLS, SLA) and metal based techniques (3D Printing).	Lectures, Assignments and Quizzes, Workshop and hands-on-training on RP machines	Participants will create the product designed and analyzed in (1) and (2) above using their choice of RP techniques.

In addition, we will measure the following to evaluate the effectiveness of the certificate:

- a) Number of participants who successfully pass the SME Additive Manufacturing Certificate Exam.
- b) Number of students who are offered jobs in related fields who completed the certificate
- c) Number of new projects from industry in the field of Additive Manufacturing
- d) New proposals and funding in the field of additive manufacturing.

5. Describe how the activities generated by this project will be sustained after strategic priority funding has ended, or if applicable; explain why the project does not need to be sustained. (15 points)

Once the project has been successfully completed it is self-sustaining in the subsequent years. The three main outcomes of the project will be:

- a) Adding infrastructure in the Additive Manufacturing Laboratory in AMET Department
- b) Development of certificate program materials including labs, lectures and workshops
- c) Delivering a pilot course by the end of Spring 2016

As we can see, all these outcomes will be self-sustaining from the year after the funding has ended. The infrastructure that will be purchased will be used again for many years to come. We also plan to write new NSF MRI (Major Research Instrumentation) grants to add more infrastructures later on. This funding will help us demonstrate the broader impacts of the proposed research in these proposals.

The certificate program material developed through this funding will form the core of the future program offerings. Based on the enrollments, we plan to offer multiple workshops in the future. One of

the goals is to have at least 2 workshops every year – one for the industry members and other for the students and the educators. The participant fee or the continuing education credit fee from these will pay for the faculty and administration salary. New material will be added every year and we anticipate the revenue generated to be sufficient to do so.

The pilot course will be offered in FY16. The SPF will be used to pay for the material development and offering the pilot. This activity will be funded from the credit generation and fees from the next year and will not require any additional funding.

The faculty in AMET Is very active in writing NSF and other federal grants. We will continue to write grants and those grants will help us expand the infrastructure and the material in the next few years. We also anticipate generating industry revenues (both in kind and project based) that will give us additional resources.

6.a. Provide a budget justification that explains why the funding being requested is required to support the project and outline the funding requested within the budget table below. (10 points)

- Salary for Dr. Kuldeep Agarwal – 20 Duty days for development of course and pilot= \$76,256/168 * 20 = \$9,078.00
- Salary for Dr. Winston Sealy – 20 Duty Days for development of course and pilot= \$78,083/168*20 = \$ 9,295.00
- Fringe Benefits = 32% of total salary of \$18,373.00 = \$5,880.00
- Student help to set up the pilot course= 40 hrs. * \$8.70 = \$347.00. The student will help in setting up the machines, procuring the material and helping with creating parts.
- Supplies and materials = \$2,400.00 from SPF and \$5,000.00 from departmental funds. We plan to purchase three portable additive manufacturing equipment that we can use for the pilot and subsequent certificate offerings. These will complement the equipment already available in the AMET department. One of the significant portions of the certificate is the hands on component and these equipment will help in the labs.

6.b. Budget Table (5 points):

	FY16 SPF Funds	FY16 Funds from all Other Sources
Personnel		
Unclassified Salary (in-load, overload)	\$18,373.00	
\$9,078.00 – Dr. Kuldeep Agarwal		
\$9,295.00 – Dr. Winston Sealy		
Classified Salary		
Fringe ^a (Classified and Unclassified)	\$5,880.00	
Graduate Assistant Salary		
Graduate Assistant Tuition Reduction/Waiver ^b		
Non-Salary		
Student Help	\$347.00	
Purchased Services/Travel Expenses		
Supplies and Materials	\$2,400.00	\$5,000.00
Building Improvement/Construction Costs		
Equipment		
Other (please specify)		
Total Budget/Funding Requested	\$27,000.00	\$5,000.00

^a Note: All current employees must be paid fringe benefits. Fringe should be estimated based on salary and position classification: Unclassified 32%, Classified 40%, Adjunct 7.65%.

^b Estimated Tuition Reduction/Waiver for full-year enrollment: Masters \$6,600, Doctoral \$9,600.

7. Identify any special considerations or needs required for this project and how the needs will be addressed (e.g. physical space, contractual obligations, release or reassigned time, sabbatical or other leaves, workload, IT support, or collaborations with/implications for other units). (5 points)

The AMET department has the available space to carry out the certificate program. We have space in TE 308 and NH 105 to house the equipment and run the hands on portion of the certificate program. The IT in the TC106 lab is sufficient to do the theory portion of the certificate. We do not anticipate the need for any new space or IT support.

8. Provide a 1-year project timeline outlining key tasks and dates for completion. (5 points)

Task	Timeline
Identification of key requirements of SME additive manufacturing certificate.	July '15 – Aug '15
Brainstorming and development of ideas for the certificate content	Aug '15 – Oct '15
Draft certificate material development. Prepare syllabus, notes and lab exercises	Nov '15 – Dec '15
Contact industry partners for registration details. Actively solicit 5-10 personnel from industry for pilot.	Nov '15 – Dec '15
Purchase of new additive manufacturing equipment	Jan '16 – Feb '16
Contact K-12 and students for pilot offering.	Feb '16 – Mar '16
Installation of new equipment. Running sample parts and benchmarking them for pilot.	Feb '16 – Mar '16
Finalization of the certificate material. Printing of all the supplies, lab set ups and material ordering.	Mar '16 – Apr '16
Pilot offering	May '16

Dec. 3rd 2014

To,
Dr. Kuldeep Agarwal
Assistant Professor,
Department of Automotive and Manufacturing Engineering Technology,
Minnesota State University, Mankato

Sub: Certificate in Additive Manufacturing

Dear Dr. Agarwal,

I am writing this letter in support of your efforts to start a certificate in additive manufacturing at the university. Additive Manufacturing is one of the most exciting new technologies in the field and has the potential to transform how products are made.

JMP has been actively looking at ways to incorporate this technology in our business. But, because this is such a new technology, very few resources are available to understand it completely. The certificate program will help us train our engineers and plant personnel in this field. The certificate will also help us recruit new students who have the expertise in additive technology.

We believe that this certificate will help the industry in the region by training our staff as well as future generation of students. We fully support your effort and look forward to participating in this certificate once it is offered.

Regards,



David Olson
Director Of Engineering

