

Name of Institution
University of South Carolina Upstate

Name of Program (include concentrations, options, and tracks)
Bachelor of Applied Science – Advanced Manufacturing Management

Program Designation

- Associate's Degree Master's Degree
 Bachelor's Degree: 4 Year Specialist
 Bachelor's Degree: 5 Year Doctoral Degree: Research/Scholarship (e.g., Ph.D. and DMA)
 Doctoral Degree: Professional Practice (e.g., Ed.D., D.N.P., J.D., Pharm.D., and M.D.)

Does the program qualify for supplemental Palmetto Fellows and LIFE Scholarship awards?
 Yes

No

Proposed Date of Implementation
Fall, 2017

CIP Code
14.4201

Delivery Site(s)

The BMW Training and Development Center in Greer, SC will be the primary site with the option for delivery of some courses on other USC Upstate campuses including the University Center of Greenville.

Delivery Mode

- Traditional/face-to-face*
*select if less than 50% online
- Distance Education
 100% online
 Blended (more than 50% online)
 Other distance education

Program Contact Information (name, title, telephone number, and email address)

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Institutional Approvals and Dates of Approval

- | | |
|---|--------------------------------|
| 1. Division of Natural Sciences and Engineering | <u>Jeannie Chapman 3-22-16</u> |
| 2. Academic Affairs Committee | <u>George Williams 4-01-16</u> |
| 3. Faculty Senate | <u>Paul Grady 5-12-16</u> |
| 4. Senior Vice Chancellor for Academic Affairs | <u>Clif Flynn 5-12-16</u> |
| 5. Chancellor | <u>Thomas F. Moore 5-12-16</u> |
| 6. President | <u>//s// 6-23-16</u> |
| 7. Board of Trustees | <u>Approved 6-24-16</u> |

Background Information

State the nature and purpose of the proposed program, including target audience and centrality to institutional mission. (1500 characters)

The Department of Natural Sciences and Engineering (NSE) at the University of South Carolina Upstate is proposing the establishment of a Bachelor of Applied Science (BAS) in Advanced Manufacturing Management (AMM) in the College of Arts and Sciences. The BAS in AMM degree, complementary with Engineering Technology Management, is different from traditional degree programs at USC Upstate in that it is a technology-focused program that is crafted to meet the needs of the manufacturing base in the Upstate and beyond. The 2+2 degree would allow students with an Associate of Applied Science (AAS) in Mechatronics to pursue a four year degree. The Bachelor of Applied Science denotation reflects the more applied nature of the degree. It is a highly specialized professional technical degree that complements and builds on a student's expertise from a technical associate degree, thereby developing managerial skills and meeting the workforce demand for leaders in highly technical areas— i.e., an applied baccalaureate. Universities offering four-year programs requiring an AAS degree (e.g., Boise State University, Arkansas State University, University of Nebraska-Lincoln) typically award a Bachelor of Applied Science degree.

The target audience for AMM is those students who hold an AAS in Mechatronics degree from Spartanburg Community College, Greenville Technical College, and Tri-County Technical College. There are no plans to expand to other AAS majors at this time.

Mechatronics is an interdisciplinary field involving analysis and troubleshooting on advanced automated equipment and machinery found in modern manufacturing facilities. The program combines electronic, mechanical, robotics and control systems technologies.

Inspired by state-wide initiatives such as South Carolina Work Ready Communities, the major is a unique cooperative effort between USC Upstate, technical colleges, BMW and other manufacturers to provide technology-based education to workers who have completed an AAS in Mechatronics. Degree recipients will position themselves for leadership posts in manufacturing. USC Upstate, working closely with BMW and the local technical colleges, will be educating the manufacturing leaders of today and tomorrow.

This program fits well within USC Upstate's mission as a metropolitan university focusing on the needs of the expanding population along the I-85 corridor.

List the program objectives. (2000 characters)

The mission of the Advanced Manufacturing Management (AMM) 2+2 Bachelor of Applied Science degree is to prepare students with an Associate of Applied Science in Mechatronics for operational leadership positions in manufacturing.

Our Program Educational Objective is for our graduates to be employed in supervisory roles with the following job titles once they have three to five years of manufacturing work experience: Manufacturing Section Leader, Manufacturing Section Manager, or Team leader. It is becoming increasingly common for these roles to be filled with persons holding a bachelor degree.

To be prepared for these roles the graduates will meet the following Student Learning Outcomes:

- An ability to function effectively as a leader on a manufacturing team.
- An ability to identify, analyze, and solve broadly-defined manufacturing problems.
- An ability to apply written, oral, and graphical communication appropriate to manufacturing management.
- An understanding of the principles of manufacturing quality and continuous improvement.
- An understanding of professional and ethical responsibilities and knowledge of the societal and global impact of manufacturing.

Assessment of Need

Provide an assessment of the need for the program for the institution, the state, the region, and beyond, if applicable. (1500 characters)

Students with an AAS in Mechatronics currently have a very limited path to a four year degree. The AMM degree will create a new path for mechatronics students and thereby increase the number of adults with four year degrees in the Upstate region that will meet a need for industrial production managers in the growing manufacturing sector. According to the Bureau of Labor and Statistics a bachelor's degree and five years of work experience is typically required to become an industrial production manager.

According to the SC Appalachian Council of Governments the Upstate region is growing faster than the nation and nineteen percent of Upstate jobs are in manufacturing compared to nine percent nationwide. The council also identified a "technical skills gap" between the supply of available labor and the skills required in modern advanced manufacturing. According to the Metropolitan Studies Institute from 2010 to 2020, manufacturing is expected to grow in the Spartanburg Workforce Investment Area (WIA) by 3,401 jobs. This constitutes a 1.10% annual increase in manufacturing jobs. An additional problem with meeting the needs of manufacturing leadership is the result of the region being 4.5 percentage points below the national average of 38.7 percent of adults holding 2 or 4 year degrees.

In support of the need for technical skills well over 200 Associate of Applied Science degrees in Mechatronics have been awarded in the last three years by our three target schools alone. Greenville Technical College awarded 41 AAS in Mechatronics degrees from 2013-15,

Spartanburg Community College awarded 21 in 2013-14, and Tri-County Technical College 160 from 2012-2015. These students are in high demand with local manufacturing companies. Additionally, BMW and other area manufacturers have indicated a need for industrial production managers with both technical capability and leadership skills. This need complements the tremendous growth in the AAS programs in Mechatronics at the Upstate technical colleges. If the students with an AAS in Mechatronics are provided a path to a four year degree they will fill much of the need for industrial production managers.

Employment Opportunities

Is specific employment/workforce data available to support the proposed program?

- Yes
 No

If yes, complete the table and the component that follows the table on page 4. If no, complete the single narrative response component on page 5 beginning with "Provide supporting evidence."

Employment Opportunities			
Occupation	Expected Number of Jobs	Employment Projection	Data Source
Industrial Production Managers	49,100 job openings nationwide between 2014 and 2024	-3.7% in total positions nationwide	Bureau of Labor and Statistics
Managers, all other	255,400 job openings nationwide between 2014 and 2024	3.9% in total positions nationwide	Bureau of Labor and Statistics

Provide additional information regarding anticipated employment opportunities for graduates. (1000 characters)

Even though the national trend is slightly lower for industrial production managers the Upstate region of South Carolina should experience growth in this category. Data from US Bureau of Labor Statistics show that in Spartanburg County, manufacturing accounts for 19.3% of all jobs compared to a national average of 8.0 %. Average earnings in the manufacturing sector were \$58,711 in Spartanburg in 2015 – nearly \$18,000 more than the average earnings for all business sectors in Spartanburg County - \$40,969. Employers such as BMW have expressed a need to hire and promote individuals with bachelor’s degrees into positions such as Team Leader, Section Leader, and Section Manager. These positions require individuals with both technical and leadership skills.

According to Market Street Services between 2010 and 2015, 17,492 new jobs were added in Spartanburg County, a 14.2% growth rate that far exceeded the state (9.6%) and national (8.1%) figures. BMW is currently investing in a \$1 Billion expansion in the Upstate that will add another 800 jobs (Collins). Toray, an advanced material supplier, is also investing \$1 Billion in Spartanburg County in a manufacturing plant that will employ 500 people (SC Department of Commerce). We estimate one industrial production manager position will be created for every 30 new jobs created in a manufacturing organization. Therefore these 1,300 positions will create a need for more than 40 new industrial production managers. Hiring by BMW will also lead to proportional increases throughout the local supply chain.

Provide supporting evidence of anticipated employment opportunities for graduates, including a statement that clearly articulates what the program prepares graduates to do, any documented citations that suggests a correlation between this program and future employment, and other relevant information. Please cite specific resources, as appropriate. (3000 characters)

Note: Only complete this if the Employment Opportunities table and the section that follows the table on page 4 have not previously been completed.

See the table.

Will the proposed program impact any existing degree programs and services at the institution (e.g., course offerings or enrollment)?

Yes

No

If yes, explain. (500 characters)

AMM will complement the existing 2+2 Engineering Technology Management (ETM) degree. The ETM degree (accredited by the Engineering Technology Accreditation Commission of ABET) requires students to complete an AAS in Engineering Technology while the AMM degree will require students to complete an AAS in Mechatronics.

AMM and ETM will coordinate marketing that delineates the career paths. The AMM degree will lead to careers in operations management while the ETM degree will lead to careers in engineering and technology management. ETM graduates will also qualify for manufacturing and process engineering positions.

List of Similar Programs in South Carolina

Program Name	Institution	Similarities	Differences
None			

Description of the Program

Projected Enrollment*						
Year	Fall		Spring		Summer	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
17/18	20	120	20	120	20	120
18/19	40	240	40	240	40	240
19/20	60	360	60	360	60	360
20/21	60	360	60	360	60	360
21/22	60	360	60	360	60	360

*Total students per semester, credit hours based on cohorts of 20 students completing six hours per semester. Estimates based on a new cohort of twenty students starting each fall. The initial cohort of students will be part-time students as the target audience of students is working full time. There may be an opportunity to offer the program to full-time students once the early cohorts have completed the program. Each cohort will complete 18 hours per year (19 during the year including the science course). Each cohort will require 10 semesters to complete the program. The cohort's plan of study will include summer semesters.

Besides the general institutional admission requirements, are there any separate or additional admission requirements for the proposed program?

Yes

No

If yes, explain. (1000 characters)

This program will require students to attend a regionally accredited technical college and complete an AAS in Mechatronics before being fully admitted into the AMM program at USC Upstate. Students may apply during their final semester at technical college, but must prove AAS completion before enrolling for a second semester at USC Upstate.

Are there any special articulation agreements for the proposed program?

Yes

No

If yes, identify. (1000 characters)

Articulation agreements will be created with each of the Upstate technical colleges offering Mechatronics.

Curriculum

Curriculum by Category			
Courses Transferred	Credit Hours	Courses at USC Upstate	Credit Hours
Technical Courses		General Education*	
IMT, EEM, or AMT	42	ENGL 101 Composition I	3
		ENGL 102 Composition II	3
General Education*		MATH 121 College Algebra	3
CPT101/CPT170/EGR 130 – Computer Basics Course	3	MATH 102 Probability and Statistics	3
ENG 165/SPC205 – Professional Communications/Speech	3	Natural Science w/ Lab	4
Humanities Elective	3	Foreign Language 101 level	3
Social Science Elective	3	Fine Art	3
Gen Ed Elective	6	History	3
		Major	
*General Education Courses may		AMMG 300 Manufacturing Leadership I	3
Be completed at technical college		AMMG 330 Manufacturing Work Practices	3
Or USC Upstate		AMMG 410 Manufacturing Leadership II	3
		AMMG 415 Manufacturing Quality	3
		AMMG 420 Manufacturing Project Management	3
		AMMG 450 Operational Excellence	3
		AMMG 500 Senior Seminar	3
		Cognate (related 300 level courses)	12
		Elective	3

Total Credit Hours Required

121

120

Course Descriptions for New Courses

Course Name	Description
AMMG U300. Manufacturing Leadership I (3).	Manufacturing leadership including business communication, business presentations, spreadsheet basics, financial reports, supervisory skills, and leadership roles. Prerequisites: Admission into the AMM Cohort and MATH 121 or consent of instructor.
AMMG U330. Manufacturing Work Practices (3).	Manufacturing work practices including safety topics, lean manufacturing, training, and operational efficiency. Prerequisites: AMMG U300 or consent of instructor.
AMMG U410. Manufacturing Leadership II (3).	Manufacturing leadership including budgeting, project selection, supervision, and leadership roles. Prerequisites: AMMG U300 or consent of instructor.
AMMG U415. Manufacturing Quality (3).	Manufacturing quality practices including statistical process control, quality management systems, and problem solving methodology. Prerequisites: AMMG U300 or consent of instructor.
AMMG U420. Manufacturing Project Management (3).	Tools and techniques for planning, and scheduling manufacturing projects. Prerequisites: AMMG U300 or consent of instructor.
AMMG U450. Operational Excellence (3).	Advanced operational excellence. This course will build on concepts taught in AMMG 330 and 415 including value stream mapping, supply chain management, and change management. Prerequisites: AMMG U330 and U415 or consent of instructor.
AMMG U500 Senior Seminar (3)	Manufacturing management concepts including an exploration of manufacturing's effect on the local community and global society. Prerequisites: AMMG 410 and 450 or consent of instructor.

Faculty

Faculty and Administrative Personnel				
Rank	Full- or Part-time	Courses Taught or To be Taught, Including Term, Course Number & Title, Credit Hours	Academic Degrees and Coursework Relevant to Courses Taught, Including Institution and Major	Other Qualifications and Comments (i.e., explain role and/or changes in assignment)
Program Coordinator/ Instructor*	FT	AMMG 300, 330, 415, 450	MS or MBA business, engineering, or related field	Prior experience in manufacturing leadership and operational excellence
Assistant Professor*	FT	AMMG 300, 410, 420, 500	PhD in business, leadership, engineering, or related field	Prior experience in manufacturing leadership and project management
<p>The Program Coordinator will be hired to begin in August 2018 and will develop AMMG 300, AMMG 330, AMMG 415, and AMMG 415 for delivery during the 18/19 school year.</p> <p>The Assistant Professor will be hired to begin in August 2019 and will develop AMMG 410, AMMG 420, and AMMG 500 for delivery during the 19/20 school year.</p>				

Note: Individuals should be listed with program supervisor positions listed first. Identify any new faculty with an asterisk next to their rank.

Total FTE needed to support the proposed program (i.e., the total FTE devoted just to the new program for all faculty, staff, and program administrators):

Faculty	1.5	Staff	0.0	Administration	0.5
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Faculty /Administrative Personnel Changes

Provide a brief explanation of any additional institutional changes in faculty and/or administrative assignment that may result from implementing the proposed program. (1000 characters)

The AMM program will require two new full-time faculty members with one acting as the program coordinator. The program will initially launch in the fall of 2017 with the first cohort of students taking only general education courses for the first year. An existing faculty member will need to cover program coordinator duties during the 17/18 academic year. The first AMM faculty member/program coordinator will be hired to begin in August of 2018 and the second faculty member will begin in Aug 2019. There may be an opportunity to share one or more faculty lines between AMM and ETM allowing faculty to specialize.

Library and Learning Resources

Identify current library/learning collections, resources, and services necessary to support the proposed program and any additional library resources needed. (1000 characters)

The current library collection meets the needs of the AMM program. The current library materials related to the Johnson College of Business and Economics and the Engineering Technology Program will meet the needs of the AMM program. The faculty will regularly consult with the assigned library liaison to develop collections as needs evolve.

The USC Upstate Library has 12 library faculty positions. The physical structure of the library with its collections and computers is open a total of 82.5 hours per week. Reference services online through texting and chat are available 24/7. In addition, one library computer lab is available 24/7.

The library has 240,943 volumes in its collection. In addition to the library's online catalog, there is electronic access to more than 250 databases, 489,000 electronic books, and more than 235,000 full-text electronic journals. These resources are available via remote access through a campus proxy server.

USC Upstate students and faculty have access to the resources beyond the physical boundaries of the campus through the statewide consortia known as PASCAL (Partnership Among South Carolina Academic Libraries).

Student Support Services

Identify academic support services needed for the proposed program and any additional estimated costs associated with these services. (500 characters)

USC Upstate provides student support services via the Student Success Center. The student Success Center provides Academic Support, Advising Services, Career Services, and the Opportunity Network. These programs include services such as tutoring, supplemental instruction, transfer advising, and mock interviews. The Opportunity Network supports traditionally underrepresented students such as first generation college students with resources to be successful at USC Upstate. USC upstate also offers targeted support for Non-Traditional students including a Non-Traditional student handbook. The current level of academic support services meets the needs of the program.

Physical Resources

Identify any new instructional equipment needed for the proposed program. (500 characters)

None.

Will any extraordinary physical facilities be needed to support the proposed program?

Yes

No

Identify the physical facilities needed to support the program and the institution's plan for meeting the requirements, including new facilities or modifications to existing facilities. (1000 characters)

The courses for the initial cohorts will be delivered at the BMW Training and Development Center to accommodate the students working 8 to 12 hours shifts. Future cohorts may be offered at the University Center of Greenville for those students not already employed in manufacturing. New facilities will not be required for the program.

Financial Support

Estimated New Costs by Year						
Category	1st	2nd	3rd	4th	5th	Total
Program Administration	106,460 Includes fringe	106,460	106,460	106,460	106,460	532,300
Faculty and Staff Salaries	--	106,460 Includes fringe	106,460	106,460	106,460	425,840
Adjunct Instructors**	30,000	45,000	90,000	90,000	90,000	345,000
Equipment	0	0	0	0	0	0
Supplies and Materials	3,000	3,000	3,000	3,000	3,000	15,000
Library Resources	0	0	0	0	0	0
Other	0	0	0	0	0	0
Total	139,460	260,920	305,920	305,920	305,920	1,318,140
Sources of Financing						
Category	1st	2nd	3rd	4th	5th	Total
Tuition Funding	149,640	308,280	476,280	496,800	505,170	1,936,170
Program-Specific Fees	2,700	5,400	6,300	6,300	6,300	27,000
State Funding (i.e., Special State Appropriation)	0	0	0	0	0	0
Reallocation of Existing Funds	0	0	0	0	0	0
Federal Funding	0	0	0	0	0	0
Other Funding	0	0	0	0	0	0
Total	152,340	313,680	482,580	503,100	511,470	1,963,170
Net Total (i.e., Sources of Financing Minus Estimated New Costs)	12,880	52,760	176,660	197,180	205,550	645,030

**The adjunct instructors will teach non-AMM course sections delivered off-site and dedicated to AMM students in the cohort.

Budget Justification

Provide a brief explanation for the other new costs and any special sources of financing (state funding, reallocation of existing funds, federal funding, or other funding) identified in the Financial Support table. (1000 characters)

Note: Institutions need to complete this budget justification *only* if any other new costs, state funding, reallocation of existing funds, federal funding, or other funding are included in the Financial Support table.

The AMM program will generate tuition from the students and a new upper division course fee.

The tuition numbers are based on each cohort containing twenty students and each student completing eighteen credit hours per year. Of the eighteen credit hours six would be at the summer tuition rate of \$311.25 per credit hour and twelve would be at the regular tuition rate of \$432.00 per credit hour. It is very unlikely that there will be any non-resident students in the program. For each 20 students in the program the revenue by semester will be - fall \$51,840, spring \$51,840, and summer \$37,350. Once three cohorts are in rotation the program will generate tuition of \$423,090 per year.

The upper division course fee of \$45 per course will generate \$2,700 per year once the program is in full operation. This fee would support student enrichment programs beyond the classroom. These programs will be modeled after the existing Johnson College of Business and Economics Professional Series with programs on professionalism, presentation skills, and business etiquette.

Additional financial data may be found in Appendix A.

Evaluation and Assessment

Programmatic Assessment: Provide an outline of how the proposed program will be evaluated, including any plans to track employment. Identify assessment tools or software used in the evaluation. Explain how assessment data will be used. (3000 characters)

The AMM program will assess and evaluate each Student Learning Outcome (SLO) annually. Each SLO will be assessed by at least one direct measure and a graduate survey. The direct measures will include test questions and selected assignments in the AMM program. The graduate survey will be administered to a sample of graduates two to four years after completing the AMM program.

Each test question that is directly linked to a Student Outcome will be administered in either AMMG Course Exams or the AMM Assessment Exam. The AMM Assessment Exam will be a comprehensive end of program exam with target questions developed in conjunction with an industrial advisory committee. The targeted questions will assess student's retention and understanding of the key program material. The AMM Assessment Exam will be administered in AMMG 500. There will also be selected assignments and test questions embedded in other AMMG courses. The plan for assessment questions, assignments, and survey questions is listed in the table below.

The annual assessment data will be collected by the AMM Assessment Coordinator and shared with the AMM faculty each year. The AMM faculty will meet to evaluate the assessment data and determine any continuous improvement actions based on the results. The faculty will also review the results of actions. The data and the action plans will be summarized and reported to the University through the existing USC Upstate University Assessment Committee.

Student Learning Assessment

Expected Student Learning Outcomes	Methods of/Criteria for Assessment
An ability to function effectively as a leader on a manufacturing team.	Assessment exam questions in AMMG 410 and the AMM assessment Exam Graduate Survey Questions
An ability to identify, analyze, and solve broadly-defined manufacturing problems.	Assessment exam questions in AMMG 500 and the AMM assessment Exam Graduate Survey Questions
An ability to apply written, oral, and graphical communication appropriate to manufacturing management.	Capstone assignment in AMMG 500 and the AMM assessment Exam Graduate Survey Questions
An understanding of the principles of manufacturing quality and continuous improvement.	Assessment exam questions in AMMG 450 and the AMM assessment Exam Graduate Survey Questions
An understanding of professional and ethical responsibilities and knowledge of the societal and global impact of manufacturing.	Assessment exam questions in AMMG 500 and the AMM assessment Exam Graduate Survey Questions

Will the proposed program seek program-specific accreditation?

Yes

No

If yes, provide the institution's plans to seek accreditation, including the expected timeline for accreditation. (500 characters)

Will the proposed program lead to licensure or certification?

Yes

No

If yes, explain how the program will prepare students for licensure or certification. (500 characters)

Teacher or School Professional Preparation Programs

Is the proposed program a teacher or school professional preparation program?

Yes

No

If yes, complete the following components.

Please attach a document addressing the South Carolina Department of Education Requirements and SPA or Other National Specialized and/or Professional Association Standards.

REFERENCES

SC Appalachian Council of Governments and County Economic Development Office, Annual Update of the Comprehensive Economic Development Strategy for the Appalachian Region of South Carolina. Sept 2015

Collins, Jeffrey; AP Story; http://news.yahoo.com/bmw-plans-1-billion-expansion-south-carolina-170149332.html;_ylt=A0LEVr0icuWMsMAVlonnIIQ;_ylu=X3oDMTByMHZ0NG9yBGNvbG8DYmYxBHBvcwM3BHZ0aWQDBHNIYwNzcg--

South Carolina Department of Commerce, <http://sccommerce.com/news/press-releases/toray-selects-spartanburg-county-its-business-expansion-us>

APPENDIX A. Financial Information by cohort.

AMM Revenue	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Fall and Spring Tuition Rates	458.50	472.25	486.50	501.00	516.00
Summer Tuition Rates	330.00	340.00	350.00	360.50	371.25
# Credit hours per student per semester	6	6	6	6	6
Fall and Spring Semester	2	2	2	2	2
# students per year	20	20	20	20	20
Cohort 1	149,640.00	154,140.00	158,760.00		
Cohort 2		154,140.00	158,760.00	163,500.00	
Cohort 3			158,760.00	163,500.00	168,390.00
Cohort 4				163,500.00	168,390.00
Cohort 5					168,390.00
	149,640.00	308,280.00	476,280.00	490,500.00	505,170.00

Program fees for 7 courses @ \$45 per course	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Cohort 1	2,700.00	2,700.00	900.00		
Cohort 2		2,700.00	2,700.00	900.00	
Cohort 3			2,700.00	2,700.00	900.00
Cohort 4				2,700.00	2,700.00
Cohort 5					2,700.00
	2,700.00	5,400.00	6,300.00	6,300.00	6,300.00