



## MEMORANDUM

**To:** Julio Frenk, President

**From:** Tomás A. Salerno  
Chair, Faculty Senate

**Date:** January 31, 2019

**Subject:** Faculty Senate Legislation #2018-34(B) – Creation of a New Additive Manufacturing Track within Master of Science in Mechanical Engineering Program (MSME), College of Engineering

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The Faculty Senate, at its January 30, 2019 meeting, had no objections to the proposal from the College of Engineering to create a new Additive Manufacturing track within the Master of Science in Mechanical Engineering Program. The College proposed to create the new track with the addition of four new courses to the existing framework of the current MS degree. The College anticipates that they will begin to accept students into the new track beginning in fall 2019.

The Faculty Senate does not approve budget concepts, therefore no budget information is included here.


This legislation is now forwarded to you for your action.

TAS/rh

Enclosure

cc: Jeffrey Duerk, Provost and Executive Vice President for Academic Affairs  
Guillermo Prado, Dean of the Graduate School  
Jean-Pierre Bardet, Dean and Professor, College of Engineering  
Victoria Coverstone, Chair and Professor, Mechanical and Aerospace Engineering

**CAPSULE:** Legislation #2018-34(B) – Creation of a New Additive Manufacturing Track within Master of Science in Mechanical Engineering Program (MSME), College of Engineering

APPROVED:  DATE: 3/7/19  
(President's Signature)

OFFICE OR INDIVIDUAL TO IMPLEMENT: Dean Jean-Pierre Bardet

EFFECTIVE DATE OF LEGISLATION: IMMEDIATELY  
(pending any additional approval by the Board of Trustees)

NOT APPROVED AND REFERRED TO: \_\_\_\_\_

REMARKS (IF NOT APPROVED): \_\_\_\_\_



# Proposal Submission Checklist

Proposals are to be submitted to the Office of Assessment and Accreditation (OAA), if applicable, the Graduate Council (for graduate programs excluding Law and Medical), if applicable, and the Faculty Senate. Refer to the [Procedures for Program Changes](#) document for information on the approvals and notifications needed for program changes and the [Proposal Submissions Specifications](#) document for an explanation of the process and a list of the materials required.

*(Please note that change approvals can take 2 semesters to complete.)*

**FORM INSTRUCTIONS:**

1. Save/download the form as a pdf.
2. After completing the information below, print and scan the form.
3. Insert it with the background materials that are specified, in the order listed, and submit to [facsen@miami.edu](mailto:facsen@miami.edu).

**Please note:** only scanned versions can be accepted.

Include this checklist at the beginning of each proposal.

## KEY CONTACT PERSONNEL INFORMATION

First Name

Victoria

Last Name

Coverstone

Proponent's Title

Professor and Chair

Department, if applicable

Mechanical and Aerospace Engineer

School/College

Engineering

E-mail

vcoverstone@miami.edu

Phone

3052843316

Title of Proposal

Professor and Chair

(-continue to next page-)

## MANDATORY MEMORANDA AND FORMAT

*Please check that each item listed below is included in the proposal package of materials, in the ORDER as listed. The applicable title (i.e. Letter of Explanation, Memo from the Dean, etc.) is to precede each section in the materials.*

Only proposals conforming to this format will be accepted.

### 1. This completed checklist.

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### 2. Letter of explanation. (2-3 pages only, double spaced, 12 pt font)

Yes     No

If no, explain why:

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### 3. A memo from the dean(s) signifying approval of the faculty of the relevant School(s) / Colleges(s).

Yes     No

If no, explain why:

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### 4. A memo that all affected or relevant School / College Council(s) have approved.

Yes     No

If no, explain why:

**5. A memo from the department chair(s) signifying approval of the faculty of the relevant department(s).**

Yes     No

If no, explain why:

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**6. A memo from the Office of Accreditation and Assessment (OAA) if the proposal involves academic programs (degrees, certificates, majors, minors, concentrations, specializations, tracks, etc.) such as new programs, closing programs, or program changes (such as changes in requirements, program length, modality, name, location).**

*(To be submitted by OAA to the Graduate Council or the Faculty Senate, as appropriate.)*

Applicable     Not applicable.

If not, explain why:

The Memo from Patty Murphy, executive director of Office of Assessment and Accreditation, stated that "it was determined that this (proposed program) would not rise to the level of a 'significant departure' because it is only a track within the existing Mechanical Engineering program". Therefore there is no need for SACSCOC approval. Please see the included Memo from Patty Murphy.

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**7. A memo from the Graduate School Dean signifying approval of the Graduate Council (for graduate programs only).**

*(To be submitted to the Faculty Senate by the Graduate Council.)*

Applicable     Not applicable.

If not, explain why:

**8. Academic Deans Policy Council (ADPC) approval, for interdisciplinary issues and as appropriate. Please consult with the Dean of the Graduate School or the Secretary of the Faculty Senate to check if this is needed.**

Yes       No

If no, explain why:

This program does not involve interdisciplinary issues, and neither the Dean of Graduate School nor Graduate Council discussion raised such concerns.

**9. Additional required documents as listed on the "Proposal Submissions Specifications," i.e. market analysis, budget information, assessment of library collections, etc. as specified.**

List additional documents included:

End form.



1252 Memorial Drive  
P. O. Box 248125  
Coral Gables, FL 33124-4629

Phone: 305-284-4154  
Fax: 305-284-5441  
graduateschool@miami.edu

## MEMORANDUM

DATE: November 14, 2018

TO: Tomas Salerno  
Chair, Faculty Senate

FROM: Guillermo (Willy) Prado *Guillermo Prado*  
Dean, The Graduate School

SUBJECT: Proposal – New track within MS in Mechanical Engineering program

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The College of Engineering submitted a request to implement a new track in “Addictive Manufacturing” to the MS in Mechanical Engineering program. The proposal was discussed at the meeting of the Graduate Council on Tuesday, November 13, 2018, and none of the Graduate Council members expressed any concerns.

cc: Jean-Pierre Bardet, Dean, College of Engineering  
Victoria Coverstone, Chair of Mechanical Engineering, College of Engineering  
Qingda Yang, Professor, College of Engineering  
Patty Murphy, Executive Director, Office of Assessment and Accreditation

UNIVERSITY OF MIAMI  
COLLEGE of ENGINEERING



Jean-Pierre Bardet, Ph.D.  
Dean and Professor

1251 Memorial Drive  
MEB Room 255  
Coral Gables, FL 33146

Ph: 305-284-6035  
Fax: 305-284-2885  
bardet@miami.edu

November 5, 2018

Dr. Guillermo (Willy) Prado  
Dean, Graduate School  
University of Miami

Dr. Patty Murphy  
Executive Director  
Assessment and Accreditation SACSCOC Accreditation Liaison  
University of Miami

**Re: Letter of support and approval: MSME Program Modification**

Dear Drs. Prado and Murphy:

The faculty in the Department of Mechanical and Aerospace Engineering have voted to augment their MS program with an "Additive Manufacturing Focus." Working within the framework of the existing MS degree, the faculty are developing four new core courses in the area of additive manufacturing to leverage the tremendous resources the College of Engineering has invested in its facilities (Johnson & Johnson Collaborative Laboratory) and in new faculty hires/expertise. We believe that this graduate focus will be a signature feature of the Department of Mechanical and Aerospace Engineering.

The College of Engineering supports and approves of the suggested "Additive Manufacturing Focus".

Regards,

Jean-Pierre Bardet

JPB:vc



UNIVERSITY OF MIAMI  
COLLEGE of ENGINEERING



**Department of  
Mechanical &  
Aerospace  
Engineering**

1251 Memorial Drive  
MEB Room 205  
Coral Gables, FL 33146

Phone: 305-284-2571  
Fax: 305-284-2580  
[www.mae.miami.edu](http://www.mae.miami.edu)

Prof. Victoria Coverstone  
Tel: 305-284-3221;  
Fax: 305-284-2580  
Email: [vcoverstone@miami.edu](mailto:vcoverstone@miami.edu)

## Memorandum

To: Patty Murphy  
From: V.L Coverstone, Chairman MAE Department  
Date: 11/2/2018  
Re: MSME Program Modification

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This memo is to inform you that the faculty in the Department of Mechanical and Aerospace Engineering have voted to augment our MS program with an "Additive Manufacturing Focus." Working within the framework of the existing MS degree, the faculty are developing four new core courses in the area of additive manufacturing to leverage the tremendous resources the College of Engineering has invested in facilities (Johnson&Johnson Collab) and in new faculty hires/expertise. We believe that this graduate focus will be a signature feature of our department and are excited to be given the opportunity to officially accept students beginning Fall 2019.



**MEMORANDUM**

**DATE:** November 7, 2018

**TO:** Victoria Coverstone, Chair, Department of Mechanical Engineering  
College of Engineering

**FROM:** Patty Murphy, Executive Director  
Office of Assessment and Accreditation 

**RE:** ADDENDUM to November 5<sup>th</sup> Memo re: New Additive Manufacturing Track within MSME Program

This memorandum is to follow up on the College of Engineering's intent to implement a new track in Additive Manufacturing in the Master of Science in Mechanical Engineering (MSME) program effective Fall 2019. In my previous memo dated November 5<sup>th</sup>, I stated that this change would be considered a significant departure and would require approval from SACSCOC prior to implementation.

However, after consulting with my colleague at SACSCOC and providing details regarding this proposal, it was determined that this would not rise to the level of a "significant departure" because it is only a track within the existing Mechanical Engineering program.

SACSCOC only requires notification or approval of changes that represent a significant departure from our current programs. Therefore, no notification to or approval from SACSCOC is required to implement this change. Since this represents a change from my previous memorandum, I wanted to inform you so that you have this for your records.

Please contact me if you have any questions at [pattymurphy@miami.edu](mailto:pattymurphy@miami.edu) or (305) 284-3276.

**CC:** Faculty Senate  
Guillermo Prado, Dean of the Graduate School  
Jean-Pierre Bardet, Dean of the College of Engineering  
Karen Beckett, University Registrar  
Carrie Glass, Executive Director of Student Financial Assistance and Employment

UNIVERSITY OF MIAMI  
COLLEGE of ENGINEERING



**Department of  
Mechanical &  
Aerospace  
Engineering**

1251 Memorial Drive  
MEB Room 205  
Coral Gables, FL 33146

Phone: 305-284-2571  
Fax: 305-284-2580  
[www.mae.miami.edu](http://www.mae.miami.edu)

Prof. Victoria Coverstone  
Tel: 305-284-3221;  
Fax: 305-284-2580  
Email: [vcoverstone@miami.edu](mailto:vcoverstone@miami.edu)

## Memorandum

To: Dean Prado  
From: V.L Coverstone, Chairman MAE Department  
Date: 11/2/2018  
Re: MSME Program Modification

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This memo is to inform you that the faculty in the Department of Mechanical and Aerospace Engineering have voted to augment our MS program with an "Additive Manufacturing Focus." Working within the framework of the existing MS degree, the faculty are developing four new core courses in the area of additive manufacturing to leverage the tremendous resources the College of Engineering has invested in facilities (Johnson&Johnson Collab) and in new faculty hires/expertise. We believe that this graduate focus will be a signature feature of our department and are excited to be given the opportunity to officially accept students beginning Fall 2019.

This action requires notification to the Graduate Council. The notification process requires that this memo be forwarded to the Graduate School. This action will be scheduled for review during the next available Graduate Council session. The Graduate Council will read and discuss this action. Comments and concerns will be returned to the originator. Concurrently, this memo and Graduate Council concerns and comments will be forwarded to the Faculty Senate for scheduling during their next most appropriate session.

## Master of Science (MS) Degree with Additive Manufacturing Focus

### Dept of Mechanical and Aerospace Engineering The University of Miami

#### Objectives:

The MS program with an additive manufacturing concentration gives students unique access to hands-on training in various methods of design, analysis, and fabrication from world-class experts. Students will benefit from university resources such the Johnson-Johnson Innovation Center -- a 3D printing space available to all engineering students, and from our internship programs with leading industrial companies and governmental research institutions.

#### Core courses: (Blue signifies new course)

#### 1. Scientific and Engineering Foundations of additive manufacturing (3 credits, MAE 6xx - new)

*Instructor: Dr. Coakley (MAE)*

**Course objectives:** The state of the art in material processing fundamentals including sintering, fusion of metals, polymers, and ceramics.

#### 2. Methods of Engineering Analysis (3 credits, MAE 601 – existing class)

*Instructor: Prof Rao or Yang (MAE)*

Analysis of engineering systems in equilibrium and motion. Examples considered from mechanical, electrical, thermal and fluids engineering. Mathematical theory and computer methods for obtaining numerical solutions are developed for various cases involving discrete and continuous systems.

#### 3. Additive Manufacturing of Engineering Materials (3 credits, MAE 6xx -new)

*Instructor: Prof E. Celik (MAE) + Dr. Dariavach (J&J)*

**Course objectives:** the state of the art in understanding processing, structure, and property relationships in metals, polymers, polymer based composites, and bio-compatible materials fabricated using additive manufacturing

#### 4. Additive Manufacturing Lab (3 credits, MAE 6xx -new)

*Instructor: Prof E. Celik (MAE lab) + Dr. Dariavach (J&J Lab)*

**Course objectives:** hands-on experience in designing, 3D-printing functional, and testing of mechanical/aerospace/biological components that may not be able to easily made by traditional manufacturing processes, making use of the Johnson-Johnson lab facilities and the 3D printing lab in the ME department.

#### 5. CAD and FEM for Stress Analysis of 3D Printed Structures (3 credits, New -- MAE 762)

*Instructor: Prof Karkkainen or Yang*

Computer aided design and analyses of physical systems behavior using discrete models. Topics include CAD design, numerical analysis, and FEM modeling of 3D printed materials

and structures. Students solve engineering problems using student-developed and existing software

**6. Engineering Optimization (3 credits, MAE 730, moved to a fall offering)**

**Instructor: Prof Rao**

Applied single- and multi-objective optimization and decision making concepts and techniques with applications in engineering design and/or manufacturing problems.

**7. MS Thesis (6 credits, MAE 810) or MS Capstone Project (3 credits, MAE 752)**

**Instructor: MAE faculty or J&J advisor**

Students may choose to do a MS thesis of 6 credits or a capstone project of 3 credits

**Course objectives:** Apply learned disciplines to perform research and to finish a comprehensive MS thesis or a MS project summary under the supervision of a faculty member

**Electives (mostly from existing MAE graduate courses):**

**1. Advanced Mechanics of Materials (3 credits, MAE 607)**

**Instructor: Prof Yang or Rao**

Formulate and quantitatively state the mechanical/physical responses of structural components and configurations subjected to loads, temperature, residual-strains etc.

**2. Introduction to Composite Materials and Analysis (3 credits, MAE 616)**

**Instructor: Prof Karkkainen or Yang**

Course provides an introduction to composite materials and terminology. Topics include advantages offered by composite materials, current aerospace, automotive, and bio-mechanics applications, experimental results, analytical models, and effects of impact and fatigue loads. The environment's impact on composite materials' performance and design procedures are discussed. Case studies examining composite materials as efficient replacements are also included

**3. Intermediate Heat Transfer (3 credits, MAE 608)**

**Instructor: Prof Liu**

Course discusses steady and unsteady heat transfer by conduction, convective heat transfer in laminar and turbulent fluid flow, natural convection, and heat transfer by radiation.

**4. Mechanical Vibrations (3 credits, MAE 602)**

**Instructor: Prof Yang or Rao**

Basic theory of free and forced vibrations of mechanical systems with and without damping. Applications to systems with one and several degrees of freedom are included

**5. Design for Manufacturability (3 credits, MAE 605)**

**Instructor: Prof Rao or Coakley**

Manufacturing concerns at design stage. Design theory and methodology. Statistical considerations in geometric dimensioning, tolerances, reliability-based design, and quality control. Producibility, design for assembly, and value engineering. Life cycle costs and

optimum design using nonlinear programming and Taguchi approaches. Hands on projects on machine tools.

**6. Special topic (MAE 690)**

**Instructor: MAE faculty or J&J advisor**

Student working for a semester directly with a ME/JJ faculty/advisor with a special topic mutually decided by the student and the advisor

**8. Multidisciplinary Option (A graduate course within CoE)**

**Instructor: CoE faculty or J & J advisor**

A student may choose to take up to two graduate level courses from other CoE departments with permission of his/her faculty advisor

**MAE MS in Additive Manufacturing – 2-Year Plan of Study**

<p><b>Fall Year 1 (9 hrs)</b>                  MAE 6XX* – Foundations of Additive Manufacturing – 3 hrs                  MAE 601* -- Methods of Engineering Analysis – 3 hrs                  MAE 730 – Engineering Optimization – 3 hrs</p>	<p><b>Spring Year 1 (9 hrs)</b>                  MAE 6XX* –Additive Manufacturing of Engineering Materials – 3 hrs                  MAE 762* – CAD &amp; FEM for 3D-Printed Structures – 3 hrs                  MAE 6XX* –Lab for Additive Manufacturing – 3 hrs</p>
<p><b>Fall Year 2 (6 hrs)</b>                  MAE Fall Elective 1 – 3 hrs                  MAE Fall Elective 2 – 3 hrs</p>	<p><b>Spring Year 2 (6 hrs)</b>                  MAE Spring Elective 3 – 3 hrs *                  MAE 810 or 752 – MS Thesis (6 hrs) or Capstone Project (3 hrs)</p> <p>* not required for MS thesis option</p>

**MS can be completed in 2 semesters by combing fall semesters and spring semesters.**

### MAE MS in Additive Manufacturing – 1-Year Full-time Plan of Study

<b>Fall Year 1 (15 hrs)</b> MAE 6XX* – Foundations of Additive Manufacturing – 3 hrs MAE 601* -- Methods of Engineering Analysis – 3 hrs MAE 730 – Engineering Optimization – 3 hrs MAE Fall Elective 1 – 3 hrs MAE Fall Elective 2 – 3 hrs	<b>Spring Year 1 (15 hrs)</b> MAE 6XX* –Additive Manufacturing of Engineering Materials – 3 hrs MAE 762* – CAD & FEM for 3D-Printed Structures – 3 hrs MAE 6XX* –Lab for Additive Manufacturing – 3 hrs MAE Spring Elective 3– 3 hrs * MAE 810 or 752 – MS Thesis (6 hrs) or Capstone Project (3 hrs)  * not required for MS thesis option
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\* Core Courses

#### Fall Electives (each course is 3 hrs)

1. MAE 690 – special topics
2. MAE 602 – Mechanical Vibrations
3. MAE 605 – Design for Manufacturability
4. MAE 690 – Special problems

#### Spring Electives (each course is 3 hrs)

1. MAE 607 – Advanced Mechanics of Materials
2. MAE 608 – Intermediate Heat Transfer
3. MAE 616 – Introduction to Composite Materials and Analysis