SYLLABUS

SOUTHERN POLYTECHNIC COLLEGE OF ENGINEERING AND ENGINEERING TECHNOLOGY

DEPARTMENT OF ENGINEERING TECHNOLOGY

MET 3332: RAPID DESIGN AND MANUFACTURE

FALL 2021

Course Information

Class meeting time: Lecture M,W 1:25pm-2:15pm
Lab M,W 2:30pm-3:45pm
Modality and Location: Lecture F2F Q218
Lab F2F; Q214/Q115
Syllabus is posted in D2L

Instructor Information

Name: Randy Emert
Email: remert@kennesaw.edu
Office Location: Q226
Office phone: 470-578-7406
Office Hours: M-Th, 11am-12pm
Preferred method of communication: email

Course Description

This course is focused on bringing products to market as quickly as possible primarily through the use of 3D scanning and additive manufacturing technologies. Product Design, reverse engineering, and rapid tooling are topics covered and applied in this course.

Course Materials

Required Text:
ToolingU.com. Instructions and code are on D2L along with the schedule of lessons.
Gibson, Ian, Rosen, David, and Strucker, Brent. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Second Edition. Springer, 2015. ISBN 978-149 392 1126 (.pdf version recommended to be used on the SME-Additive Manufacturing Certification)
Technology requirements: Access to internet; Solidworks; Cura 4.10.0; flash drive
http://www.toolingu.com
http://www.sme.org/certified-additive-manufacturing-fundamentals
http://my.solidworks.com (CSWA-Additive Manufacturing Certification Course)

Learning Outcomes

Students completing MET 3332 will have the ability to:
1. Complete a product design cycle from initial concept to prototype.
2. Apply 3D scanning technology from initial scan to CAD file and/or rapid prototype.
3. Determine which additive manufacturing technology to apply in order to speed development in design and/or manufacturing.
4. Develop camaraderie in an engineering team environment.

Course Requirements and Assignments

Tests: Three test grades will be ToolingU, SME Fundamentals of Additive Manufacturing Certification Test, and the CSWA-Additive Manufacturing Certification. There are sixteen ToolingU lessons. The average of these 16 ToolingU lessons will count as a test score. Each test may be taken up to three times in order to get the best grade possible. The second test grade will come from the score on the SME Fundamentals of Additive Manufacturing Certification Test. The third test grade will come from the CSWA-Additive Manufacturing Certification.
Labs: There will be nine lab grades. 3D printing labs will be evaluated on the 3D printed models and written report. 3D scanning Labs will be based on scanned images and geometric models.

Evaluation and Grading Policies

Tests	50%
Labs	50%

ToolingU provides immediate feedback on each lesson with a test score. The SME Additive Manufacturing Certification and the CSWA Additive Manufacturing Certification provide immediate feedback with a test score. The tests will be posted in D2L one week after their due date. Any discrepancies on assignments, tests, or labs must be identified through email, remert@kennesaw.edu, within one week of being posted in D2L.

GRADING SCALE:
90% - 100% A
80% - 89% B
70% - 79% C
60% - 69% D
0% - 59% F

Grades will be rounded up if they are > or = .5 or above, for example, an 89.6 is an A, but 79.2 is a C.

Course Policies

Students are expected to attend each lab. If you are unable to attend, send an email to remert@kennesaw.edu to document that you will not be in attendance. Communication is key. If you are aware of conflicts email early to notify me that you will be missing class. There are five labs assigned during the semester and each lab builds upon the previous lab.
All due dates are listed in the Course Schedule below. If you are unable to meet the due dates due to extenuating circumstances, prior arrangements are required and must be documented through email at remert@kennesaw.edu.

Institutional Policies

Federal, BOR, & KSU Course Syllabus Policies

KSU Student Resources

This link contains information on help and resources available to students: KSU Student Resources for Course Syllabus

Course Delivery

KSU may shift the method of course delivery at any time during the semester in compliance with University System of Georgia health and safety guidelines. In this case, alternate teaching modalities that may be adopted include hyflex, hybrid, synchronous online, or asynchronous online instruction.

COVID-19 illness

If you are feeling ill, please stay home and contact your health professional. In addition, please email your instructor to say you are missing class due to illness. Signs of COVID-19 illness include, but are not limited to, the following:

· Cough
· Fever of 100.4 or higher
· Runny nose or new sinus congestion
· Shortness of breath or difficulty breathing
· Chills
· Sore Throat
· New loss of taste and/or smell

COVID-19 vaccines are a critical tool in “Protecting the Nest.” If you have not already, you are strongly encouraged to get vaccinated immediately to advance the health and safety of our campus community. As an enrolled KSU student, you are eligible to receive the vaccine on campus. Please call (470) 578-6644 to schedule your vaccination appointment or you may walk into one of our student health clinics.

For more information regarding COVID-19 (including testing, vaccines, extended illness procedures and accommodations), see KSU’s official Covid-19 website.

Face Coverings

Based on guidance from the University System of Georgia (USG), all vaccinated and unvaccinated individuals are encouraged to wear a face covering while inside campus facilities. Unvaccinated individuals are also strongly encouraged to continue to socially distance while inside campus facilities, when possible.

Course Schedule

MET 3332 – Rapid Design and Manufacture		
	Lecture	Lab
Week 1		
8/16	Course Introduction	Key Chain
	TU: Introduction to Additive Manufacturing 111	
8/18	Product Design	
	TU: Additive Manufacturing Safety 121	
Week 2		
8/23	FDM Design	U-Joint
	TU: Design for Fused Deposition Modeling 301	
8/25	Additive Manufacturing Processes (Ch1, Ch2)	
	TU: The Basic Additive Manufacturing Process 131	
Week 3		
8/30	Additive Manufacturing Process Chain (Ch3)	
	TU: Rapid Prototyping 161	
9/1	Vat Photopolymerization Processes (Ch4)	
	TU: Additive Manufacturing Prototype to Production 162	
Week 4		
9/8	**Sign up for SME Additive Manufacturing Certification Test**	Issettas-R-Us
	Powder Bed Fusion (Ch5)	
	TU: Additive Manufacturing Methods and Materials 141	
9/13	Extrusion Based Systems (Ch6)	
	TU: Additive Manufacturing Materials Science 211	
Week 5		
9/15	Material Jetting (Ch7)	
	TU: Design for Additive Manufacturing 201	
9/20	Binder Jetting (Ch 8)	
	TU: Integrating Additive Manufacturing with Traditional Manufacturing 221	
Week 6		Vacuum Forming
9/22	Sheet Lamination (Ch9)	
	TU: Additive Manufacturing as a Secondary Process 231	
9/27	Directed Energy Deposition (Ch10)	
	TU: Nondestructive Testing for Additive Manufacturing 241	
Week 7		
9/29	Direct Write Technologies (Ch11)	
	TU: The Additive Manufacturing Supply Chain 251	
10/4	TU: Managing the Additive Manufacturing Supply Chain 252	
Week 8		
10/6	TU: Introduction to Hybrid Manufacturing 151	
	TU: Hybrid Manufacturing with Directed Energy Deposition 261	
10/11	**SME Additive Manufacturing Certification Test**	
Week 9		
10/13	Field Trip: KSU Kinisiology Lab	Camera Mount

10/18	Guidelines for Process Selection (Ch13)	
Week 10		
10/20	Design for Additive Manufacturing (Ch17)	
10/25	Field Trip: Delta Tech Ops	
Week 11		
10/27	Material Testing	
11/1	Material Testing	
Week 12		
11/3	**CSWA-Additive Manufacturing Certification**	Directional Light Box
11/8	Material Testing	
Week 13		
11/10	Material Testing	
11/15	Material Testing	
Week 14		
11/17	Introduction to 3D Scanning	Aircraft Beacon
11/29	3D Scanning Criteria	
Week 15		
12/1	3D Scanning Next Engine	Linkage
12/6		
5/6	**Final Exam CSWA-Additive Manufacturing Certification**	

CSWA-Additive Manufacturing Certification		
10/13	Introduction to Additive Manufacturing	7 min
	Machine Types	8 min
10/18	Materials	7 min
	Model Preparation	9 min
10/20	File Export Settings	8 min
	Machine Preparation	7 min
10/25	Printing the Part	6 min
	Post Printing	7 min
10/27	Part Finishing	9 min
11/1	Software Options	9 min
11/3	CSWA-Additive Manufacturing Certification 1st Attempt	
11/17	CSWA-Additive Manufacturing Certification 2nd Attempt	
12/8	CSWA-Additive Manufacturing Certification 3rd Attempt	

This syllabus including scheduling and grading may be modified based on mutual agreement of instructor and student.