Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: CITE | Dept/Division: Engineering | Alpha Designator/Number: ME 630 | (•) Graded ( ) CR/NC

Contact Person: SARDER E. SADIQUE, Ph.D., P.E. (CA) | Phone: 3046965621

NEW COURSE DATA:

New Course Title: Manufacturing Systems

Alpha Designator/Number: M E 6 3 0

Title Abbreviation: M A N U F A C T U R I N G S Y S T E M S

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

This course covers tool design and metal cutting theory, CAD/CAM, CIM, CNC m/c, CNC programming, fixture design, metal forming, gear manufacturing, non-traditional machining, PLC, flexible manufacturing, robotics, rapid prototyping/tooling.

Co-requisite(s): | First Term to be Offered: Spring 2015

Prerequisite(s): Graduate Status | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*):

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head _____	Date _____
Registrar _____	Date _____
College Curriculum Chair _____	Date _____
Graduate Council Chair _____	Date _____

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College: CITE | Department/Division: Engineering | Alpha Designator/Number: ME 320

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

SARDER E. SADIQUE, Ph.D., P.E. (CA), Assistant Professor of Mechanical Engineering

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

Not Applicable

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

Not Applicable

6. COURSE OBJECTIVES: (May be submitted as a separate document)

Submitted as a separate document in the Course Syllabus

7. COURSE OUTLINE (May be submitted as a separate document)

Submitted as a separate document in the Course Syllabus

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

Submitted as a separate document in the Course Syllabus

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lecture

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10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

MIDTERM, FINAL, PROJECTS

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

N/A

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

Submitted as a separate document in the Course Syllabus

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Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Engineering

Course Number and Title: ME 630 Manufacturing Systems

Catalog Description:
This course covers tool design and metal cutting theory, CAD/CAM, CIM, CNC m/c, CNC programming, fixture design, metal forming, gear manufacturing, non-traditional machining, PLC, flexible manufacturing, robotics, rapid prototyping/tooling.

Prerequisites: Graduate status

First Term Offered: Fall 2016

Credit Hours: 3

Course Title/Number	**Manufacturing Systems - ME 630**
Semester/Year	Fall/2015
Days/Time	
Location	
Instructor	Sarder E. Sadique, Ph.D., P.E.(CA)
Office	Weisberg Engineering Lab Room 109 (previously lab general office) Division of Engineering College of Information Technology and Engineering Marshall University Huntington, WV 25755
Phone	304-696-5621
E-Mail	sadique@marshall.edu
Office/Hours	
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Catalog Course Description:

This course covers tool design and metal cutting theory, CAD/CAM, CIM, CNC m/c, CNC programming, fixture design, metal forming, gear manufacturing, non-traditional machining, PLC, flexible manufacturing, robotics, rapid prototyping/tooling.

Course Prerequisites:

Graduate Status

Required Text:

Course Textbook:

- Manufacturing Processes and Systems, Phillip F. Ostwald Jairo Munoz. ISBN 0-471-04741-4

References:

- Programmable Logic Controllers & and their Engineering Applications. Alan J Crispin. McGraw-Hill Book Company
- Metrology for Engineers. Galyer J & shotbolt. Cassell.
- Materials and Processes in Manufacturing E. Paul De Garmo. J Temple Blank. Ronald A Kohser.
- Mac Millan Publishing Company. ISBN 0-02-946140-5.
- Processes and Design for Manufacturing. Sherif D.El Wakil. ISBN 0-534-95165-1
- Fundamentals of Modern Manufacturing. Mikell P. Groover. ISBN 0-471-36680-3
- Automation, Production Systems and Computer, Integrated Manufacturing, Third edition Groover M.P., Prentice Hall. ISBN 0-13-239321-2

- S. Kalpakjian, and S. R. Schmid, *Manufacturing Engineering and Technology*, *7*th Edition, Pearson Prentice Hall, Singapore, 2013, ISBN-10: 0133128741.

Course Objectives:

- Describe differences between past and present methods of manufacturing.
- Identify the advantages of interchangeable parts, the assembly line, automation, robotics, and technology in the manufacturing process.
- Provides ways to analyze manufacturing systems in terms of modern and advanced manufacturing.
- Reviews fundamental topics including: optimization, process analysis and behavior of production systems.
- Analyze, design, and transform the complex systems of processes and technology that enable the extended enterprise.
- Continue to expand their capabilities through professional development and advanced education.
- Use knowledge of manufacturing principles to create, develop, and implement systems for the manufacture of products.

Class/Laboratory Schedule

- Class: 3 hrs

Grade Policy:

Attendance and Participation	5%
Homework	25%
Quizzes	10%
Project	15%
Midterm Exam	15%
Final Exam	30%

Letter Grade Scale*:

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

* *The instructor does reserve the right to slightly curve or scale the grades based on class groupings/performance.*

Tests/Exams:

Makeup exams will be given only due to **extraordinary circumstances**, and only if the instructor is notified **prior** to the exam and the instructor judges it to be an acceptable excuse. Academic dishonesty (cheating) on any exam will result in a grade of zero for that exam. A second infraction will result in a course grade of F and possible University sanctions.

Grading Policy of Tests/Exams:

Three tests and a final exam will be given during the course of the semester. Exams will be closed book and closed notes. No makeup exams will be given with the exception of unusual circumstances (institutional excuse, severe injuries, family emergencies, group activities etc.).

Topics to be Covered:

Lecture	Topic	Chapter
	Introduction to unit CNC programming.	
	CNC programming and CAD/CAM	
	Fixture design	
1	**Design for Manufacturability:** Product design and concurrent engineering. design for manufacture. Assembly, disassembly & service. Environmentally conscious design. Sustainable manufacturing & product life cycle.	1
2	**Design for Manufacturability:** Selecting Materials (material substitution, material properties, cost and availability, service life and recycling). Selecting manufacturing processes (casting, forming and shaping, machining (manual/CNC), joining, micro-manufacturing and nano-manufacturing, and finishing). Computer-Integrated Manufacturing. Lean Production and Agile Manufacturing. Quality Assurance and Total Quality Management.	=
3	Metal cutting theory	2
4	Cutting tool life	=
5	**Testing and Inspection:** Nondestructive testing techniques, Aautomated inspection, Quality Assurance, Statistical methods of quality control.	4
6	Logic and Boolean algebra	5
7	Non-traditional metal removal	5
8	Gear manufacturing and gear measurement.	5
9	Application of pneumatics and logic	6
10	**Bulk Deformation Processes:** Bending, Forging and Rolling, Extrusion. Rod, Wire, and Tube Drawing. Swaging. Die Manufacturing Methods. Economics of Bulk Forming.	=
7	**Sheet Metal Forming Processes**	7
8	Programmable logic controllers	8
9	**Rapid Prototyping and Rapid Tooling**	10
10	**Manufacturing of Composite Materials**	11
11	**Automation of Manufacturing Processes and Operations:** Hard automation, Numerical Control, Adaptive Control. Material Handling and Movement, Sensor Technology, Flexible Fixturing, Assembly, Disassembly and Service	14
12	**Computer-Integrated Manufacturing Systems:** Computer-integrated manufacturing databases. Computer-Aided Design and Engineering. Computer-Aided Manufacturing. Computer-Aided Process Planning. Computer Simulation of Manufacturing Processes and Systems. Cellular Manufacturing. Flexible Manufacturing Systems. Just-in-Time Production. Lean Manufacturing	15

* *The above schedule, policies, and assignments in this course are subject to change in the event of extenuating circumstances or by mutual agreement between the instructor and the students i.e. Schedule may be revised if necessary. Students will be notified if this is the case.*

Attendance Policy:
The attendance policy will follow University's excused absence policy. You are expected to attend all classes. However, the instructor accepts your absence for one session provided that an advance notice will be given, unless this is an excused absence such as institutional excuse, severe injuries, family emergencies, group activities etc.

Learning Outcomes:

Course Outcome – student will:	**Implementation Method**	**Evaluation Method**	**Program Outcomes**
Describe modern manufacturing operations, including their capabilities, limitations, and how to design for lowest cost. Explain how designers influence manufacturing schedule and cost.	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	c2, e2, k-3
Describe the relationship between customer desires, functional requirements, product materials, product design, and manufacturing process selection	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	c2, e2, k-3
Name the basic metal-casting Processes and Equipment including Sand, Investment, Die, Centrifugal casting, and others.	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	c2, e2, k-3
Describe various Bulk Deformation Processes including forging, rolling, extrusion, drawing, and swaging.	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	a2, c2, e2
Describe the most common sheet metal forming processes including bending of sheets, plates and tubes.	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	a2, c2, e2
Define material removal operations including turning, boring, drilling, milling and others.	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report	a2, c2, e2

		• Project	
Describe the most commonly used joining and fastening processes including oxyfuel gas welding, shielded metal arc welding, submerged arc welding, gas metal arc welding and others.	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	a2, c2, e2
Describe the advantages and disadvantages of hard (inflexible) and soft (flexible) manufacturing automation	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	a2, c2, e2
Explain the advantages and disadvantages of discrete-event simulation and how it is used to reduce manufacturing costs	• Lectures • In-class examples • Homework assignments • Lab	• Homework Assignments • Exam • Quiz • Lab report • Project	a2, c2, e2

- Demonstrate graduates have proficiency in materials and manufacturing processes: understanding the behavior and properties of materials as they are altered and influenced by processing in manufacturing.
- Demonstrate graduates have proficiency in process, assembly and product engineering: understanding the design of products and the equipment, tooling, and environment necessary for their manufacture.
- Demonstrate graduates have proficiency in manufacturing competitiveness: understanding the creation of competitive advantage through manufacturing planning, strategy and control.
- Demonstrate graduates have proficiency in manufacturing systems design: understanding the analysis, synthesis, and control of manufacturing operations using statistical and calculus based methods, simulations and information technology.

PROGRAM LEARNING OUTCOMES (ABET)

Item No.	Outcome
a-2	Complete an engineering assignment that involves the use of calculus and scientific principles (e.g., chemistry or physics).
c-2	Complete a design with clearly defined objectives, engineering standards, and realistic constraints. Present a design in a professional manner
e-1	Formulate and solve an engineering problem with given data and constraints using applicable standards for a problem already identified. Present the results in a professional manner
k-3	Ability to use the techniques, skills and modern engineering tools necessary for engineering practice: Use of a modern engineering too for a design.

Additional Academic Policies:

Marshall University policies pertaining to Academic Dishonesty, Excused Absences, University Computing Services Acceptable Use, Inclement Weather, Dead Week, Students with Disabilities, Academic Dismissal, Academic Forgiveness, Academic Probation and Suspension, Academic Rights and Responsibilities of Students, Affirmative Action, and Sexual Harassment can be found at: http://www.marshall.edu/academic-affairs/?page_id =802.