DEPARTMENT OF MECHANICAL ENGINEERING

SUNY AT STONY BROOK

Manufacturing Process

Course Title:	**MEC325** Manufacturing Processes, Spring 2018 (3 credits)
Prerequisites:	MEC 225 (MEC 125 is a pre- or co-requisite)
Blackboard:	http://blackboard.stonybrook.edu (It is required that you use the Blackboard for this course)
Lecture/Lab:	MWF 11:00-11:53 in Engineering 145
Instructor:	**Prof. Cindy Chang** email: qing.chang@stonybrook.edu
Office:	Light Engineering, Room 163; Phone (631)632-8329
Office Hours:	MF: 12:30-3:30PM & other time by appointment
Lab Staff:	**Prof. Noah Machtay** 632-9014; Room HE-148; nmachtay@ic.sunysb.edu
TA:	**Anik Sarker** email: Anik.Sarker@stonybrook.edu Office Hours: M, Thu: 2:30-4:00pm, HE-101 **Ioannis Nikiforakis** email: ioannis.nikiforakis@stonybrook.edu Office Hours: Mon: 1:00-4:00pm, LE 158
Course Objective:	Modeling and quantitative analysis of manufacturing processes used in industry to manufacture mechanical systems: machining, deformation, welding, assembly, non-traditional manufacturing. Process capabilities, costs and limits; influence of processes on the final mechanical properties of the product; production system analysis, random process, basics of inventory control and quality control. Hands-on experience in the fundamentals of machining including sheet metal working, drilling, taping, turning, boring, milling, welding, and additive manufacturing.
Assignments & Deadlines:	Lab reports are due in class based on the lab rotation schedule and deadlines. Late reports will not be accepted after the class on the day they are due, and will receive zero in grade. Written reports should follow the "Format of Lab Reports" handout. Term project is due 4/27, vote for term project is due 5/6.
Textbook:	M. P. Groover, "Fundamentals of Modern Manufacturing materials, processes, and systems," 6th ed., Wiley, 2009 (ISBN: 978-0-4-7046700-8)
Optional:	Kalpakjian & Schmid, "Manufacturing Processes for Engineering Materials," 4th ed., Prentice Hall, 2003 Wallace Hopp & Mark Spearman, "Factory Physics," any edition
Examinations:	3 Midterm Exams (50 minutes), 4 quizzes (15 minutes, in class), 1 Final Exam • All exams are scheduled in class (Final exam follow the schedule), open book/notes

- **NO make-up exams unless in extreme scenarios with Doctor's notes, police reports.**

Grading: Semester letter grade is based upon your performance in the following categories

Midterm exams (10% each)	*30%*	*Homework*	*10%*
Final exam	*20%*	*Podcast term project*	*10%*
Lab and reports	*20%*	*Quizzes of SME video*	*10%*

Grading Scale of MEC325/580

NOT a curve – accumulation of your course work, as follows:

A: 100 – 92	A-: 91 – 89	B+: 88 – 86
B: 85 – 82	B-: 81 – 79	C+: 78 – 75
C: 74 – 70	C-: 69 – 66	D+: 65 – 63
D: 62 – 60	F: < 59	

Labs:

Lab	Title	System Description & Task	Person in charge
1	3D Printing	Design and fabricate a solid model using the Lulzbot Taz 5 3D printer	Prof. Noah Machtay
2	CNC machining	CNC machining (desktop milling machine or lathe)	Prof. Noah Machtay

****** A team of 4 students need to be formed during the first week of the class.

Term Project: Video Podcast (refer to podcast document)

- Term project is due 4/26, vote for term project is due 5/6

Alternative Term Project (coming soon): Take RAMP Challenge 2017, a team up to 4 students can be formed. An extra credit of 10 points will be given if you submitted the model by the deadline and send me the proof of the submission along with all submitted files/models

- Details refer to NIST competition.docx and 2017 RAMP Challenge.pdf on Black Board

Student Outcome (SO's) of this course:

a. The ability to apply knowledge of mathematics, science, and engineering to mechanical engineering problem,
b. The ability to design and conduct experiments, as well as to analyze and interpret data.

c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
e. The ability to identify, formulate, and solve engineering problems.
g. An ability to communicate effectively
h. The broad education necessary to understand the impact of engineering solutions in a global and societal context.
j. A knowledge of contemporary issues.
k. The ability to use modern engineering techniques, skills, and computing tools necessary for engineering practice.

Course Learning Objectives (CLO's) and Assessment Tools:

COURSE LEARNING OBJECTIVES (CLOs)	**SOs**	**ASSESSMENT TOOLS**
1. Demonstrate the skills to analyze and/or synthesize the parameters of a manufacturing process, such as force required or strain limit, in order to design or improve the operation of a manufacturing process	a, c	Assessment questions
2. Demonstrate the skills to analyze factory floor operation and random process	a, e	Assessment questions
3. Demonstrate the ability to write a CNC program, including the M-code and G-code	a, c, j, k	Assessment questions
4. Demonstrate the skills in modern manufacturing through hands-on practice and lab assignments, such as EDM, CNC programming, and Rapid Prototyping	b, c, j, k	Hands-on lab assignments & lab reports
5. Produce a multimedia video podcast term project containing a professional presentation of manufacturing process(es) or an engineering system/ or develop model of a typical manufacturing process (e.g. end milling)	g, h, j	Rubrics of evaluation

STUDENT OUTCOMES SUPPORTED (Scale 1-3)	a	b	c	d	e	f	g	h	i	j	k	l	m	n
	1	2	2		2		2	2		3	3			
	3 – Strongly supported 2 – Supported 1 – Minimally supported											Program Criteria		

COURSE TOPICS
1. Introduction of manufacturing processes, engineering, and technology 2. Basics of engineering materials & properties 3. Theory of metal machining, Machining operations 4. CNC machining; M-code/G-code 5. Cutting tool technology & machine tools 6. Introduction to Additive manufacturing; EDM 7. Abrasive machining processes 8. Metal forming and sheet metal working 9. Casting & molding 10. Introduction to composite manufacturing 11. Factory physics, production system and inventory anaysis

	12. SPC and introduction to lean manufacturing, six sigma 13. Introduction to flexible manufacturing, digital manufacturing

It is important to note that in order for you to earn a passing grade in this class, you have to earn a passing grade (60/100 percentile) in at least two lab/report and video podcast term project. The lab reports and video podcast are graded using rubrics that will be made available to you in class. Failure to comply with this requirement and report/podcast will result in a letter grade of "F".

Course Outline:

		Content
22-Jan	1	introduction - syllabus, grading, lab, podcast, exam
24-Jan		Lab tour
26-Jan		introduction - Chapter 1
29-Jan	2	CNC
31-Jan		CNC
2-Feb		CNC
5-Feb	3	CNC
7-Feb		Ch 03
9-Feb		Ch03, Ch04
12-Feb	4	Ch20 - cutting theory
14-Feb		Ch20 -continue, Ch21-1 operation and tool
16-Feb		Ch21-2 - operation and tools (SME video: lathe operation)
19-Feb	5	Ch22-1 - cutting tool technology (SME video: milling&machine center)
21-Feb		Ch22 - tool technology (SME video: cutting tool material)
23-Feb		**Exam 1**
26-Feb	6	(SME video: cutting tool geometry, quiz); **Quiz 1: milling & machine center, turning and Lathe basic**
28-Feb		(SME video: basic hole making) Ch24 - Grinding
2-Mar		Ch24 - Grinding
5-Mar	7	Ch24 - Grinding (SME video: Basics of grinding); **Quiz 2: Cutting Tool geometry and material**
7-Mar		(SME video: work holding) Ch17 - Metal forming
9-Mar		Ch17 - Metal forming, Ch18 - Bulk deformation (SME video: Forging)
12-Mar	8	spring recess
14-Mar		
16-Mar		
19-Mar	9	Ch18 - Forging and Extrusion; (play aluminum extrusion video)
21-Mar		Ch18, Ch19- Sheet metal (SME video: stamping)
23-Mar		Ch19- Sheet metal (video: superplastic forming, soda can); **Quiz 3: Grinding and Forging**
26-Mar	10	Ch10 - Casting molding (SME Video: casting)
28-Mar		**Exam 2**
30-Mar		Ch10 - Casting (SME Video: die casting)
2-Apr	11	Ch30 - Welding
4-Apr		welding continue (video clips); non-traditional mfg, EDM (SME EDM video)
6-Apr		Introduction to additive manufacturing
9-Apr	12	play video about plastic, **Quiz 4: Stamping and Die Casting**
11-Apr		Factory physics 1 - Ch7 (best case)
13-Apr		Factory physics 2 - Ch7 (best case and little's law); retake quiz 4
16-Apr	13	Factory physics 3 - Ch 7 (worst case, PWC and rest)
18-Apr		Factory physics 4 - Ch8 (stop at tortois example)
20-Apr		Factory physics 5 - Ch 8 (finish example 1)
23-Apr	14	Factory physics 6 - Ch8
25-Apr		Factory physics - Inventory
27-Apr		**Exam 3**
30-Apr	15	Factory physics - Inventory
2-May		Factory physics - Inventory
4-May		Inventory, review; AM Ted video

*Please referred to updated schedule posted on Black Board

Blackboard

You are required to use the Internet to access Blackboard and online information for important announcements, homework/handouts, and supplementary materials of the course. You can access blackboard at:

http://blackboard.stonybrook.edu

Please note that you have to use your NetID to login to the blackboard system.

DISABILITY SUPPORT SERVICES (DSS) STATEMENT

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, room128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: http://www.stonybrook.edu/ehs/fire/disabilities]

ACADEMIC INTEGRITY STATEMENT

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

CRITICAL INCIDENT MANAGEMENT

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.