MEC 325 Manufacturing Processes – subject to change

(3 Credits) Spring 2025

Instructor: Noah D. Machtay, Ph.D., P.E.

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Virtual Office Hours:	TuTh 10:30AM-12:00PM	meet.google.com/ycq-yfkr-wpy
Lecture:	MoWe 11:00-11:55AM	Javits 109
Lab Session(s):	**Tuesday:** 12:30-2:20PM	Heavy Engineering 137
	Thursday: 12:30-2:20PM	Heavy Engineering 137
	Friday AM: 9:30-11:20AM	Heavy Engineering 137
	Friday PM: 12:00-1:50PM	Heavy Engineering 137

Attendance policy: It is the responsibility of the student to make arrangements with a classmate to get any notes that are missed during absences.

Text: Groover, "Fundamental of Modern Manufacturing", 6th Edition, Wiley 2016

Homework Assignments: Homework problems have been assigned for the duration of the semester, and have been posted along with their solutions. Homework is not graded. Homework is assigned solely for the benefit of the student, so that they may practice the principles discussed during lecture, evaluate their understanding, and, in part, prepare for examinations. There will also be a number of laboratory projects that must be completed and submitted as assigned.

Video Project: There will be a video project for which students will produce a video documenting and demonstrating a manufacturing process. Details to be announced. Project Due 4/28/2025, and Peer Review due 5/5/2025

Lab work: Students be formed into lab groups consisting of 2-3 students by the instructor. The lab groups will be further subdivided into Regiments A and B. Lab groups are responsible for conducting experiments and design work as instructed. It is each student's responsibility to ensure that the group functions well and achieves the assigned goals. Students found to be making insufficient contributions to their group's work will be removed from the group, and will receive a grade of zero for all lab work, at the sole discretion of the instructor.

Lab Roles: Each lab experiment has 3 roles: the draftsperson who completes the mechanical drawing of the part using proper geometric dimensioning and tolerancing standards, the machinist who completes the machine operations to fabricate the part as designed, and the inspector who is responsible for using proper metrology techniques to measure the finished part and for reporting on compliance and/or deviations from the dimensions of the original drawing. Each student ***MUST*** perform each role at least once over the course of the 4 laboratory experiments, or else a grade of zero will be assigned for the course.

Lab Grading: Each student is responsible for the drawing the group produces, the part the group produces, the inspection that the group performs for each lab, and the submission of the assignment (either performing the task themselves, or supporting and double-checking the team member performing the task). Instructors will also grade the accuracy of the part manufactured by the group. All students in a group will receive the same grade, unless differential grading is deemed appropriate by the instructor, in which case the student(s) failing to contribute adequately will receive a grade of zero instead. Refer to the lab grading rubric for details. Late submissions will receive a grade of zero.

Lab Due Dates (by the end of your respective lab session during the week listed):

The report for lab 1 is due: Week of 2/24-2/28/2025
The report for lab 2 is due: Week of 3/24-3/28/2025
The report for lab 3 is due: Week of 4/14-4/18/2025
The report for lab 4 is due: Week of 5/5-5/9/2025

Lab Safety: All safety training must be completed by 2/3/2025. At the sole discretion of the instructor, any student may be removed from the laboratory for any unsafe conduct, at any time, and for any duration. At the sole discretion of the instructor, these students may be barred from returning to the lab for any duration, including future semesters, preventing retaking of the course. Affected students will receive grades of zero for all missed lab work, up to and including the complete course grade. Your safety is our top priority, and as such, this policy is not negotiable. Using university equipment and/or facilities to create or attempt to create weapons or other items with significant injurious capacity will result in instant failure of the course, and a permanent and irrevocable ban from the laboratory, at the instructor's sole discretion.

Exams/Term Project: *Two midterm exams and a final exam.* Midterm 1 will be held on 3/31/2025, and Midterm 2 will be held on 4/23/2025. Final exam as scheduled by the registrar. Exams will be closed book and open notes; students may have notes they have prepared in their own handwriting; no printed materials. Exams will be administered using the Respondus system, and students are responsible for preparing this system on their computers, and ensuring that they have a proper testing environment available, with suitable hardware, internet, privacy, etc. and so on. In place of any or all exams, instructor, at their discretion, may substitute term projects to be worth an equivalent percentage of the semester grade.

Grading: *1st midterm: 10%, 2nd midterm: 10%, Video Project: 10%, Final: 20%, Lab Projects: 40%, Participation: 10%.*

Cell phone and electronic device policy: Cellular phones or other communication devices are not permitted in lectures or labs, and are especially prohibited from exams. If you are found to be in possession of such a device during an exam, you will be ejected from the exam and will receive a grade of zero. Audio or video recording or photography during lectures is strictly prohibited, and anyone found in violation will be ejected from the course with a failing grade.

Excused absences: Absence from lectures is excused: no documentation is needed; students just need to make arrangements with a classmate to get any notes they miss. For exams, notification of intention to be out for a religious holiday or absence due to illness MUST be made through the CEAS Undergraduate office, who will verify and evaluate the notification, and provide the instructor with appropriate instructions; you must include your name, SBID#, and the course number when contacting CEAS in regards to your absence. From the university policy statement regarding religious holidays, students will be expected to notify their professor in advance, but definitely before the final date of the 'add/drop' period of their intention to be out for religious observance.

For hopefully obvious reasons, students may not come to the laboratory when ill. Students are excused from laboratory attendance due to illness, and are just required to arrange with their groupmates to take on additional tasks to compensate accordingly. Prolonged illness that prevents significant participation in a lab project in its entirety will be resolved on an individual basis, and may include make-up lab sessions, incomplete grades, or other mechanisms; this should be discussed with the instructor as early as is practicable given the circumstances, and we'll figure it out. Making a false request for an excused absence is an act of academic dishonesty and will be prosecuted accordingly.

Course Objectives: Introduces traditional and modern manufacturing processes, their capabilities, and limitations. The properties of engineering materials are discussed in the context of manufacturing applications. Examples of topics to be discussed include additive processes (casting, 3D printing, etc.), subtractive processes (milling, turning, etc.), forming processes (forging, bending, extrusion, etc.), and joining processes (welding, mechanical fastening , etc.). Hands-on experience with various manufacturing processes.

Pre/corequisites: MEC 203

Statement on Academic Dishonesty

Academic dishonesty is an extremely serious offense and will not be tolerated in any form. Academic dishonesty in general is the presentation of intellectual work that is not originally yours. Examples include, *but are not limited to*, copying or plagiarizing class assignments including homework, reports, designs, and other submitted materials; copying or otherwise communicating answers on exams with other students; bringing unapproved aids, either in physical (written) or electronic form to an exam; obtaining copies of an exam prior to its administration, etc. Academic dishonesty violates both the ethical and moral standards of the Engineering profession and all infractions related to academic dishonesty will be prosecuted to the fullest via the CEAS CASA committee. For you, the honest student, academic dishonesty results in lower class curves, hence a depression in your GPA and class standing, while cheapening the degree you earn. Please note that failing to provide proper citations in a paper or report constitutes plagiarism and will be prosecuted accordingly. Be sure to cite your sources![1]

Allowed Calculators

For both security and uniformity in this class **only** the following calculators will be allowed to be used on the midterm and final exams. There will be no exceptions.

Casio:	All FX-115 and FX-991 models. Any Casio calculator must contain fx-115 or fx-991 in its model name.

[1] Dr. Jon Longtin, Department of Mechanical Engineering, Stony Brook University

Hewlett Packard: The HP 33s and HP 35s models, but no others.

Texas Instruments: All TI-30X and TI-36X models. Any Texas Instruments calculator must contain either TI-30X or TI-36X in its model name.

Course Learning Objectives
1. Ability to analyze subtractive manufacturing processes and select appropriate feeds and speeds for cutting tools and materials
2. Ability to analyze additive manufacturing processes and identify the effects of thermal transitions on materials during processing
3. Ability to analyze joining processes and identify standard symbols and notation for engineering design
4. Ability to analyze forming processes and calculate force requirements
5. Produce a multimedia video podcast term project containing a professional presentation of manufacturing process(es) or an engineering system.

Grading Policy:

100-95 = A	
94-90 = A-	
89-87 = B+	
86-84 = B	
83-80 = B-	
79-77 = C+	
76-74 = C	
73-70 = C-	
69-65 = D+	
64-60 = D	
<60 = F	

Note: All grades are TRUNCATED, not rounded.

Approximate Course Schedule, subject to revision:

Topic 1	Introduction, Syllabus, Lab and Video Project Introduction
Topic 2	Engineering Materials and their Properties (2-9)
Topic 3	Subtractive manufacturing (20): Theory
Topic 4	Subtractive manufacturing (21): Machines
Topic 5	Subtractive manufacturing (22,24): Cutting tools, Grinding
Topic 6	Additive manufacturing (10-11): Casting, molding
Topic 7	Additive manufacturing (12-13, 32): Plastic and glass working, Rapid Prototyping
Topic 8	Additive manufacturing (15-16): Powders, ceramics
Topic 9	Forming Processes, bulk (17-18): Extrusions, forming, forging
Topic 10	Forming Processes, sheet (19): Sheetmetal forming
Topic 11	Joining (28-31): Welding, brazing, soldering, adhesives, mechanical fastening
Topic 12	CAD/CAM integration (In Lab)
Topic 13	G-Code programing (In Lab)
Topic 14	Basic machining metrology (In Lab)

Topic 15	CNC Operation (In Lab)

Approximate Lab Work Schedule:

Week 1.	Safety instruction, Project and design work overview, Introduction to tools and equipment, Introduction to G-Code, M-Code, T-Code machine control programming, Introduction to basic CAM software operation for Rapid Prototyping
Week 2.	CNC control with G-Code, M-Code, T-Code, and basic tooling/speeds and feeds Basic Rapid Prototyping operation
Week 3.	Review of mechanical drawing standards, introduction to basic metrology Regiment A: Basic FDM Rapid Prototyping Project Session 1 (Additive Manufacturing) Regiment B: Basic CNC Machining Project Session 1 (Subtractive Manufacturing)
Week 4.	Review of basic metrology Regiment A: Basic FDM Rapid Prototyping Project Session 2 (Additive Manufacturing) Regiment B: Basic CNC Machining Project Session 2 (Subtractive Manufacturing)
Week 5.	Regiment A: Basic FDM Rapid Prototyping Project Session 3, Project Due (Additive Manufacturing) Regiment B: Basic CNC Machining Project Session 3, Project Due (Subtractive Manufacturing)
Week 6.	Introduction to CAM software operation for CNC Machining Regiment A: Basic CNC Machining Project Session 1 (Subtractive Manufacturing) Regiment B: Basic FDM Rapid Prototyping Project Session 1 (Additive Manufacturing)
Week 7.	Review of CAM software operation for CNC Machining Regiment A: Basic CNC Machining Project Session 2 (Subtractive Manufacturing) Regiment B: Basic FDM Rapid Prototyping Project Session 2 (Additive Manufacturing)
Week 8.	Regiment A: Basic CNC Machining Project Session 3, Project Due (Subtractive Manufacturing) Regiment B: Basic FDM Rapid Prototyping Project Session 3, Project Due (Additive Manufacturing)
Week 9.	Regiment A: Advanced FDM Rapid Prototyping Project Session 1 (Additive Manufacturing) Regiment B: Advanced CNC Machining Project Session 1 (Subtractive Manufacturing)
Week 10.	Regiment A: Advanced FDM Rapid Prototyping Project Session 2 (Additive Manufacturing) Regiment B: Advanced CNC Machining Project Session 2 (Subtractive Manufacturing)
Week 11.	Regiment A: Advanced FDM Rapid Prototyping Project Session 3, Project Due (Additive Manufacturing) Regiment B: Advanced CNC Machining Project Session 3, Project Due (Subtractive Manufacturing)
Week 12.	Regiment A: Advanced CNC Machining Project Session 1 (Subtractive Manufacturing) Regiment B: Advanced FDM Rapid Prototyping Project Session 1 (Additive Manufacturing)
Week 13	Regiment A: Advanced CNC Machining Project Session 2 (Subtractive Manufacturing) Regiment B: Advanced FDM Rapid Prototyping Project Session 2 (Additive Manufacturing)
Week 14	Regiment A: Advanced CNC Machining Project Session 3, Project Due (Subtractive Manufacturing) Regiment B: Advanced FDM Rapid Prototyping Project Session 3, Project Due (Additive Manufacturing)

FDM = Fused Deposition Modeling, a type of Rapid Prototyping, Additive Manufacturing
CNC = Computer Numerical Control, control of a machining system using a computer, Subtractive Manufacturing

Laboratory Project Summary:

Basic FDM Rapid Prototyping Project: Utilizing an existing solid model, students will produce a properly dimensioned and toleranced mechanical drawing, manufacture the part using FDM Rapid Prototyping equipment in the laboratory, and inspect the mechanical dimensions of the finished part against the original drawing to determine whether the part is within tolerances or not. Each project must be approved by the course instructor.

Basic CNC Machining Project: Students will design a 2D pattern to be machined into the available workpiece; the pattern must include both straight lines and arcs. They will then produce a fully dimensioned and toleranced mechanical drawing of the part, manufacture the part using the CNC equipment in the lab which they will program without the aid of CAM software (writing G-code, M-code, T-code by hand), and inspect the mechanical dimensions of the finished part against the original drawing to

determine whether the part is within tolerances or not. Each project must be approved by the course instructor.

Advanced FDM Rapid Prototyping Project: Students will design a three dimensional object which must mechanically integrate with the part produced during the Advanced CNC Machining project. Students will produce a properly dimensioned and toleranced mechanical drawing, manufacture the part using FDM Rapid Prototyping equipment in the laboratory, and inspect the mechanical dimensions of the finished part against the original drawing to determine whether the part is within tolerances or not. Each project must be approved by the course instructor.

Advanced CNC Machining Project: Students will design a three dimensional pattern to be machined into the available workpiece; the finished part must integrate with the part produced during the Advanced FDM Rapid Prototyping project. They will then produce a fully dimensioned and toleranced mechanical drawing of the part, manufacture the part using the CNC equipment in the lab which they will program using CAM software, and inspect the mechanical dimensions of the finished part against the original drawing to determine whether the part is within tolerances or not. Each project must be approved by the course instructor.

University required statements:
"STUDENT ACCESSIBILITY SUPPORT CENTER (SACS) STATEMENT (must be the following language)
If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, 128 ECC Building, (631) 632-6748, or at sasc@Stonybrook.edu. They will determine with you what accommodations 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 the Student Accessibility Support Center. For procedures and information go to the following website: https://ehs.stonybrook.edu/programs/fire-safety/emergency-evacuation/evacuation-guide-people-physical-disabilities and search Fire Safety and Evacuation and Disabilities.
ACADEMIC INTEGRITY STATEMENT (must be the following language as approved by the undergrad council):
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 (must be the following language as approved by the undergrad council):
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. 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 Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Until/unless the latest COVID guidance is explicitly amended by SBU, during Spring 2022 "disruptive behavior" will include refusal to wear a mask during classes."

"Mode of Conduct for Exams: LockDown Browser + Webcam Requirement
This course requires the use of LockDown Browser and a webcam for online exams. The webcam can be the type that's built into your computer or one that plugs in with a USB cable.Watch this brief video to get a basic understanding of LockDown Browser and the webcam feature: https://www.respondus.com/products/lockdown-browser/student-movie.shtml

Download Instructions

- Select the quiz in the course
- Under Quiz Requirements you will see "To take this quiz you must use the Respondus LockDown Browser"
- Below this will appear: "You can use the button below if you have not already downloaded LockDown Browser". Click the button to go to the download page and then follow the instructions
- Use the link to download Respondus LockDown Browser to your computer; follow the installation instructions
- Return to the Quiz page in Brightspace (it may still be open in another tab) and select the quiz
- Select "Launch LockDown Browser"
- The quiz will now start

Note: LockDown Browser only needs to be installed once to a computer or device. It will start automatically from that point forward when a quiz requires it.

Guidelines
When taking an online exam, follow these guidelines:

- Select a location where you are comfortable having a video recording taken of yourself and your workspace environment. This area should be free of distractions and interruptions.
- Turn off all other devices (e.g. tablets, phones, second computers) and place them outside of your reach
- Before starting the test, know how much time is available for it, and also that you've allotted sufficient time to complete it
- Clear your desk or workspace of all external materials not permitted - books, papers, other devices
- Remain at your computer for the duration of the test
- If the computer, Wi-Fi, or location is different than what was used previously with the "Webcam Check" and "System & Network Check" in LockDown Browser, run the checks again prior to the exam
- To produce a good webcam video, do the following:
    - Avoid wearing baseball caps or hats with brims
    - Ensure your computer or device is on a firm surface (a desk or table). Do NOT have the computer on your lap, a bed, or other surface where the device (or you) are likely to move
    - If using a built-in webcam, avoid readjusting the tilt of the screen after the webcam setup is complete
    - Take the exam in a well-lit room, but avoid backlighting (such as sitting with your back to a window)
- Remember that LockDown Browser will prevent you from accessing other websites or applications; you will be unable to exit the test until all questions are completed and submitted

Getting Help
Several resources are available if you encounter problems with LockDown Browser:

- The Windows and Mac versions of LockDown Browser have a "Help Center" button located on the toolbar. Use the "System & Network Check" to troubleshoot issues. If an exam requires you to use a webcam, also run the "Webcam Check" from this area
- 24/7/365 Live Chat Support is also available from the Help Center, or from within the "it's not working" troubleshooter.
- Note: the instructor cannot provide any IT support before, during, or after exams. You will need to contact the university technical support resources for assistance with such issues.
- Respondus has a Knowledge Base available from support.respondus.com. Select "LockDown Browser & Respondus Monitor" as the product to view helpful articles.
- If you're still unable to resolve a technical issue with LockDown Browser, go to support.respondus.com and select "Submit a Ticket". Provide detailed information about your problem and what steps you took to resolve it"[2]

[2] From Respondus, Inc.

Course Delivery Mode and Structure:

This is an in-person course, delivered in-person. Students must be mindful of all course expectations, deliverables and due dates.

How We Will Communicate:

Course-related questions should be asked during lectures, virtual office hours, or by email. If you use Brightspace's Email Tool, it will automatically include your full name, course name and section when you send me an email. I strive to respond to your emails as soon as possible, but I generally get to replies in approximately 2 business days. Your Stony Brook University email must be used for all University related communications. You must have an active Stony Brook University e-mail account and access to the Internet. *All instructor correspondence will be sent to your SBU e-mail account.* Please plan on checking your SBU email account daily for course related messages.

Technical Requirements:

This course uses Brightspace for the facilitation of communications between faculty and students, submission of assignments, and posting of grades. The Brightspace course site can be accessed at https://Brightspace.stonybrook.edu If you are unsure of your NetID, visit https://it.stonybrook.edu/help/kb/finding-your-netid-and-password for more information. You are responsible for having a reliable computer and Internet connection throughout the term. ***Caution! You will be at a disadvantage if you attempt to complete all coursework on a smart phone or tablet.*** *It may not be possible to submit the files required for your assignments.*
The following list details a minimum recommended computer set-up and the software packages you will need to have access to, and be able to use:

PC with Windows 10 or 11

- Latest version of Chrome, Firefox or Explorer; (A complete list of supported browsers and operating systems can be found on the Brightspace website.)
- Sufficient RAM, CPU, GPU, and storage to properly run all required software
- High speed internet connection
- Printer
- Word processing software (Microsoft Word, Pages, etc.)
- Headphones
- Microphone
- Webcam
- Ability to download and install software applications and plug-ins (note: you must have administrator access to install applications and plug-ins).
- Microsoft Office
- Video recording and editing hardware and software
- Animation software
- Autodesk Fusion360
- Cura and Orca Slicing Software

Technical Assistance:

If you need technical assistance at any time during the course or to report a problem with Brightspace you can:

- submit a help ticket on the web at http://it.stonybrook.edu/services/itsm)
- call (631) 632-9800 (technical support, log-in issues, computer support, wifi, software & hardware)
- call (631) 2-CELT [631-632-2358]
- Note that the course instructor cannot provide technical assistance

Attendance and Late Work Policy:

Late Work Policy: Late work will not be accepted. Late work will receive a grade of zero.

Course and University Policies

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, Room 128, (631)632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

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/commcms/academic_integrity/index.html **Important Note:** Any form of academic dishonesty, including cheating and plagiarism, will be reported to the Academic Judiciary.

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 University Community Standards 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. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

UNDERSTAND WHEN YOU MAY DROP THIS COURSE:

It is the student's responsibility to understand when they need to consider disenrolling from a course. Refer to the Stony Brook Academic Schedule for dates and deadlines for registration: http://www.stonybrook.edu/commcms/registrar/calendars/academic_calendars

Incomplete Policy:

Under emergency/special circumstances, students may petition for an incomplete grade. Circumstances must be documented and significant enough to merit an Incomplete. If you need to request an incomplete for this course, contact the CEAS undergraduate office for approval as far in advance as possible.

Course Materials and Copyright Statement:

Course material accessed from Brightspace, SB Connect, SB Capture, Echo, Zoom, Google, or a Stony Brook Course website is for the exclusive use of students who are currently enrolled in the course. Content from these systems cannot be reused or distributed without written permission of the instructor who retains ownership of all materials.

Students are bound by the following statement, to which they must agree:
"Academic integrity is expected of all students at all times, whether in the presence or absence of members of the faculty. Understanding this, I declare that I shall not give, use, or receive unauthorized aid in this examination. I have been warned that any suspected instance of academic dishonesty will be reported to the appropriate office and that I will be subjected to the maximum possible penalty permitted under University guidelines."