



MEC 316 - Instrumentation and Solid Mechanics Laboratory

Online Syllabus

Course Description:

The aim of this course is to teach students instrumentation and techniques that are pertinent to perform experiments in solids as they respond to external static/dynamic loads. Students are to learn and witness different modes of material/structural failure such as yielding, ultimate stress, material fatigue, structural instability, vibration and stress concentration. Another aim is to perform experiments to check the validity (and the lack of) of the beam theory described in MEC 363(Solid Mechanics). Experiments will be performed to show the existence of neutral axis in a beam under bending, the visualization and calculation of stress concentration due to the existence of a circular hole under tension. Students form groups of 3 to 4 who are collectively responsible for the lab projects. Lectures at the beginning of the course provide background information and theories of experimentation. Not to be taken in the same semester with MEC 317. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

Instructor:

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Laboratory Technical Staff:

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Undergraduate Teaching Assistant:

Raidah Zaman

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Required Course Textbook and Materials:

Lab Manual and necessary materials will be uploaded on Blackboard.

Recommended Readings/Bibliography:

- Measurement System, Application and Design, 3rd Ed., by Ernest O. Debelin, McGraw-Hill, 1983.
- Mechanics of Solids. An Introduction, by T.J. Lardner and R. R. Archer, McGraw-Hill, 1994.
- Experimental Stress Analysis, 2nd Ed., by J.W. Dally and W. F. Riley, McGraw-Hill, 1978.
- Manual on Experimental Stress Analysis . Society for Experimental Mechanics J. Doyle, J. Phillips, and D. Post, Society for Experimental Mechanics, 1989.

- The Dynamical Behavior of Structures, 2nd Ed., by G. B. Warburton, Pergamon Press, 1976.
- Theory and Design for Mechanical Measurements, by R. S. Figliola and D. E. Beasley, John Wiley, 1991.

All reference books above are reserved in the engineering library.

Course Delivery Mode and Structure:

This is a combined synchronous/asynchronous, online course, delivered in the Blackboard learning management system (LMS). Students must be mindful of all course expectations, deliverables and due dates. All assignments and course interactions will utilize internet technologies. See "Technical Requirements" section for more information. In Blackboard, you will access online lessons, course materials, and resources.

How We Will Communicate:

Course-related questions should be posted in the General Questions Forum in the course Discussion board. For personal/private issues, the preferred method of contact is via email listed at the top of this syllabus. If you use Blackboard'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 please allow between 24-48 hours for a reply. 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 regularly for course related messages. To log in to Stony Brook Google Mail, go to <http://www.stonybrook.edu/mycloud> and sign in with your NetID and password.

Technical Requirements:

This course uses Blackboard for the facilitation of communications between faculty and students, submission of assignments, and posting of grades. The Blackboard course site can be accessed at <https://blackboard.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 homework 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
- Macintosh with OS 10.13 or higher
- Latest version of Chrome, Firefox or Explorer; Mac users may use Chrome, Firefox or Safari. (A complete list of supported browsers and operating systems can be found on the My Institution tab of the [Blackboard website](#).)
- 8 GB RAM
- High speed internet connection
- Printer
- Word processing software (Microsoft Word, Pages, etc.)
- Speakers (either internal or external) or headphones
- Ability to download and install free software applications and plug-ins (note: you must have administrator access to install applications and plug-ins).
- Adobe Flash player with the latest update is crucial for playing multiple videos throughout the course

Technical Assistance:

If you need technical assistance at any time during the course or to report a problem with Blackboard 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]

Part 2: Course Learning Objectives and Assessments

Learning Objectives and Activities:

Upon completion of the course, students will be able to:

1. Learn to apply mathematics, physics, and engineering principles to measurement problems in mechanical engineering pertaining to the mechanics of solids.
2. Design and conduct experiments and interpret data.
3. Learn modern measurement techniques as applied to mechanical structures and systems.
4. Identify, formulate, and solve engineering problems.
5. Learn to communicate effectively.

How to Succeed in this Course:

- Complete all assigned readings in the course
- Complete all assigned reports in a timely manner

Assignments and Expectations:

Lab Reports (100%): In this course, you need to complete lab reports, that are due on the day of the course (Tuesday/Thursday) by midnight on the weeks they are assigned. You will upload one lab report as a group as a .PDF file type to blackboard each week they are due, which demonstrates your understanding of the experiments. A rubric for the report is as follows in part 4.

Report Content:

1. Title Page (experiment title, *all* names, the completed section by name date due)
2. Abstract
3. Introduction
4. List of Equipment
5. Theory (includes drawings and descriptions)
6. Experimental Procedures
7. Results (includes calculation of experimental results; figures, graphs and tables must be labeled with a number and a caption; units, and all numerical quantities must be included)
8. Discussion (trends in the results, comparison with theoretical predictions)
9. Error Analysis
10. Conclusions
11. References (if you have them)
12. Appendices (handwritten calculations, spreadsheet calculations, and other data)

Reports must be typed with a 12 pt font and double-spaced. Graphs of data must be computer generated using a software such as Excel.

Lab Reports

- 1. Lab 1:** Determination of Material Properties: Young's Modulus and Poisson's Ratio
- 2. Lab 2:** Natural Vibration Modes of a Cantilever Beam
- 3. Lab 3:** Labview Based Instrumentation to Calibrate a Linear Variable Differential Transformer, and DC voltage and AC Signal Measurements
- 4. Lab 4:** Photoelastic Stress Analysis of Beams
- 5. Lab 5:** Shadow Moiré Method for Shape Measurement, and Optical Metrology
- 6. Lab 6:** Determination of Material Properties: Shear Modulus and Material Fatigue
- 7. Lab 7:** Structural Instability
- 8. Lab 8:** Straightness Measurement of Linear Motion
- 9. Lab 9:** Digital Image Correlation/Digital Speckle Photography Techniques
- 10. Lab 10:** Photoelasticity for Stress Concentration Analysis

Part 3: Course Schedule

LIST FORMAT

- **Learning Module 1 Introduction part 1 Labs 1-5**
 - Learning Objectives
 - Introduction to the course
 - Design and conduct experiments and interpret data.
 - Identify, formulate, and solve engineering problems.
 - Read/Listen:
 - begin to read over the lab manual provided on blackboard, emphasis on writing lab reports for MEC 316, time saving tips, error analysis, and the uncertainty tree: towards a more enjoyable error analysis
 - Complete:
 - Form groups of 3 or 4 students, before next week, using online signup sheet
 - Coming Up:
 - Labs 1- 5 begin.
- **Learning Module 2 Labs 1-5**
 - Learning Objectives
 - Learn to apply mathematics, physics, and engineering principles to measurement problems in mechanical engineering pertaining to the mechanics of solids.
 - Design and conduct experiments and interpret data.
 - Learn modern measurement techniques as applied to mechanical structures and systems.
 - Learn to communicate effectively.
 - Read/Listen:
 - *Lab manual labs 1-5*
 - Recorded Lecture/Experimentation videos for the corresponding lab, Blackboard
 - Complete:
 - Lab reports for one group
 - Coming Up:
 - Introduction part 2 Labs 6-10
- **Learning Module 3: Introduction part 2 Labs 6-10**
 - Learning Objectives
 - Introduction to the course
 - Design and conduct experiments and interpret data.

- Identify, formulate, and solve engineering problems.
- Coming Up:
 - Labs 6 - 10 begin.
- **Learning Module 4 Labs 6-10**
 - Learning Objectives
 - Learn to apply mathematics, physics, and engineering principles to measurement problems in mechanical engineering pertaining to the mechanics of solids.
 - Design and conduct experiments and interpret data.
 - Learn modern measurement techniques as applied to mechanical structures and systems;
 - Learn to communicate effectively.
 - Read/Listen:
 - *Lab manual labs 6-10*
 - Recorded Lecture/Experimentation videos for the corresponding lab, Blackboard
 - Complete:
 - Lab reports for **each** group
 - Coming Up:
 - Course completion

Part 4: Grading, Attendance, and Late Work Policies

Assessment & Grading:

Viewing Grades on Blackboard: Points you've earned for graded activities will be posted to the MyGrades screen in the Tools area of Blackboard.

In this course, you will be assessed on the following:

Percentage/Points	Activity/Assignment
100	Lab Reports
100	Total Possible

Report Rubric

Abstract (5 points)
Introduction (5 points)
List of Equipment (5 points)
Theory (10 points)
Experimental Procedure (10 points)
Results (15 points)
Discussion (15 points)
Error Analysis & Tree (15 points)
Conclusion (5 points)
Quality of Writing (15 points)
Clarity (5 points)
Style (5 points)
Format (5 points)
Total (100 points)

Letter Grades:

Final grades assigned for this course will be based on the percentage of total points earned and are assigned as follows:

A (100-94)	A- (93-90)	B+ (89-87)	B (86-82)
B- (81-79)	C+ (78-76)	C (75-72)	C- (71-68)
D+ (67-64)	D (63-60)	F (59 or below)	

Late Work Policy:

I will accept late work only in extenuating circumstances, with requisite proof to verify this circumstance. Discuss with your group members if something comes up, then contact the instructor/TAs.

Part 5: 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 me for approval as far in advance as possible.

Course Materials and Copyright Statement:

Course material accessed from Blackboard, SB Connect, SB Capture 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 and/or the copyright holder. Duplication of materials protected by copyright, without permission of the copyright holder is a violation of the Federal copyright law, as well as a violation of Stony Brook's Academic Integrity.

Online Communication Guidelines and Learning Resources:

Maintain Professional Conduct Both in the Classroom and Online: The classroom is a professional environment where academic debate and learning take place. I will make every effort to make this environment safe for you to share your opinions, ideas, and beliefs. In return, you are expected to respect the opinions, ideas, and beliefs of other students—both in the face-to-face classroom and online communication. Students have the right and privilege to learn in the class, free from harassment and disruption. The course follows the standards set in the Student Code of Conduct, and students are subject to disciplinary action for violation of that code. If your behavior does not follow the course etiquette standards stated below, the grade you receive for a posting may suffer. I reserve the right to remove any discussion messages that display inappropriate language or content.

Online Post Etiquette:

- Offensive language or rudeness will not be tolerated. Discuss ideas, not the person.
- Avoid cluttering your messages with excessive emphasis (stars, arrows, exclamations).
- If you are responding to a message, include the relevant part of the original message in your reply, or make sure to refer to the original's contents so as to avoid confusion;
- Be specific and clear, especially when asking questions.
- Use standard punctuation and capitalization. Using all UPPERCASE characters gives the appearance of shouting and makes the message less legible;
- Remember that not all readers have English as their native language, so make allowances for possible misunderstandings and unintended discourtesies.

Online Classes Require Better Communication: It is important to remember that we will not have the non-verbal cues that occur in a face-to-face classroom. I cannot see the confused, frustrated, or unhappy expressions on your face if you encounter problems. **You MUST communicate with me so that I can help.** To make the experience go smoothly, remember that you're responsible for initiating more contact, and being direct, persistent, and vocal when you don't understand something.

My Role as the Instructor: As the instructor, I will serve as a "guide" in terms of the Discussion Board. While I will not respond to every post, I will read what is posted, and reply when necessary. Expect instructor posts in the following situations:

- To assist each of you when it comes to making connections between discussion, lectures, and textbook material.
- To fill in important things that may have been missed.
- To re-direct discussion when it gets "out of hand".
- To point out key points or to identify valuable posts.

Student Learning Resources:

- **Academic and Transfer Advising Services:** Have questions about choosing the right course? Contact an advisor today. Phone: (631) 632-7082 (option 2); email: advising@stonybrook.edu; website: <http://www.stonybrook.edu/commcms/advising/>
- **Amazon @ Stony Brook:** Order your books before classes begin. Phone: (631) 632-9828; email: Bookstore.Liaison@stonybrook.edu; website: <http://www.stonybrook.edu/commcms/bookstore/>
- **Bursar:** For help with billing and payment. Phone: (631) 632-9316; email: bursar@stonybrook.edu; website: <http://www.stonybrook.edu/bursar/>

- **Career Center** The Career Center's mission is to support the academic mission of Stony Brook University by educating students about the career decision-making process, helping them plan and attain their career goals, and assisting with their smooth transition to the workplace or further education. Phone: (631) 632-6810; email: sbucareercenter@stonybrook.edu; Website: <http://www.stonybrook.edu/career-center/>
- **Counseling and Psychological Services**: CAPS staff are available by phone, day or night. <http://studentaffairs.stonybrook.edu/caps/>
- **Disability Support Services**: Students in need of special accommodations should contact DSS. Phone: (631) 632-6748; email: dss@stonybrook.edu; <http://www.stonybrook.edu/commcms/studentaffairs/dss/>
- **Library**: Access to online databases, electronic journals, eBooks, and more!
 - **Library Instruction Website** - <http://library.stonybrook.edu/workshops-this-week-citation-skills-worldcat-and-endnote-the-hsc/>
 - **SBU Library Research Guides and Tutorials** <http://library.stonybrook.edu/research/research-basics/>
- **Registrar**: Having a registration issue? Let them know. Phone: (631) 632-6175; email: registrar_office@stonybrook.edu; <http://www.stonybrook.edu/commcms/registrar/>
- **Writing Center**: Students are able to schedule face-to-face and online appointments. <https://www.stonybrook.edu/writingcenter/>
- **Support for Online Learning** <http://www.stonybrook.edu/commcms/onlineed/student.html>
- **Ombuds Office** The Stony Brook University Ombuds Office provides an alternative channel for confidential, impartial, independent and informal dispute resolution services for the entire University community. We provide a safe place to voice your concerns and explore options for productive conflict management and resolution. The Ombuds Office is a source of confidential advice and information about University policies and procedures and helps individuals and groups address university-related conflicts and concerns. <http://www.stonybrook.edu/ombuds/>