COURSE TITLE: MEC410 Design of Machine Elements, Spring 2020 (3 credits)

PREREQUISITES: MEC310, MEC363

BLACKBOARD http://blackboard.stonybrook.edu

LECTURE: 5:30 – 6:50 PM, Mon, Wed; Room: Engineering 143
INSTRUCTOR: Jay Mendelson, Professor email: jay.mendelson@stonybrook.edu
OFFICE: Light Engineering 171
OFFICE HOURS: Mon 3:30PM - 5:00PM
TA: Aditya Patankar email: Aditya.Patankar@stonybrook.edu office hours by appointment

Catalog Data: Application of analytical methods, material science, and mechanics to problems in design and analysis of machine components. Includes the design of mechanical components such as bearings, gears, shafting, springs, fasteners, belts, clutches, and brakes, and takes into consideration factors such as manufacturability and reliability. Design projects with open-ended and interactive problems are assigned to integrate several machine elements in a system.

ASSIGNMENTS: (i) Homework problems are due one week after they are assigned; Homework is to be done in either MS-Excel or Google Sheets software. Solutions will be posted one day after the due date. Late homework will not be accepted. Written reports are expected for all design projects.


EXAMINATIONS: 2 Midterms (in class, 80 minutes)
1 Final, to be scheduled during finals week in May 2019
All exams are scheduled in class, using student prepared equation sheets and a calculator

Make-up exams must be arranged prior to the exams. Make-up exam policy is consistent with university policy on:

(1) Student Participation in University Sponsored Events
http://sb.cc.stonybrook.edu/bulletin/current/policiesandregulations/policies_expectations/participation_univsponsored_activities.php

(2) University policy on Final Exams:
http://sb.cc.stonybrook.edu/bulletin/current/policiesandregulations/records_registration/final_examinations.php

(3) New York State Education Law regarding Equivalent Opportunity and Religious Absences
http://sb.cc.stonybrook.edu/bulletin/current/policiesandregulations/policies_expectations/equivalopportunity_religiousabsences.php
Allowed Calculators: Following the Mechanical Engineering Department’s mandatory calculator policy, only the following calculators will be allowed to be used on all exams. There will be no exceptions.

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

More details are found in the document.

Calculators 2019.pdf

This list of calculators is identical to that allowed for the National Council for Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering (FE) exam that many of you will take in your senior year, as well as the Professional Engineering (PE) exam that you may take several years from now.

Grading Scale: Semester letter grade is based upon the grading scale for your aggregate grade.

<table>
<thead>
<tr>
<th>Grade Letter</th>
<th>Grade Interval</th>
<th>Grade Interval</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>92 ≤ A ≤ 100</td>
<td>70 ≤ C+ &lt; 66</td>
</tr>
<tr>
<td>A-</td>
<td>92 ≤ A- &lt; 86</td>
<td>66 ≤ C &lt; 62</td>
</tr>
<tr>
<td>B+</td>
<td>80 ≤ B+ &lt; 86</td>
<td>58 ≤ C- &lt; 62</td>
</tr>
<tr>
<td>B</td>
<td>75 ≤ B &lt; 80</td>
<td>54 ≤ D+ &lt; 58</td>
</tr>
<tr>
<td>B-</td>
<td>75 ≤ B- &lt; 70</td>
<td>51 ≤ D &lt; 54</td>
</tr>
<tr>
<td>C</td>
<td>0 ≤ F &lt; 51</td>
<td></td>
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</tbody>
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The aggregate grade is determined from:

Homework assignments 10%
Two Design projects 5% each, 10% total
Two Midterm exams 20% each, 40% total
Final exam 40%

Note: Homework and Design projects are done in either MS-Excel or Google Sheets uploaded to Blackboard, with data from these projects entered into the automatic grading system

Your attendance is required, and is a part of your final grade. **If you miss 1/3 or more of the classes, you will be penalized one letter grade on your final grade for the class.**
## ABET Course Learning Objectives:

<table>
<thead>
<tr>
<th>COURSE LEARNING OBJECTIVES</th>
<th>ASSESSMENT TOOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Know how to design shafts and axles to prevent mechanical failure under a given load.</td>
<td>Exams, Project</td>
</tr>
<tr>
<td>2. Know how to analyze clutches and brakes in loaded shafts and axles.</td>
<td>Exams</td>
</tr>
<tr>
<td>3. Understand the principles of bolted joints.</td>
<td>Exams, Project</td>
</tr>
<tr>
<td>4. Know how to analyze a joint in bending and shear.</td>
<td>Exams, Project</td>
</tr>
<tr>
<td>5. Understand the concepts of welded joints and permanent joints.</td>
<td>Exams, Project</td>
</tr>
<tr>
<td>6. Know how to design a mechanical spring.</td>
<td>Exams, Project</td>
</tr>
<tr>
<td>7. Know how to analyze forces associated with a gear or gear trains.</td>
<td>Exams, Project</td>
</tr>
<tr>
<td>8. Know how to size a gear based on bending stress &amp; surface wear.</td>
<td>Exams, Project</td>
</tr>
<tr>
<td>9. Know how to design belt transmission system.</td>
<td>Exams</td>
</tr>
</tbody>
</table>

### COURSE TOPICS
1. Machine Design for Different Types of Loading
2. Belt and Chain Drives
3. Kinematics of Gears
4. Spur Gears
5. Helical, Bevel and Worm Gears
6. Keys, Couplings and Seals
7. Design of Shaft
8. Tolerances
9. Rolling contact bearings
10. Design of a Power Transmission System
11. Linear Motion Elements
12. Springs
13. Fasteners
14. Welded and Mechanically assembled frames
15. Specification of AC and DC motors
16. Design of brakes and clutches

1. The Bachelor of Science (B.S.) degree program of Mechanical Engineering is accredited by the Engineering Accreditation Commission of ABET, [http://www.abet.org](http://www.abet.org).

### Tentative Course Outline and Assignments:
Usage of Blackboard

Students are required to use Blackboard, where important announcements, slides, homework, assignments, and supplementary materials of the course are posted. We will be using the automatic grading capability of Blackboard to grade homework and projects. Anti-plagiarism software will be used to guarantee that all students do their own work in accordance to Stonybrook policies as stated in the section below on ACADEMIC INTEGRITY.

http://blackboard.stonybrook.edu

Use your NetID and password to login. You can also call the Blackboard Support Team at: 631-632-2777 or e-mail: blackboard@stonybrook.edu for further information.
Important Copyright Notice: The materials in this course available online through Blackboard or other online channels are for the exclusive use of registered students currently enrolled in this course, and may not be retained or further distributed. In addition to legal sanctions, violation of these copyright prohibitions may result in University disciplinary action.

Various University Policies and Statements

**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.

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](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 is 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](http://www.stonybrook.edu/commcms/academic_integrity/index.html)

**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.