Title of Course: Engineering Mechanics I  
Semester:  
Credits: 3

Course Description
This course is a three-dimensional vector treatment of the static equilibrium of particles and rigid bodies. The topics include: Equivalent force and couple system; analysis of beams, trusses, frames and machines, friction, impending motion, method of virtual work and stability of equilibrium.

Prerequisites/Co-requisites
ESC 130, MAT 302, PHY 215 and SCI 120 or departmental approval

Learning Outcomes

<table>
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<tr>
<th>Course Student Learning Outcomes</th>
<th>Measurements (means of assessment the learning outcomes listed in first column)</th>
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<td>Students will be able:</td>
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<tr>
<td>To perform analysis of an engineering system, draw the free body diagram, introducing all reaction forces at the supports.</td>
<td>Graded statics problems involving application of Concentrated and distributed forces: exam questions and problems.</td>
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<td>To understand the condition of static equilibrium and calculate the reaction at the supports</td>
<td>Graded laboratory report where students will experimentally determine reactions at the supports, subsequently comparing them with theoretical reactions calculated using equilibrium equations</td>
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<tr>
<td>To represent given forces and moments as vectors.</td>
<td>Graded exam problems and questions, containing step-by-step calculations necessary to represent given forces and moments as vectors.</td>
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| To solve two and three-dimensional statics problems and apply fundamental laws of mechanics to solve practical problems | a. Graded laboratory report containing both: the experimental and theoretical solutions for a 3D static problem;  
b. Graded exam questions and problems. |

The Program Outcomes

<table>
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<tr>
<th>Students will:</th>
<th>Measurements</th>
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<tr>
<td>Analyze practical engineering problems and apply creative thinking to solve them</td>
<td>Graded statics problems involving application of concentrated and distributed forces: exam questions and problems.</td>
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<tr>
<td>Demonstrate advanced science and mathematical skills</td>
<td>Graded exam problems and questions, containing step-by-step calculations necessary to represent given forces and moments as vectors.</td>
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</table>
This syllabus is provided as a general informational guide. Some of the information may vary depending on the specific course section and instructor. Different sections of the same course may require different textbooks. Verify the section specific textbook information in the CUNY's Academic Course Schedule Web Page. Modifications of the grading system presented here will be communicated by the instructors of the sections when they meet the class.

Required Text & Readings

Laboratory Manual and Study Guide

Use of Technology (if applicable)

Evaluation & Requirements of Students
45\% Tests
25\% Final Examination
20\% Laboratory Reports
10\% Home works and Class Participation

There will be three one hour examinations (15\% each, total 45\%) and comprehensive final examination (25\%) .

Outline of Topics

1. \textbf{Statics of Particles} \hspace{1cm} \textbf{1 week}

Forces in a space. Rectangular components of a Force; Addition and subtraction of vectors (forces) in space. Equilibrium of a particle in Space. Reading Assignment: Beer & Johnston 2.12 to 2.15

2. \textbf{Rigid Bodies} \hspace{1cm} \textbf{1 week}

3. \textbf{Equivalent Force Systems:} \hspace{1cm} \textbf{1 week}
Couples as Vectors. Reduction of a force system to one force and one couple. Equivalent system of forces. Reduction of a force system to a single force. Reading Assignment: Beer & Johnston 3.15 to 3.20

4. \textbf{Equilibrium of Rigid Bodies:} \hspace{1cm} \textbf{2 weeks}

Equilibrium in three dimensions: Reaction at supports and connections for a three dimensional structure. Equilibrium of a rigid body in three dimensions. Reading Assignment: Beer & Johnston 4.8 to 4.9

5. \textbf{Distributed Forces: Centroid and Center of Gravity:} \hspace{1cm} \textbf{1 week}
Center of gravity. Centroids of area and lines. Composite plates. Determination of centroids by integration. Theorem of Pappus-Guldinus. Distributed forces in beams and structures. Reading Assignment: Beer & Johnston 5.1 to 5.8

6. \textbf{Engineering Stuctures:} \hspace{1cm} \textbf{1-1/2 week}
7. Forces in Beams: 1 week
Internal forces in members. Types of loads and supports. Axial and shear forces, and bending moment in a beam.
Reading Assignment: Beer & Johnston 7.1 to 7.6

8. Friction Forces: 1-1/2 weeks
Laws of Coulomb (dry) friction. Simple contact friction problems.
Rolling resistance. Belt Friction
Reading Assignment: Beer & Johnston 8.1 to 8.4, 8.7 to 8.10

9. Distributed Forces, Moments of Inertia: 1-1/2 weeks
Second moments or Moment of inertia of a plane area. Polar moments of inertia. Parallel axis Theorem. Moments of inertia of composite areas.
Reading Assignment: Beer & Johnston 9.1 to 9.7

10. Method of Virtual Work: 1-1/2 weeks
Reading Assignment: Beer & Johnston 10.1 to 10.4, 10.8, 10.9

11. Kinematics of a Particle*: 1 week
Curvilinear Motion of a Particle: Position vector, velocity and acceleration. Differentiation of a vector function with respect to time.

Class Participation
Participation in the academic activity of each course is a significant component of the learning process and plays a major role in determining overall student academic achievement. Academic activities may include, but are not limited to, attending class, submitting assignments, engaging in in-class or online activities, taking exams, and/or participating in group work. Each instructor has the right to establish their own class participation policy, and it is each student’s responsibility to be familiar with and follow the participation policies for each course.

BMCC Mask Mandate Policy for In-Person Classes
CUNY has put in place a temporary mask mandate policy that requires the wearing of masks indoors in all campus buildings. See: https://www.cuny.edu/coronavirus/university-updates/clarity-new-mask/

Face masks help prevent the spread of COVID-19. As it is possible to have or carry the coronavirus without having or showing symptoms, it is necessary for every person in our community to wear a mask even if you are fully vaccinated and/or have tested negative for COVID19, or think you are completely healthy. For appropriate/acceptable masks and guidelines on use, see CDC guidelines at: https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html.

While the mask mandate is in effect, the following will apply to all in-person classes (including in-person classes associated with hybrid courses):

- In a classroom, if a fully vaccinated instructor is teaching a class and can maintain social distance from all others in the classroom, he/she may choose not to wear a mask (subject to any additional Department guidelines regarding the use of face shields or other layers of protection).
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- Students who attempt to enter a classroom without wearing masks will be asked by the instructor to put on their masks before entering. Students who remove their masks during a class session will be asked by the instructor to put on their masks. Masks will be available for distribution for those who need one.
- Students may remove their masks momentarily during class (to drink something quickly), in classrooms other than labs, but must replace their masks immediately after that. The consumption of food is not permitted in any classroom or lab.
- Students who are not fully vaccinated are also required to maintain social distancing between themselves and all others in a classroom.

BMCC Policy on Plagiarism and Academic Integrity Statement
Plagiarism is the presentation of someone else’s ideas, words or artistic, scientific, or technical work as one’s own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism. Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC’s Web site, www.bmcc.cuny.edu. For further information on integrity and behavior, please consult the college bulletin (also available online).

FREE BMCC STUDENT SUPPORT SERVICES
BMCC is committed to the health and well-being of all students. It is common for everyone to seek assistance at some point in their life, and there are free and confidential services on campus that can help.

Advocacy and Resource Center (ARC) https://www.bmcc.cuny.edu/student-affairs/arc/ room S230, 212-220-8195, arc@bmcc.cuny.edu. If you are having problems with food or housing insecurity, finances, health insurance or anything else that might get in the way of your studies at BMCC, contact the Advocacy and Resource Center (formerly Single Stop) for assistance. Please contact us at arc@bmcc.cuny.edu, call 212-220-8195, or come by the office at room S230. You may also contact the Office of Student Affairs, S350, 212-220-8130, studentaffairs@bmcc.cuny.edu, for assistance.

Counseling Center www.bmcc.cuny.edu/counseling, room S343, 212-220-8140, counselingcenter@bmcc.cuny.edu. Counselors assist students in addressing psychological and adjustment issues (i.e., depression, anxiety, and relationships) and can help with stress, time management and more. Counselors are available for walk-in visits.

Office of Compliance and Diversity https://www.bmcc.cuny.edu/about-bmcc/compliance-diversity, room S701, 212-220-1236. BMCC is committed to promoting a diverse and inclusive learning environment free of unlawful discrimination/harassment, including sexual harassment, where all students are treated fairly. For information about BMCC’s policies and resources, or to request additional assistance in this area, please visit or call the office, or email olevy@bmcc.cuny.edu, or twade@bmcc.cuny.edu. If you need immediate assistance, please contact BMCC Public safety at 212-220-8080.
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**Office of Accessibility** [www.bmcc.cuny.edu/accessibility](http://www.bmcc.cuny.edu/accessibility), Students who need academic accommodations in connection with a disability must initiate the request with BMCC’s Office of Accessibility (OA). Students need to register with the Office of Accessibility in order to officially disclose their disability status to the College and to determine eligibility for appropriate reasonable accommodations (including any prior IEPs or 504s). Please contact the OA at the start of the semester (or as soon as possible) to coordinate any accommodation request/s: [www.bmcc.cuny.edu/accessibility](http://www.bmcc.cuny.edu/accessibility), Room N360 (accessible entrance: 77 Harrison Street), 212-220-8180, accessibility@bmcc.cuny.edu.