

INSTRUCTION: Using the following format, prepare a Teaching portfolio for each of the courses taught. Retain the **blue** coloured headings as it is and enter your details in **black** coloured texts.

Teaching Portfolio

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1) Course Details:

Name: Mechanics **Code:** ME1L001 (L-T-P-C: 3-1-0-4)

Semester: Spring- 2024

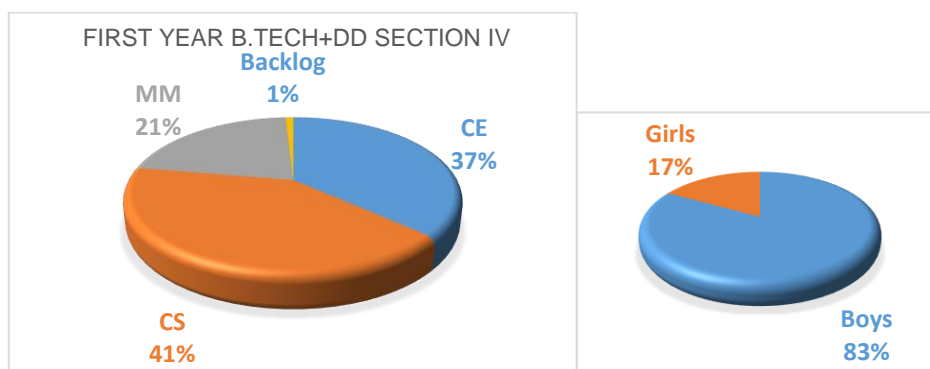
One Text / Reference Book:

Vector Mechanics for Engineers: Statics and Dynamics – Ferdinand P. Beer, E. Russell Johnston, Jr. (TMH)

Course Content (only key topics):

Force systems; Equilibrium; Friction; Kinematics and Kinetics of particles; Properties of areas; Concept of stress and strain; Torsion; Flexural loading; Transformation of stress and strain; Combined loading; Column.

Class composition: 112 students



2) Learning outcomes (mention up to 5 outcomes):

After completing the course, students will be able to:

- Explain the concepts, namely - force, torque, energy, particles, kinematics of particles, rigid body in two dimensions, equilibrium, friction, Mohr's circle for stress, internal forces and bending moments.
- Draw Free Body Diagrams (FBD) for rigid bodies, such as truss, frames, machines and beams.
- Explain the concepts of stress and strain at a point, and the stress-strain relationships for linear, elastic, homogeneous, and isotropic materials.
- Analyse, evaluate and solve practical situations using the above, and using consistent notation and sign conventions.

3) Assessment format:

Assignments (10 marks); Two 1 hr tests (10 marks) – Open book; Mid-sem (30 marks) – Closed book; End-sem (50 marks) – Closed book.

4) Attendance policy:

Latecomers (up to 5 min) were warned and marked. Students who were late by more than 5 min were not allowed to enter the class. The attendance was monitored and students get email alerts if they were absent by more than 2-3 classes. The students having attendance less than 80% were debarred from writing Mid/End Semester examination.

5) Teaching-aids:

Describe briefly usage of chalkboard, projection, multi-media, models, anything else.

Both Chalkboards and Power point presentations are employed. The Power point presentations are shared with students for their ready reference. For better visualization, models of screw jacks, C-clamp, truss, beams with different support conditions, etc were demonstrated in the class.

6) Activities and fraction of class time spent on these (Reference - bookend lecture model):

Details of classes conducted in Active Collaborative Learning (ACL) Classrooms

Room No	Date	Duration		Nature of activities
		From	To	
L02M	22.02.24	09:00 am	10:00 am	For each round table, the students were divided up into groups of three. Each group was given a critical thinking level problem on the concept of stress & strain, which they were expected to solve in at least two different ways. The basic ideas underlying the solutions techniques should be explained by each group. Every group member should also provide an example of a related practical problem that can be solved using with these methods.
L02M	29.02.24	09:00 am	10:00 am	

Details of activities in other classes

Lecture Class: Generally, whenever a new topic was discussed, it was announced beforehand. After giving an introduction for about 10-12 min, 3-4 min were spared for mutual discussion and clarification of doubts, if any. The lecture continued for another 18-20 min. Doubts / queries, if any, were addressed and example problems were solved to know the applications of the discussed concept (10-15 min).

Tutorial Class: Assignments related to the topics discussed in the preceding lecture classes were shared before the tutorial session. Four TAs are assigned with a group of 12-15 students each, who act as mentors, interact, and help them to understand concepts in a better way through closer interaction and problem-solving. They also interacted outside the class and remained connected using WhatsApp groups. Many times, the students were asked to solve new and challenging problems on the board, discuss the solution, and clear the doubts of other students.

7) Concepts / principles taught with either analogies or multiple points of view:

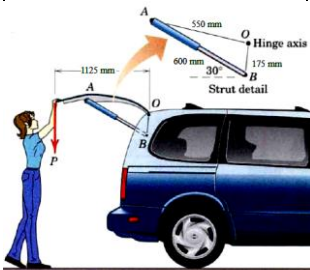
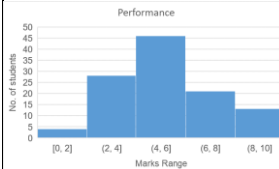
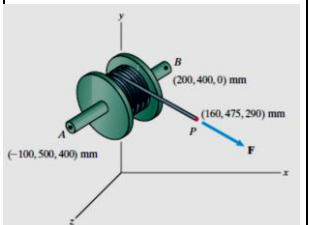
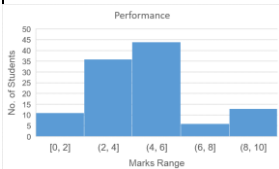
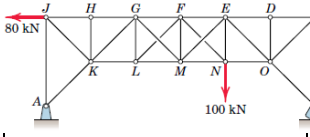
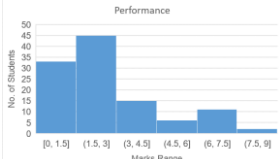
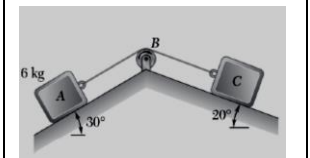
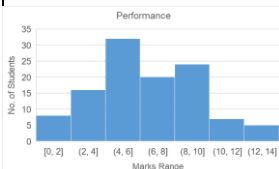
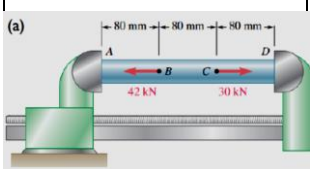
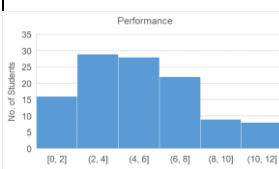
Application of friction force: Square-threaded screws are commonly seen in presses, screw jacks, and other devices. An analogy to the analysis of threaded screws is the manner in which blocks slide on inclined planes. To have a large mechanical advantage, an inclined plane should have a long base with a gentle slope, if a block is considered to be moved up the incline to reach a particular height. An inclination with such a long base would require a lot of space in practical applications. Therefore, screws can be thought of as an inclined plane that is wrapped around a central cylinder, providing a large mechanical advantage.

8) Up to 5 most significant questions asked by students (give Roll no. and name):

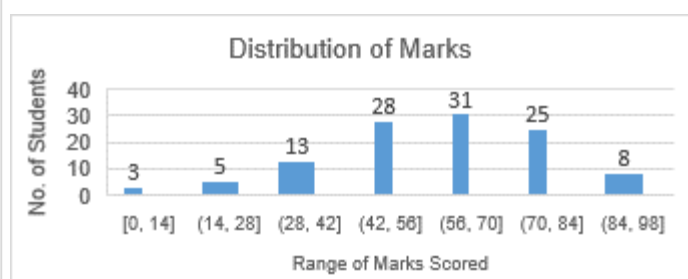
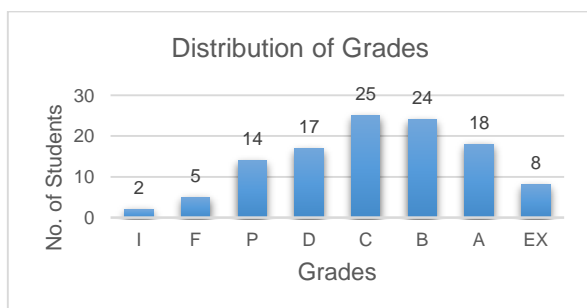
Include questions which made you think, and you could not answer immediately.

Question	Student name & Roll no
How to identify zero-force members in truss? If the member force is zero, then why is it required in the structure?	Anurag Mishra 23CE01005
Equivalent force-couple system and wrench system	Shatadeep De 23CE01052
Cause of failure of brittle materials like chalk in torsion and tension	Sukirti Garg 23CE02009
How to identify the point of contra-flexure in bending of beam?	Shashank M N 23CS02010
Sign convention of shear stress in Mohr's Circle problems	Utkarsh Malhotra 23MM01025

9) Up to 5 critical thinking level questions from assignments and examinations together with the marks, answering time and student performance:

Assignment questions		Time & Marks	Performance
It is desired that a person be able to begin closing the van hatch from the open position shown with a 40 N vertical force P. As a design exercise, determine the necessary force in each of the two hydraulic struts AB. The mass center of the 40 kg door is 37.5 mm directly below point A. Treat the problem as two dimensional.		90 min 10 marks	
The magnitude of the force F is 0.2 N and its direction cosines are $\cos \theta_x = 0.727$, $\cos \theta_y = 0.364$, and $\cos \theta_z = 0.582$. Determine the magnitude of the moment of F about the axis AB of the spool.		90 min 10 marks	
The truss shown is composed of 450 right triangles. The crossed members in the center two panels are slender tie rods incapable of supporting compression. Retain the two rods which are under tension and compute the magnitudes of their tensions. Also find the force in member MN.		60 min 10 marks	
Blocks A and C are connected by a rope that passes over drum B. Knowing that the drum rotates slowly clockwise and that the coefficients of friction at all surfaces are $\mu_s = 0.30$ and $\mu_k = 0.20$, determine the smallest mass of block C for which block A (a) will remain at rest, (b) will be in impending motion up the incline, (c) will move up the incline at a constant speed.		45 min 10 marks	
Examination questions		Time & Marks	Performance
A steel tube ($E = 200$ GPa) with a 32 mm outer diameter and a 4 mm wall thickness is placed in a vise, which is adjusted so that its jaws just touch the ends of the tube without exerting pressure on them, see Fig. 3(a). The two forces shown are then applied to the tube. After these forces are applied, the vise is adjusted to decrease the distance between its jaws by 0.2 mm. Determine (a) the forces exerted by the vise on the tube at A and D, (b) the change in length of portion BC of the tube.		30 min 15 marks	

10) Overall student performance and grading policy:



11) Feedback provided to the students on their performance in the assignments, examinations and activities:

Assignments and examinations were evaluated. Mistakes committed were pointed out in the answer paper for every student. In the class, correct solutions were given including the steps, possible reasons for the mistakes were explained, and methods to avoid them in future were suggested. There are more ways of giving feedback.

12) Students' feedback on teaching:

Registration time perception:

Statement	The faculty handling the course teaches well.	The course contents are exciting.
Response	<p>Strongly Disagree (0.97%) Disagree (4.37%) Neutral (15.53%) Agree (46.60%) Strongly Agree (32.52%)</p> <p>Total Responses: 206 Score: 0.76 out of 1</p>	<p>Strongly Disagree (0.00%) Disagree (1.94%) Neutral (16.99%) Agree (50.97%) Strongly Agree (30.10%)</p> <p>Total Responses: 206 Score: 0.77 out of 1</p>

Perception and Feedback at the end of the course:

Statement	The faculty handling the course taught well.	The course contents were exciting.
Response	<p>Strongly Disagree (2.63%) = 3 Disagree (0.88%) = 1 Neutral (7.02%) = 8 Agree (28.95%) = 33 Strongly Agree (60.53%) = 69</p> <p>Score: 0.86 out of 1</p>	<p>Strongly Disagree (3.51%) = 4 Disagree (0%) = 0 Neutral (10.53%) = 12 Agree (35.09%) = 40 Strongly Agree (50.88%) = 58</p> <p>Score: 0.82 out of 1</p>

Descriptive comments at the end of the course (mention up to 5 significant comments):

Comments included here should be verbatim. A comment that reflects three or more comments with almost identical meanings should be included here.

Aspects of the course and the teacher that need improvement.

1. More and more number of questions to be solved in the class for better understanding of subject.
2. Speed can be improved a bit
3. Too strict about the attendance
4. Some more assignments could have been given to learn more about applications of mechanics in real life.
5. I see no improvement other than more teaching hours for mechanics as the course length is big as compared to time given

What I like most about the course and the teacher.

1. The course was interesting as it contained the study about uses of mechanics in our daily lives. The teacher has taught all the concepts very well. He always clears the doubts even after discussing it multiple times in the class. He has been very supportive regarding the assignments also.
2. Sir explained each topic in such a way that a student like me who was scared of Mechanics understood the subject pretty well. He was a bit strict but yeah he teaches very well. Not only

theory and numerical, he showed the real life applications of each concept which I liked the most. He is a very good teacher.

3. Problems are straight out discussed on real world application making this subject most interesting out of all subjects in this semester. Concepts were explained in detail also providing proofs, appropriate no. of problems were discussed in tutorial.
4. sir is punctual and disciplined. His strictness made us disciplined and consistent to classes.
5. The use of the combination of the slides and the board is best. It saves a lot of time instead of writing long notes. Sir sends notes after the class which is very useful.

13) Identifying and dealing with students who are either gifted or need special attention because of low performance or psychological problems:

Mention if you identified a student who needed professional counselling.

Student name	Roll no	Manner of identification	Nature of attention provided
XXXX (Gifted student)	YYYY	ZZZZ	UUUU
Mekala Rupesh	23MM02007	These backlog students had very low attendance and poor performance in mid-semester exam.	<p>Their absence was looked into, and appropriate counselling was given. Doubt clearing sessions were conducted based on mutually available free slots beyond class hours. They were asked to regularly interact with the designated TAs.</p> <p>Aswin, Vansh Raj, and Swastik performed better on the end-semester examination and received a "P" grade. Other students were unable to pass. Amrutha Sai scored "D" grade in the supplementary examination held in July.</p>
Nilabja Mandal	23MM02008		
Vansh Raj Gupta	23CE01061		
Ponnada Amrutha Sai	23CS01050		
Aswin Roy	23CE02028		
Swastik Venkatraman Hegde	23MM02012		
Manas Bajpai	23MM01013	I contacted his faculty advisor since he had low attendance. Advisor said that he was receiving medical treatment.	I advised him to take a break for medical treatment. When he returned after break, examinations had started. Hence, I advised him to register for the next semester. This semester, he has been consistently present in class.
Ajjarapu B. B. Vardhan	22CE02006	He is a backlog student who registered for this course, but faced difficulty in attending classes due to an overlap with another course in the same slot.	He took the other course but interacted with the TAs of my course who took extra sessions to help him understand various topics. He was unable to write the end-semester examination. He did however, show up for the July supplementary examination and scored a 'P' grade.

14) Anything else

15) Peer / Experts' feedback on teaching

16) Performance of students in the follow-on course

17) Performance of students in real life