# COURSE SYLLABUS AND COURSE REQUIREMENTS
# ACADEMIC YEAR 26/27 AUTUMN

| | |
|---|---|
| *Course title* | *Mechanics I (Statics)* |
| *Course Code* | *MSB112AN* |
| *Hours/Week: le/pr/lab* | 1/3/0 |
| *ECTS* | 5 |
| *Degree Programme* | Mechanical Engineering BSc |
| *Study Mode* | *Full-time, in-person* |
| *Requirements* | Exam |
| *Teaching Period* | 26/27 autumn |
| *Prerequisites* | N/A |
| *Department(s)* | Department of Mechanical Engineering |
| *Course Director* | *Dr. Ferenc Orbán* |
| *Teaching Staff* | *Dr. Dávid Csonka, PhD, Dr. Boldizsár Kurilla PhD* |

## COURSE DESCRIPTION

This course introduces the fundamental principles of engineering statics, with an emphasis on the analysis of forces acting on bodies in equilibrium. Students develop proficiency in vector operations, force and moment calculations, and the analysis of two- and three-dimensional force systems. Topics include the determination of resultants, equilibrium of particles and rigid bodies, free-body diagrams, and distributed loading. The course also examines the internal effects of loading through the development of shear force and bending moment diagrams for beams. Throughout the course, students apply analytical problem-solving techniques to engineering applications, providing a foundation for subsequent studies in mechanics, structural analysis and design.

## SYLLABUS

### 1. GOALS AND OBJECTIVES

Specific, measurable student behavioural learning objectives.
Students should acquire an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

Upon completion of the course, the student must be able to,
- Describe force and moment systems and identify all unknown loads as applied to statically determinate rigid bodies.
- Analyse statically determinate beams, trusses, frames, machines, and systems with friction forces.
- Introduce section properties.
- Draw shear and moment diagrams for statically determinate beams, frames, and machines under given loads.

### 2. COURSE CONTENT

| | **TOPICS** |
|---|---|
| **LECTURE, PRATICE, LAB** | 1. *Force Systems*<br>2. *Equilibrium*<br>3. *Trusses*<br>4. *Beams and frames*<br>5. *Compound beams*<br>6. *Internal force diagrams*<br>7. *Gerber girder*<br>8. *Friction*<br>9. *Centroids* |

## DETAILED SYLLABUS AND COURSE SCHEDULE, TENTATIVE

*UNFORESEEABLE CIRCUMSTANCES MIGHT AFFECT THE SCHEDULE BELOW. ACADEMIC HOLIDAYS INCLUDED*

***LECTURE***

| *week* | **Topic** | **Compulsory reading** | **Required tasks (assignments, tests, etc.)** | **Completion date, due date** |
|---|---|---|---|---|
| *1st* | General requirements. Basic concepts. Force. Force systems. Concurrent forces. Fundamental principles of statics. Moment. Resolution into components. Constraints. | [3] Chapter 1<br>[2] Chapters 1.2; 2.1; 2.2 and 2.3 | | |
| *3rd* | Resultant of parallel forces. Reduction of a force. Equilibrium of three and four forces. Balancing a force with three forces of prescribed directions. Construction and calculation of internal force diagrams for loads consisting of concentrated forces. Beams subjected to distributed loads. Relationship between loading and internal force diagrams. Internal force diagrams for concentrated moment loading. Beams under combined loading. | [3] Chapter 1<br>[2] Chapter 3, 4, 7.1 and 7.2 | | |
| *5th* | Internal force diagrams of compound beams. Application of superposition. | [4] Chapter 4<br>[3] Chapter 7 | | |
| *7th* | Planar hinged structures. Trusses. | [4] Chapter 3<br>[3] Chapter 6 | | |
| *9th* | Gerber girder. Planar unstable structures. Cable. | Lecture notes | | |
| *10th* | Friction. Equilibrium with friction. Pin friction in joints. Belt friction. Rolling resistance. Concept of centroid. Centroids of lines and plane areas. | [2] Chapters 5.1, 9.1, 9.2 and 9.3 | | |
| *12th* | | | | |
| *14th* | | | **Make up tests** | |

***PRACTICE***

| *week* | **Topic** | **Compulsory reading** | **Required tasks** | **Completion date** |
|---|---|---|---|---|
| *1st* | Registration | | | |
| *2nd* | Equilibrium of a concurrent force system. Resultant and equilibrium of a planar force system. Equilibrium using one, two, and three forces. | [2] Chapters 1.2; 2.1; 2.2 and 2.3<br>[3] Chapter 2 | | |
| *3rd* | Resultant and equilibrium of a planar force system. Examples of equilibrium using three forces. General force systems | [2] Chapters 1.2; 2.1; 2.2 and 2.3<br>[3] Chapter 2 and 3 | | |
| *4th* | Determination of reactions for cantilever and simply supported beams. Calculation of internal forces at a specified location. Internal force diagrams of beams. | [2] Chapter 3, 4<br>[4] Chapter 4<br>[3] Chapter 7 | | |
| *5th* | Internal force diagrams of beams. | [2] Chapters 7.1, 7.2<br>[4] Chapter 4<br>[3] Chapter 7 | | |
| *6th* | Planar hinged structures, compound beams | Lecture notes | | |
| ***7th*** | | | **1st test** | |
| *8th* | Autumn break | | | |
| *9th* | Trusses | [4] Chapter 3<br>[3] Chapter 6 | | |
| *10t* | Gerber girder | Lecture notes | | |
| *11th* | Gerber girder, friction | [2] Chapter 8 | | |
| *12th* | Friction, rolling resistance, belt friction, pin friction | [2] Chapter 8 | | |
| ***13th*** | | | **2nd test** | |
| *14th* | Centroids of planar shapes | [2] Chapters 5.1, 9.1, 9.2 and 9.3 | | |

## 3. ASSESSMENT AND EVALUATION

**ATTENDANCE**

In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a grade or qualification in the given full-time course if the number of class absences exceeds 30% of the contact hours stipulated in the course description. Online attendance is not available.

***Method for monitoring attendance***

*Attendance lists will monitor attendance. All relevant university regulations apply.*

**ASSESSMENT**

*There will be two midterm tests.*
*No tests scored below 40% can be accepted and must be repeated.*
*Midterm test results cannot be combined.*
*A make-up test is available on the last week.*
*Neatness is part of the grade for all student work.*

***Mid-term assessments, performance evaluation, and their weighting are a prerequisite for taking the final exam***

| Type | Assessment | *Weighting as a proportion of the pre-requisite for taking the exam* |
|---|---|---|
| 1. *Test 1* | *max 25 points* | *40 %* |
| 2. *Test 2* | *max 25 points* | *40 %* |

***Requirements for the end-of-semester signature***

- Each semester test must score at least 40%.
- Regular attendance as per the Code of Studies.

***Re-takes for the end-of-semester signature***

- *A make-up test is available according to the schedule.*

***Type of exam: written***
***The exam is successful if the result is a minimum of 40%***

***Calculation of the grade*** *(TVSz 47§ (3))*

The mid-term performance accounts for 50%, and the performance on the exam accounts for 50% of the final grade calculation.

***Calculation of the final grade based on aggregate performance in percentage.***

| Course grade | Performance in % |
|---|---|
| excellent (5) | 85 % … |
| good (4) | 70 % ... 85 % |
| satisfactory (3) | 55 % ... 70 % |
| pass (2) | 40 % ... 55 % |
| fail (1) | below 40 % |

The lower limit given at each grade belongs to that grade.

## 4. SPECIFIED LITERATURE

**COMPULSORY READING AND AVAILABILITY**

1. Csonka, Dávid; Vasvári, Gyula: **Machine Component Design and Mechanics: Vector Mechanic**s Pécs, Magyarország, DRIVEN project (2022). *Available: https://www.projectdriven.eu/outputs/*
2. F. P. Beer, E. R. Johnston, D. F. Mazurek, P. J. Cornwell, B. P. Self: **Vector Mechanics for Engineers: Statics and Dynamics, 12th edition**; Published by McGraw-Hill Education, 2019. ISBN 978-1-259-63809-1
3. R.C. Hibbeler Engineering Mechanics: Statics (12th Edition) ISBN 978-0136077909
4. R. C. Hibbeler, Structural Analysis, ninth edition, ISBN 978-0-13-394284-2

**RECOMMENDED LITERATURE AND AVAILABILITY**

1. A. Bedford, W. Fowler: **Engineering Mechanics –Statics 5th edition**; Published by Pearson Education Inc. 2008. ISBN 0-13-612915-3
2. J. L. Merian, L. G. Kraige: **Engineering Mechanics –Statics 7th edition**; Published by John Wiley & Sons Inc. 2006. ISBN: 978-0-470-61473-0

Comment:
Other edition of the abovementioned books might be usable as well, but please consult about the appropriate chapters.