Course Syllabus

1. **Course Title:** Fundamentals of Mechanics
2. **Course Code:** FUME130221
3. **Credit Units:** 3 (3/0/6) (3 units of theory/ 0 unit of practice/ 6 units of self-study)
   Duration: 15 weeks (3 hours of theory+0 hours of practice, and 6 hours of self-study per week)
4. **Course Instructors**
   1/ Dr. Phạm Tấn Hùng
   2/ MSc. Nguyễn Hoàng Châu
   3/ MSc. Trần Trọng Hỷ
   4/ MSc. Trang Tấn Triển
   5/ MSc. Nguyễn Thị Bích Liễu
5. **Course Requirements**
   Prerequisite courses: None
   Previous courses: Advanced Mathematics 1 (MATH130101), Advanced Mathematics 2 (MATH130201)
   Parallel courses: Fundamental Physics 1 (PHYS130102)
6. **Course Description**
   The course covers two basic topics, including statics and dynamics, which must be understood by students concerned with structures and materials. Statics deals with the equilibrium of rigid bodies are either at rest or move with a constant velocity; whereas dynamics is concerned with the accelerated motion of bodies.
7. **Course Goals**

Goals	Goal Description	Programme ELOs
G1	Apply core fundamental knowledge of construction engineering such as the principles of rigid-body equilibrium and the analysis of the forces causing the motion.	1.2
G2	Idealized models, analyze and solve the problems of mechanics.	2.1
G3	Engage in reading in English	3.3

8. **Course Learning Outcomes (CLOs)**

CLOs		CLO Description	Programme ELOs
G1	**G1.1**	Understand the basic concepts in mechanics	1.2
G2	**G2.1**	Analyze and find the conditions for the equilibrium of the rigid body	2.1
	G2.2	Analyze and determine the internal forces acting on cross sections. Draw the internal force diagrams and include all significant values by the sectional method and the graphical method.	2.1
	G2.3	Analyze and determine the velocity and acceleration of a rigid body	2.1

		undergoing general plane motion	
	G2.4	Analyze the planar kinetics of a rigid body undergoing general plane motion	2.1
	G2.5	Idealized models, analyze and solve the problems of mechanics.	2.1
G3	**G3.1**	Read and understand English references of mechanics.	3.3

9. Learning Resources

- Textbooks:
  1. R. C. Hibbeler. Engineering Mechanics – Statics. Prentice Hall, 2010.
  2. R. C. Hibbeler. Engineering Mechanics – Dynamics. Prentice Hall, 2010.
- References:
  1. J. L. Merian and L.G. Kraige. Engineering Mechanics – Volume I – Statics. Wiley Publishers.
  2. J. L. Merian and L.G. Kraige. Engineering Mechanics – Volume II – Dynamics. Wiley Publishers.

10. Student Assessment

- Grading scale: **10**
- Assessment plan:

Type	Content	Timeline	Assessment method	CLOs	Rate (%)
Assigments					**50**
BT#1	Analyze and find the conditions for the equilibrium of the rigid body	Week 3	Quiz	G1.1 G2.1 G2.5 G3.1	10
BT#2	Analyze and find the conditions for the equilibrium of the rigid body system	Week 5	Quiz	G2.1 G2.5 G3.1	10
BT#3	Analyze and determine the internal forces acting on cross sections. Draw the internal force diagrams and include all significant values by the sectional method and the graphical method.	Week 9	Quiz	G2.1 G2.2 G2.5 G3.1	10
BT#4	Analyze and determine the velocity and acceleration of a rigid body undergoing general plane motion	Week 12	Quiz	G2.1 G2.3 G2.5 G3.1	10
BT#5	Analyze the planar kinetics of a rigid body undergoing general plane motion	Week 14	Quiz	G2.1 G2.4 G3.1	10
Final exam					**50**
BT#6	- Analyze and find the conditions for the equilibrium of the rigid body	Week 17	Writing contest	G2.1 G2.2	

	- Analyze and determine the internal forces acting on cross sections. Draw the internal force diagrams by the graphical method. - Analyze and determine the velocity and acceleration of a rigid body undergoing general plane motion - Analyze the planar kinetics of a rigid body undergoing general plane motion			G2.3 G2.4 G2.5 G3.1	
Total					**100**

11. Course Content

Week	Content	CLOs
1	***Chapter 1: Fundamental Concepts – Supports*** *(3h,0h,6h)*	
	A/* Content and pedagogical methods in class: (3h)* **Content:** **I.** Introduce the course's goals, CLOs, content, pedagogical and assessment methods **II. *Fundamental Concepts*** 2.1. Rigid body 2.2. Force 2.3. Equilibrium **III. Moment of a force** 3.1. Moment of a force about a point 3.2. Moment of a force about a axis 3.3. Principle of moments 3.4. Couple - Moment of a couple **IV. Support - Support Reactions** **V. Idealized Models** **VI. Simplification of a Force and Couple System** **Pedagogical methods**: + Presentation of lecture + Solve problems	G1.1, G2.1, G2.5
	***B/* Self-study content**: *(6h)* + Do homework + Find real structure and idealized models	G1.1, G2.1, G3.1
2	***Chapter 2: Force System Resultants – Conditions for the equilibrium of the rigid body*** *(3h,0h,6h)*	

	A/* Content and pedagogical methods in class: (3h)*** **Content:** **I. Resultant force and Resultant couple moment** 1.1. Resultant force and Resultant couple moment 1.2. Redution of a simple distributed loading **II. Conditions for the equilibrium of the rigid body** 2.1. Equilibrium in two dimensions **Pedagogical methods**: + Presentation of lecture + Group discussion + Solve problems	G1.1, G2.1
	***B/* Self-study content**: *(6h)* + Do homework + Study chapter 2	G1.1, G2.1, G3.1
3	***Chapter 2: Force System Resultants – Conditions for the equilibrium of the rigid body* (cont.)** *(3h,0h,6h)*	
	A/* Content and pedagogical methods in class: (3h)*** **Content:** 2.2. Equilibrium in three dimensions **Pedagogical methods**: + Presentation of lecture + Group discussion + Solve problems	G1.1, G2.1
	***B/* Self-study content**: *(6h)* + Homework BT#1	G1.1, G2.1, G2.5, G3.1
4	***Chapter 3: Structural Analysis*** *(3h,0h,6h)*	
	A/* Content and pedagogical methods in class: (3h)*** **Content:** **I. Frames and machines** **Pedagogical methods**: + Presentation of lecture + Group discussion + Solve problems	G1.1, G2.1, G2.5
	***B/* Self-study content**: *(6h)* + Do homework + Study chapter 3	G1.1, G2.1, G2.5, G3.1
5	***Chapter 3: Structural Analysis (cont.)*** *(3h,0h,6h)*	
	A/* Content and pedagogical methods in class: (3h)*** **Content:** **II. Simple trusses** **III. Friction**	G1.1, G2.1, G2.5

	Pedagogical methods: + Presentation of lecture + Group discussion + Solve problems	
	***B/* Self-study content**: *(6h)* + Homework BT#2	G1.1, G2.1, G2.5, G3.1
6	***Chapter 4: Internal Forces*** *(3h,0h,6h)*	
	A/* Content and pedagogical methods in class: (3h)* **Content:** **I. Internal loadings developed in structural members** **Pedagogical methods**: + Presentation of lecture + Group discussion + Solve problems	G1.1, G2.1, G2.2
	***B/* Self-study content**: *(6h)* + Find real structure, which have axial loading members, building FBD and solve these problems. + Do homework	G1.1, G2.1, G2.**2**
7	***Chapter 4: Internal Forces (cont.)*** *(3h,0h,6h)*	
	A/* Content and pedagogical methods in class: (3h)* **Content:** **II. Shear and moment equations and diagrams** **Pedagogical methods**: + Presentation of lecture + Group discussion + Solve problems	G1.1, G2.1, G2.2
	***B/* Self-study content**: *(6h)* + Do homework	G1.1, G2.1, G2.**2**, G3.1
8	***Chapter 4: Internal Forces (cont.)*** *(3h,0h,6h)*	
	A/* Content and pedagogical methods in class: (3h)* **Content:** **III. Relations between distributed load, shear and moment** **Pedagogical methods**: + Presentation of lecture + Group discussion + Solve problems	G1.1, G2.1, G2.**2**
	***B/* Self-study content**: *(6h)* + Do homework	G1.1, G2.1, G2.**2**, G3.1

9	***Chapter 4: Internal Forces (cont.)*** *(3h,0h,6h)*	
	A/ **Content and pedagogical methods in class***: (3h)* **Content:** **III. Relations between distributed load, shear and moment** **Pedagogical methods**: + Presentation of lecture + Group discussion + Solve problems	G1.1, G2.1, G2.**2**
	B/ **Self-study content**: *(6h)* + Homework BT#3	G1.1, G2.1, G2.**2**, G3.1
10	***Chapter 5: Planar Kinematics of a Rigid Body*** *(3h,0h,6h)*	
	A/ **Content and pedagogical methods in class***: (3h)* **Content:** **I. Planar Rigid-Body Motion** **II. Translation** **III. Rotation about a Fixed Axis** **IV. Absolute Motion Analysis** **Pedagogical methods**: + Presentation of lecture + Group discussion + Solve problems	G1.1, G2.3, G2.5
	B/ **Self-study content**: *(6h)* + Do homework	G1.1, G2.3, G2.5, G3.1
11	***Chapter 5: Planar Kinematics of a Rigid Body (cont.)*** *(3h,0h,6h)*	
	A/ **Content and pedagogical methods in class***: (3h)* **Content:** **I. Relative-Motion Analysis: Velocity** **II. Instantaneous Center of Zero Velocity** **Pedagogical methods**: + Presentation of lecture + Group discussion + Solve problems	G1.1, G2.3, G2.5
	B/ **Self-study content**: *(6h)* + Do homework	G1.1, G2.3, G2.5, G3.1
12	***Chapter 5: Planar Kinematics of a Rigid Body (cont.)*** *(3h,0h,6h)*	
	A/ **Content and pedagogical methods in class***: (3h)* **Content:** **III. Relative-Motion Analysis: Acceleration** **Pedagogical methods**:	G1.1, G2.5, G2.5

	+ Presentation of lecture + Group discussion + Solve problems	
	***B/* Self-study content**: *(6h)* + Homework BT#4	G1.1, G2.5, G2.5, G3.1
13	***Chapter 6: Planar Kinetics of a Rigid Body: Force and Acceleration*** *(3h,0h,6h)*	
	A/* Content and pedagogical methods in class: (3h)* **Content:** **I. Mass Moment of Inertia** **II. Planar Kinetic Equations of Motion** **III. Equations of Motion: Translation** **IV. Equations of Motion: Rotation about a Fixed Axis** **V. Equations of Motion: General Plane Motion** **Pedagogical methods**: + Presentation of lecture + Group discussion + Solve problems	G1.1, G2.5, G2.5
	***B/* Self-study content**: *(6h)* + Do homework	G1.1, G2.5, G2.5, G3.1
14	***Chapter 6: Planar Kinetics of a Rigid Body: Work and Energy*** *(3h,0h,6h)*	
	A/* Content and pedagogical methods in class: (3h)* **Content:** **I. Kinetic Energy** **II. The Work of a Force** **III. The Work of a Couple Moment** **IV. Principle of Work and Energy** **V. Conservation of Energy** **Pedagogical methods**: + Presentation of lecture + Group discussion + Solve problems	G1.1, G2.5, G2.5
	***B/* Self-study content**: *(6h)* + Homework BT#5	G1.1, G2.5, G2.5, G3.1
15	***Chapter 6: Planar Kinetics of a Rigid Body: Work and Energy (cont.)****(3h,0h,6h)*	
	A/* Content and pedagogical methods in class: (3h)* **Content:** **VI. Principle of Work and Energy** **VII. Conservation of Energy**	G1.1, G2.5, G2.5

	Pedagogical methods: + Presentation of lecture + Group discussion + Solve problems	
	***B/* Self-study content**: *(6h)* + Do homework	G1.1, G2.5, G2.5, G3.1

12. Learning Ethics

Students must do homework by themselves. If plagiarism is found students will get zero point.

13. Date of first approval: August 1st, 2012

14. Approved by

Dean	Head of Department	Instructor
A/Prof. Dr. Nguyen Trung Kien	**Dr. Pham Tan Hung**	**MSc. Trang Tan Trien**

15. Date and Up-to-date content

1st time: Date: Oct. 7th, 2015 - Supplement equations of Largrange II and equations of motion to self-study. - Self-study motion of particles	Instructor: MSc. Trang Tấn Triển Head of Department: Dr. Phạm Tấn Hùng
2nd time: Date: Apr. 15th, 2016 - Supplement internal forces of bars - Reduce the dynamic part	Instructor: MSc. Trang Tấn Triển Head of Department: Dr. Phạm Tấn Hùng