ME 2120: Statics

2022 Winter Session	
Total Class Sessions: 25 **Class Sessions Per Week: 6** **Total Weeks: 4** **Class Session Length (Minutes): 145** **Credit Hours: 4**	**Instructor: Dr. Yu Xiang** **Email: Xiangy@cdutglobal.com** **Classroom: TBA** **Office Hours: TBA** **Language: English**

COURSE DESCRIPTION:

This course teaches students about Newton's laws of motion and how they can be used to address engineering challenges in order to learn about static equilibrium. The course covers the following topics: basic concepts and principles of statics, forces and particle equilibrium, moment of a force, moment of a couple, equivalent systems of forces on rigid bodies, equilibrium in two dimensions, equilibrium in three dimensions, analysis of general equilibrium problems, structural applications and distributed loads, distributed forces, center of mass and centroids, friction and moments of inertia of areas and mass.

PREREQUISITE KNOWLEDGE:

Students should have a background in basic calculus, and physics covering classical mechanics.

COURSE LEARNING OUTCOMES

On successful completion of this course students will be able to:

1. Define the fundamental concepts of statics, systems of units, method of problem solution, numerical accuracy.
2. Recall trigonometric laws and apply to the addition and decomposition of vectors quantities. Construct "Free Body Diagrams" of real-world problems and can apply Newton's Laws of motion and vector operations to evaluate equilibrium of particles and bodies.
3. Investigate the forces exerted on rigid bodies, moment of force about a point, axis and moment of couple.
4. Examine the equilibrium of two and three-dimensional structures and to determine whether the structure is properly supported and if the equation of equilibrium can be solved for unknown forces and reactions.
5. Explain the concepts of “center of gravity" and "centroids" and compute their location for bodies of arbitrary shape. Apply the concepts used for determining center of gravity and centroids of common 3D shapes and composite bodies.
6. Apply equilibrium relationships to calculate internal forces in individual members of two-dimensional trusses, frames and machines.

7. Use methods learnt for equilibrium of bodies and the resultant of a generally distributed loading to compute the internal forces in beams and cables.
8. Determine the moment of inertia of different areas and masses with relation to a particular axis.

COURSE MATERIALS:

Textbook:
Engineering Mechanic: Statics, J.L. Meriam, LG. Kraige, 8th Edition, Wiley.

Other Reference:
Vector Mechanics for Engineers: Statics, F.P. Beer, E.R. Johnston, D.F. Mazurek, E. Eisenberg, 11th edition. McGrawHill., New York

COURSE FORMAT AND REQUIREMENT:

The primary format of this course is lecture, problem solving and review. This will be a very fast-paced class. So it is extremely important that students keep up with required readings and homework problems. Pre-reading the relevant chapter and attempting the assigned homework problems prior to attending class is strongly recommended. Familiarizing with the course material before class, you will gain a better understanding the information presented during lecture. Because the class will move quickly, you will be responsible for learning as much as possible. Students are strongly encouraged to ask questions on things you did not understand. Main learning points will be highlighted from the textbook chapters and in-class sample questions.

Attendance:

Attendance will not be taking but all quizzes will be the first priority in class. Arriving late may cause you to miss a quiz, impacting your performance assessment. There is no made-up quiz.

COURSE ASSIGNMENT:

Assignment: Assignment should be done by the next class after they are assigned. There will be 10 assignments. It's important to finish all because some of the questions on exams and quizzes will be based on assignment exercises.
Quizzes: There will be 4 quizzes administered through the whole session. Quizzes will always be completed in the first ten minutes of class. No make-up quizzes.
Exams: Midterm Exams There will be two in-class midterm exams in this course. The midterm exams will be based on concepts covered in class. They will be in-class, close-book and non-cumulative. Final Exam The final will be cumulative and close-book.

COURSE ASSESSMENT:

Assignments	10%
Quizzes	15%
Midterm Exams 1	20%
Midterm Exams 2	20%
Final Exam	35%
Total	**100%**

GRADING SCALE:

A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
98-100	**93-97**	**90-92**	**88-89**	**83-87**	**80-82**	**78-79**	**73-77**	**70-72**	**68-69**	**63-67**	**60-62**	**<60**

ACADEMIC INTEGRITY:

Students are encouraged to study together, and to discuss lecture topics with one another, but all other work should be completed independently.

Students are expected to adhere to the standards of academic honesty and integrity that are described in the Chengdu University of Technology's Academic Conduct Code. Any work suspected of violating the standards of the Academic Conduct Code will be reported to the Dean's Office. Penalties for violating the Academic Conduct Code may include dismissal from the program. All students have an individual responsibility to know and understand the provisions of the Academic Conduct Code.

SPECIAL NEEDS OR ASSISTANCE:

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.

TENTATIVE COURSE SCHEDULE:

Class 1:

Course Syllabus and Course Policy

Introduction to Statics(Basic concepts, Review of Newton's Laws, Units, Problem solving in statics)

Reading: Chapter 1

Class 2- 4:

Introduction to Force System
Two-Dimensional Force Systems(Rectangular Components, Moments, Couple and Resultants)
Reading: Chapter 2.1- 2.6
Assignment 1 and 2

Class 5- 7:
Quiz 1
Three-Dimensional Force Systems (Rectangular Components, Moments, Couple and Resultants)
Reading: Chapter 2.7- 2.9
Assignment 3

Class 8:
Midterm 1 (covering chapter 1 and 2)

Class 9- 12
Introduction to Equilibrium
Equilibrium in Two Dimensions(System Isolation and the Free-Body Diagram, Conditions of Equilibrium)
Equilibrium in Three Dimensions
Reading: Chapter 3.1-3.4
Assignment 4 and 5

Class 13- 15
Quiz 2
Analysis of Structures(Introduction, Plane Trusses, Method of Joints, Method of Sections, Spaces Trusses, Frames and Machines)
Reading: Chapter 4.1-4.6
Assignment 6

Class 16-18
Quiz 3
Distributed Forces: Centers of Mass and Centroids(Centroids of Line, Areas and Volumes, Composite Bodies and Figures; Approximations)
Beams-External Effects, Beams-Internal Effects, Flexible Cables and Fluid Statics
Reading: Chapter 5.1-5.4, 5.5- 5.9
Assignment 7 and 8

Class 19:
Midterm 2

Class 20-21:
Friction **(**Introduction, Types of Friction, Laws of Dry Friction)
Applications of frictions in Machine(Wedges, Screws and Flexible Belts)
Reading: Chapter 6.1-6.3, 6.4-6.5. 6.8
Assignment 9

Class 22-24:
Quiz 4
Moments of Inertia (Introduction, Moment of Inertia of an Area by Integration, Parallel Axis Theorem, Composite Areas, Moment of Inertia of a Mass)
Assignment 10

Class 25:
Wrap-up, Q&A, Preparation for Final Exam

Final Exam(Cumulative): TBA