ME 201: Statics & Particle Dynamics

Term: Fall 2026
Credits: 3.0
Lecture Times & Location: Tuesday & Thursday 8:00–9:15 a.m., Rowan Engineering Center 110
Modality: In-Person

Instructor Information

- **Instructor:** Dr. Inés Romero (Assistant Professor of Mechanical Engineering)
- **Email:** iromero@university.alkimi.ai
- **Office:** Rowan Engineering Center 226
- **Office Hours:**
  - Wednesday & Thursday: 1:00–2:30 p.m. (In person, Rowan Engineering Center 226)
  - Friday: 3:00–4:00 p.m. (Virtual via Zoom; link posted in Canvas)
  - Also available by appointment.

Course Description

Force systems, equilibrium of particles and rigid bodies, trusses and frames, friction, centroids and moments of inertia, and the kinematics and kinetics of particles. ME 201 establishes the foundational principles of engineering mechanics required across mechanical and aerospace disciplines. Building upon Newtonian physics and vector calculus, students learn to construct rigorous free-body diagrams, determine static equilibrium in two and three dimensions, analyze internal forces in trusses, frames, and beams, and model particle kinematics and planar kinetics. Emphasis is placed on systematic problem-solving methods, spatial visualization, and physical intuition essential for subsequent courses in mechanics of materials and machine design.

Prerequisites

PHYS 121; MATH 141 (prior or concurrent).

Measurable Student Learning Outcomes

Upon successful completion of ME 201, students will be able to:

1. **Construct Free-Body Diagrams:** Isolate mechanical systems and draw complete, accurate free-body diagrams showing all applied loads, body forces, and reaction forces or moments.
2. **Evaluate Equilibrium of Rigid Bodies:** Apply the equations of static equilibrium to solve for unknown support reactions and internal load distributions in two- and three-dimensional determinate structures.
3. **Analyze Trusses and Structural Frames:** Calculate internal member forces in trusses using the method of joints and method of sections, and evaluate internal pin forces in multi-force frames and machines.
4. **Calculate Section Properties:** Determine centroids, centers of mass, and area moments of inertia for composite geometries using integration and the parallel-axis theorem.

5. **Formulate Particle Kinematics and Kinetics:** Model the rectilinear and curvilinear motion of particles using Cartesian, normal-tangential, and polar coordinates, applying Newton's second law, work-energy, and impulse-momentum principles.

Required Course Materials & Approximate Costs

1. **Hibbeler, Russell C. *Engineering Mechanics: Statics & Dynamics*. 15th ed., Pearson, 2022.** Approx. $85 digital rental ($195 hardcover purchase; reserve copies available at Alkimi Library).
2. **Engineering calculation pad (8.5 x 11 green grid) and standard drafting tools (ruler, protractor, compass).** Approx. $15.
3. **Total estimated cost:** Approx. $15 to $100 depending on textbook acquisition preference.

Generative AI Policy (AI Level 1: AI Not Permitted for Graded Work)

In accordance with Alkimi University Academic Policies (Student Handbook §5.8), ME 201 operates under **AI Level 1**.

- **What is permitted:** Students may use AI chatbots solely as interactive conceptual tutors to clarify definitions, review vector mathematics principles, or explain general calculus concepts outside of assigned homework problems.
- **What is prohibited:** Generative AI systems must not be used to formulate free-body diagrams, solve graded problem set equations, compute equilibrium solutions, or complete examinations and quizzes. Submitting AI-generated derivations as original work constitutes academic dishonesty.
- **Disclosure:** If an AI model is consulted to understand a general engineering principle related to a problem set, you must include a brief statement at the top of your submission identifying the tool and the nature of the conceptual query.

Grading Components and Weights

- **Weekly Homework Problem Sets:** 15% (Due Wednesdays at 11:59 p.m. in Canvas (weeks 2–14; lowest dropped))
- **Biweekly Concept Quizzes:** 10% (Administered in class every other Thursday (weeks 3, 5, 9, 11, 13; lowest dropped))
- **Midterm Exam 1 (Statics of Particles & Trusses):** 20% (In class, Thursday, October 1)
- **Midterm Exam 2 (Rigid Body Equilibrium & Friction):** 20% (In class, Thursday, November 5)
- **Truss Analysis & MATLAB Computational Project:** 10% (Due Friday, November 20 at 11:59 p.m.)
- **Class Engagement & Problem Formulation:** 5% (Evaluated through active participation and in-class problem-solving exercises across the semester)
- **Comprehensive Final Examination:** 20% (Thursday, December 17, 2026, 10:30 a.m.–12:30 p.m.)

Grading Scale (Alkimi University Standard)

- **A:** 93–100% | **A-:** 90–92%
- **B+:** 87–89% | **B:** 83–86% | **B-:** 80–82%
- **C+:** 77–79% | **C:** 73–76% | **C-:** 70–72%
- **D+:** 67–69% | **D:** 60–66% | **F:** Below 60%
- **Extra credit:** No individual extra credit assignments are offered in ME 201.

Course Schedule (Fall 2026)

Week	Dates	Topics & Readings	Assignments & Deadlines
Week 1	Aug 27	**Introduction, Units, and Vector Operations:** Course expectations, Newtonian principles, unit conversions, scalars vs.	*First day of classes: Wed Aug 26.*

Week	Dates	Topics & Readings	Assignments & Deadlines
		vectors, vector addition, Cartesian vector representations, and position vectors. *Reading: Hibbeler Ch. 1–2.4*	
Week 2	Sep 1, 3	**Force Vectors and Particle Equilibrium:** Dot products, projection of vectors, free-body diagram construction, and coplanar and three-dimensional equilibrium of a particle. *Reading: Hibbeler Ch. 2.5–2.9, 3.1–3.4*	*Wed Sep 2: Add/section change deadline.*
Week 3	Sep 8, 10	**Moment of a Force and Couples:** Moment of a force about a point (scalar and cross product), Varignon's theorem, moment of a force about a specified axis, and couples and equivalent systems. *Reading: Hibbeler Ch. 4.1–4.6*	*Mon Sep 7: Labor Day (no classes). Wed Sep 9: Census date (last day to drop without a W).*
Week 4	Sep 15, 17	**Force-Couple System Reduction and Distributed Loads:** Simplification of complex force and couple systems, wrench resultants, reduction of distributed loading, and centroidal line of action. *Reading: Hibbeler Ch. 4.7–4.9*	—
Week 5	Sep 22, 24	**Equilibrium of Rigid Bodies in 2D and 3D:** Free-body diagrams of rigid bodies, support connections, two-force and three-force members, static determinacy, and equations of equilibrium in three dimensions. *Reading: Hibbeler Ch. 5.1–5.7*	—
Week 6	Sep 29, Oct 1	**Structural Analysis: Simple Trusses and Midterm Exam 1:** Definition of planar trusses, zero-force members, method of joints, method of sections, space trusses, and administration of Midterm Exam 1 in Thursday lecture. *Reading: Hibbeler Ch. 6.1–6.5*	**Midterm Exam 1 (Statics of Particles & Trusses) (in class).**
Week 7	Oct 6, 8	**Frames and Machines:** Analysis of structures containing multi-force members, dismantling mechanisms, internal pin interaction forces, and mechanical advantage. *Reading: Hibbeler Ch. 6.6*	—
Week 8	Oct 15	**Internal Forces in Structural Members:** Internal normal force, shear force, and bending moment at specified points; sign conventions; shear and bending moment diagrams for determinate beams. *Reading: Hibbeler Ch. 7.1–7.3*	*Oct 12–Oct 13: Fall break (no classes). Fri Oct 16: Midterm grades due.*
Week 9	Oct 20, 22	**Friction and Dry Contact Mechanics:** Characteristics of Coulomb dry friction, angles of friction, tipping versus slipping criteria, wedges, and screw threads. *Reading: Hibbeler Ch. 8.1–8.5*	—
Week 10	Oct 27, 29	**Center of Gravity, Centroids, and Composite Bodies:** Center of gravity, center of mass, centroids of lines, areas, and volumes via integration, and centroid determination for composite geometries. *Reading: Hibbeler Ch. 9.1–9.4*	—
Week 11	Nov 3, 5	**Moments of Inertia and Midterm Exam 2:** Second moment of area, radius of gyration, parallel-axis theorem for areas, composite moments of inertia, and administration of Midterm Exam 2 in Thursday lecture. *Reading: Hibbeler Ch. 10.1–10.5*	*Fri Nov 6: Last day to withdraw (W) or elect Pass/No Pass.* **Midterm Exam 2 (Rigid Body Equilibrium & Friction) (in class).**
Week 12	Nov 10, 12	**Kinematics of Particles: Rectilinear and Curvilinear Motion:** Continuous and erratic rectilinear motion, general curvilinear motion, Cartesian and normal-tangential coordinate representations. *Reading: Hibbeler Ch. 12.1–12.7*	—
Week 13	Nov 17, 19	**Cylindrical Coordinates and Kinetics: Newton's Second Law:** Polar and cylindrical coordinates; equations of motion for particles in rectangular, normal-tangential, and polar frames; MATLAB truss project due Friday. *Reading: Hibbeler Ch. 12.8, 13.1–13.6*	**Truss Analysis & MATLAB Computational Project due Fri Nov 20 at 11:59 p.m.**
Week 14	Nov 24	**Kinetics of Particles: Work and Energy:** Work of a force, work of springs and gravity, kinetic energy, principle of work and energy, power, efficiency, and conservative forces. *Reading: Hibbeler Ch. 14.1–14.6*	*Nov 25–Nov 27: Thanksgiving break (no classes).*

Week	Dates	Topics & Readings	Assignments & Deadlines
Week 15	Dec 1, 3	**Kinetics of Particles: Impulse and Momentum:** Principle of linear impulse and momentum, conservation of linear momentum for systems of particles, direct central impact, and oblique impact. *Reading: Hibbeler Ch. 15.1–15.4*	—
Week 16	Dec 8	**Comprehensive Synthesis and Course Review:** Integration of static equilibrium, internal force calculations, and kinetic energy formulations; review of core problem types for the final examination. *Reading: Review Hibbeler Ch. 2–6, 9–10, 12–15*	*Wed Dec 9: Last day of classes. Thu Dec 10: Reading Day.*
Finals	Dec 17	**Comprehensive Final Examination:** Thursday, December 17, 2026, 10:30 a.m.–12:30 p.m., Rowan Engineering Center 110.	Comprehensive.

Course Policies

Attendance Policy

Class attendance and punctual arrival are expected for all lecture sessions. Collaborative problem solving and step-by-step free-body diagram derivations during class cannot be replicated through textbook reading alone. If an unavoidable illness or approved university conflict arises, notify Dr. Romero prior to the scheduled lecture. Students who miss the first two class meetings without notifying the instructor may be dropped. Students may miss class for religious observance without penalty if they notify the instructor in writing within the first two weeks of the semester (by Wednesday, September 9, 2026). Absences for university-sponsored activities (athletics, performances, conferences) are excused with a letter from the sponsoring office at least one week in advance.

Late Work Policy

Homework problem sets submitted after the Wednesday 11:59 p.m. deadline will incur a 20% penalty per 24 hours late, up to 48 hours. After 48 hours, solutions will not be accepted. To accommodate unexpected personal emergencies, the lowest homework score and lowest quiz score will be dropped automatically.

Final Exam Policy

The final examination (Thursday, December 17, 2026, 10:30 a.m.–12:30 p.m.) is scheduled by the University Registrar and can't be moved without the Dean's written approval (Faculty Handbook §5.5). A student with three or more final exams on the same calendar day may reschedule one of them. Requests go to the instructor of the middle exam by the last day of classes. For this term, send the request by Wednesday, December 9, 2026 (Student Handbook §6.4).

Academic Integrity

Alkimi University is an academic community devoted to rigorous scholarship, open intellectual inquiry, and uncompromising ethical conduct. All students are subject to the regulations of the Alkimi University Academic Integrity Policy. Academic dishonesty—including plagiarism, cheating on examinations, unauthorized collaboration, fabrication of empirical data, and unauthorized submission of academic work generated by artificial intelligence—undermines the integrity of the university and carries severe disciplinary sanctions. Sanctions range from a failing grade on an assignment or exam to an administrative course failure recorded as an 'XF' on the official transcript, academic suspension, or expulsion. Suspected violations are formally investigated and resolved through the Office of Academic Integrity in accordance with Faculty Handbook §6. For detailed information, consult the Office of Academic Integrity, Lovell Hall 315, (555) 555-0163, integrity@university.alkimi.ai.

Accessibility Services

Alkimi University is committed to providing equitable educational access and reasonable accommodations for all students with documented disabilities, including physical, sensory, psychological, learning, and

chronic health conditions. Students requesting academic accommodations must formally register with the Office of Accessibility Services, Harlan Hall 204, (555) 555-0155, access@university.alkimi.ai. Once approved, students will receive an official Faculty Accommodation Letter detailing approved accommodations. Students should present this letter to the instructor as early in the semester as possible, and at least one week prior to any exam or assignment requiring accommodation. Accommodations cannot be applied retroactively.

Student Wellness and Mental Health

Your physical health, psychological well-being, and mental health are essential to your academic success. If you experience heightened stress, anxiety, depressive symptoms, personal trauma, or academic burnout, free, confidential counseling and medical care are available through the Hollis Health & Counseling Center, located in the Hollis Center. Routine appointments are available Monday–Friday 8:00 a.m.–6:00 p.m. and Saturday 10:00 a.m.–2:00 p.m. during the semester by calling (555) 555-0190 or emailing health@university.alkimi.ai. Urgent, 24/7 crisis psychological counseling is accessible immediately at (555) 555-0199.

Campus Student Support Services

- **Academic Advising Center:** Lovell Hall 101 | (555) 555-0158 | advising@university.alkimi.ai
- **Writing Center:** Whitcombe Library 3rd Floor | Free consultations on papers, reports, and research projects at any stage.
- **Whitcombe Library:** Whitcombe Library, Main Floor | (555) 555-0170 | askalibrarian@university.alkimi.ai
- **Hollis Health & Counseling Center:** Hollis Center | (555) 555-0190 | 24/7 Counseling Line: (555) 555-0199 | health@university.alkimi.ai
- **Engineering Peer Tutoring:** Rowan Engineering Center 140 | Drop-in engineering mechanics tutoring available Tuesday and Thursday 5:00–8:00 p.m.