



ENGR213

Dynamics

Instructor	Eric Constans
E-mail	constans@rose-hulman.edu
Course Meeting Days and Time	Tu/Th 2:30 PM-3:45 PM
Required Experiential Learning Dates	N/A
Course Mode	In-person
Office Hours	MTWR 1:00-2:00pm or by appointment in the Visiting Faculty Office

Catalog Description:

Covers rectilinear and curvilinear motions, force, mass, acceleration, projectiles, pendulums, inertia forces in machines, work and energy, impulse and momentum, and impact. Prerequisite: ENGR 212

Credit Hour Policy Statement:

This class meets the federal credit hour policy of 1 hour of class with an expected 2 hours of additional student work outside of class each week for approximately 15 weeks for each hour of credit, or a total of 45-75 total hours for each credit.

Course Learning Objectives:

After completing this course, students will be able to:

- Apply the rate form of linear and angular momentum conservation to particles and rigid bodies undergoing planar motion.
- Apply the finite-time form of linear and angular momentum conservation to particles and rigid bodies undergoing planar motion with or without an impact.
- Apply the finite-time form of energy conservation to particles and rigid bodies undergoing planar motion.
- Analyze the unconstrained or constrained kinematics of particles and rigid bodies undergoing planar motion.

Methods of Instructions:

Traditional lecture with graded homework assignments, midterm examinations and a final examination.

Textbooks and Required Reading:

Mechanical Systems by P. J. Cornwell (available on the course Moodle site)

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Course Schedule:

<i>Week</i>	<i>Day</i>	<i>Topic</i>	<i>Due</i>
W1	M	Course intro, definitions, fundamental kinematics, relative motion	
	W	Dependent motion	
W2	M	Normal-tangential coordinates (aka path coordinates)	HW 1
	W	Radial-transverse coordinates (aka polar coordinates)	
W3	M	Impact and coefficient of restitution - unconstrained impact	HW 2
	W	Constrained impact problems	
W4	M	Review of particle kinematics and kinetics	HW 3
	W	Exam 1 practice/review	
W5	M	Exam 1	HW 4
	W	Translation of a rigid body	
W6	M	Fixed-axis rotation of a rigid body	HW 5
	W	Fixed-axis rotation of a rigid body + energy	
W7	M	Fixed-axis rotation of a rigid body + impact	HW 6
	W	General plane motion: instantaneous center	
W8	M	General plane motion: vector approach for velocity	HW 7
	W	Energy for general plane motion	
W9	M	Momentum and impact for general plane motion	HW 8
	W	Exam 2 practice/review	
W10	M	Exam 2	HW 9
	W	More energy and momentum examples	
W11	M	General plane motion: acceleration	HW 10
	W	Acceleration kinematics of linkage systems	
W12	M	COLM/COAM rate for general plane motion	HW 11
	W	More examples COLM/COAM rate for general plane motion	
W13	M	Rolling with slip and more COLM/COAM rate	HW 12
	W	Exam 3 practice/review	
W14	M	Exam 3	HW 13
	W	Rotating coordinate axes and sliding contact problems	
W15	M	Forces and sliding contact problems	HW 14
	W	Course review	



Grading Criteria:

Your final course grade is computed based on the following weights:

50%	Exams (3)	
	13%	Lowest-scoring exam
	17%	Middle-scoring exam
	20%	Highest-scoring exam
30%	Final exam	
20%	Homework	

To pass the course, you must have a weighted exam average of at least 60%.

Withdrawal and Attendance policies:

Harlaxton College expects regular class attendance by all students. Students are considered sufficiently mature to appreciate the necessity of regular and punctual attendance, to accept this personal responsibility and to accept the consequences of failure to attend. When absences occur due to emergency or medical reasons, students are expected to notify their instructors of the absence prior to class or to seek the assistance of the College nurse or a member of the Student Experience Team for help in notifying instructors.

Instructors have the authority to grant excused absences for medical, psychological, or personal reasons upon review of appropriate documentation and professional recommendation supporting such a request. In the event of long-term illness, reasonable accommodations will be made to allow a student to complete a course. In these cases, the Dean will need to approve the long term nature of the accommodation. The Dean of Harlaxton College has the authority to grant excused absences for medical, psychological, or personal reasons. Each instructor is expected to maintain an attendance policy in keeping with the nature of the Harlaxton program and may consider it in evaluating performance in their courses.

Policy Governing Unexcused Absences:

Harlaxton College operates an attendance policy that is binding on all faculty and students. The number of unexcused absences that are allowed before incurring a penalty is related to the number of times a class meets each week. For courses which meet three times a week, students are allowed a maximum of three unexcused absences during the semester without attracting penalty points. For courses meeting twice a week two such absences are permitted, and for courses meeting once a week a single absence is allowed. Additional unexcused absences will attract a grade penalty. Three absences will result in a full-letter grade reduction, with an additional full-letter grade reduction for every three absences thereafter.

Policy Governing Excused Absences.

- Excused absences are not given to facilitate student travel independent of College-sponsored travel.
- Students may be permitted to miss class because of participation in academic field trips.
- Instructors must co-ordinate and confirm academic fieldtrips with the Dean, prior to the commencement of the Semester to ensure their inclusion in the Semester timetable.
- Where authorization for an academic fieldtrip is requested after the commencement of the semester, the request must be submitted to the Dean.



The following information is required:

- Purpose and brief description of the official Harlaxton event or academic fieldtrip.
- Dates, location, and times (as applicable).
- Alphabetical list of students involved along with their student identification number.

If approval is granted:

- Instructors affected will be notified at least one week prior to the class period during which absence is anticipated, or as soon as possible.
- Missed class time due to student participation is to be considered an excused absence.
- The grade of a student may not be lowered in any class due to excused absences.
- It is the student's responsibility - to take the initiative by consulting with their instructors before the absence occurs, and - to do what is required by the instructor to make up all missed assignments and/or examinations.
- Instructors are required to assist students in these occasional situations of excused absences.

Honor Code:

All students at the University of Evansville agree to the University honor code: I will neither give nor receive unauthorized aid, nor will I tolerate an environment that condones the use of unauthorized aid. **AI may be used only with prior permission or direction by the instructor.**

- All work submitted in this course must be your own.
- The use of generative AI composition tools, such as those offered by ChatGPT, Google Bard etc. is prohibited in this course except for specific assignments and subject to the instructor's guidelines.
- Work generated by such tools without proper attribution is plagiarism and, thereby, a breach of the University's Plagiarism and Academic Honesty policy.

Disability Policy:

It is the policy and practice of the University of Evansville to make reasonable accommodations for students with properly documented disabilities. Students should contact Disability Services within the Office of Counseling Services by calling 812-488-2663 to seek services or accommodations for disabilities. Written notification to faculty from Disability Services is required for academic accommodations. The University of Evansville Disability Services office will share the request for academic accommodations with the Academic Support team at Harlaxton College. Staff members at Harlaxton will meet individually with students to discuss needs and provide additional information related to examinations or other assessments. Students from partner institutions should provide the appropriate letter of accommodation from their institution to the Academic Support team at Harlaxton College.

Non-Discrimination Statement

The University of Evansville expects all members of its community to treat each other with respect and civility. Harassing behaviors directed towards any member of our community will not be tolerated. As part of its commitment to non-discrimination, the University specifically prohibits harassment based on any other characteristics set forth in its nondiscrimination statement as follows: including race, color, gender, gender identity and expression, sexual orientation, creed or religion, national origin, age, disability, veteran status and all federally



protected groups/classes. Any form of harassment undermines the mission of the University and negatively impacts the University community as a whole.

Prohibited Conduct and Confidentiality

The University of Evansville is committed to fostering an atmosphere free from harassment and discrimination. This commitment includes identifying problems that may lead to sexual harassment and misconduct, as well as other forms of harassment and discrimination, by creating an atmosphere in which the entire University community is sensitive to preventing prohibited conduct. Additionally, the University is committed to providing support and resources to individuals who have experienced prohibited conduct. This commitment includes effectively responding when a student, visitor, guest or program participant is the victim of prohibited conduct. All campus employees, students, and guests are required to abide by the Title IX and Other Sexual Harassment and Misconduct Policy, the Harassment and Discrimination Policy, and the Consensual Sexual or Romantic Relationships Between Employees and Students Policy. Violation of these policies could result in disciplinary action, up to and including expulsion for students and termination for employees. Faculty members at the University of Evansville are considered "Responsible Employees" under the applicable federal guidelines and the University's policies. This means that I am unable to offer you confidentiality if you report any incidence of prohibited conduct to me as defined by Title IX statute. If I am made aware of a violation, I am required to report any known information to the Office of Institutional Equity.

You may choose to report the violation yourself the following ways:

Email: · Annie Sills, Assistant Director of Institutional Equity and Title IX Coordinator: cs175@evansville.edu

· Keith Gehlhausen, Executive Director of HR and Institutional Equity: kg77@evansville.edu ·

Title IX: titleix@evansville.edu

Phone: 812-288-5261

Online: <https://www.evansville.edu/safety/report.cfm>

You may also choose to speak with a Confidential Resource. Confidential Resources are required to maintain confidentiality and cannot report violations to the Office of Institutional Equity:

University of Evansville

- Counseling Services: counselingservices@evansville.edu, 812-488-2633
- Health Center Professionals: healthcenter@evansville.edu, 812-488-2033
- University Chaplain: chaplain@evansville.edu, 812-488-5262

Harlaxton College

- College Nurse: Lesley Selby, RGN, +44 01476 403027, lseyby@harlaxton.ac.uk
- Counselling Services: counselling@harlaxton.ac.uk