ESC240 Dynamics
Section 1
Class: TuThu 8:00-9:15, Donovan Hall G103

Instructor	Dr. Firas A. Khasawneh
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Office Hours	TuTh 2:00-4:00; or by appointment.

Textbooks:

- FP Beer et al, Vector Mechanics for Engineers: Statics and Dynamics, 10th ed., (McGraw Hill, 2013).

Any supplemental course material will be posted on Blackboard.

Communication: Check Blackboard frequently, i.e., daily. In the event I must communicate urgently to the class then I will send and email in addition to posting an announcement.

Grading Scheme:

Programming & Lab Assignments:	15	Exams (3 exams, 15 each):	45
Homework & Quizzes:	15	Final Exam:	25
		Total:	**100**

Exams: Each exam during the regular semester is worth 15 points. The final exam is comprehensive and is worth 25 points. **The final exam is scheduled on Tuesday 5/3, 8:00AM–10:00PM at Donovan Hall G103**.

Homework & Quizzes:
Homework is extremely important for your success in this class. That being said, although I will be assigning homework, I will not be grading all of the homework assignments or all the different parts of an assignment. Sometimes I may give a pop quiz based on a homework problem in lieu of collecting the homework. I will post the solutions to the homework at the same time the homework is assigned. These solutions are intended to help you if you get stuck while coming up with your own solution. Please use these solutions only as a guide; however, be very careful not to copy the solution manual as this will be considered plagiarism and is in violation of the university policies. You are expected to have studied and completed the previous lecture's class examples before attending the subsequent class. If you do the homework and the class examples, you will find the quizzes particularly easy. **Homework will be due a the beginning of the lecture. No late homework will be accepted.**
Quizzes: Short pop quizzes will be given. The quiz will cover concepts you learned from doing the homework and/or the class examples. If you have done the homework and re-worked the class examples, the quizzes should be easy for you. 25%–50% of any quiz grade will be awarded solely for attempting to solve it. You must attend the class in its entirety to receive any credit for the quiz. There will be no make-up quizzes.

Computer use: It is the formal policy of this class that computers are necessary. This includes access to and the use of the Internet. Additional requirements are the use of R and Matlab.

- Collaboration on programming assignments must be limited to discussing commands and structure related to the assignment. You may not provide or accept any piece of code. When you sit down to write your code you must do so individually and only using your own notes. If you have questions on how to collaborate on programming assignments, come talk to me.

Class attendance: Attendance at lectures is mandatory.

Other behavior expectations: Students are expected to take a sincere interest in learning the classroom material and to abide by the university policies. Keeping with this expectation, students should: 1) not create distractions (i.e. turn cell phones off and put laptops away), 2) show up to class on time, and 3) be courteous to other students and the instructor. During class time, cell phones should be put out of sight so that you are not tempted to text or check your email. Violations of the university policies will be dealt with appropriately and may involve the Academic Conduct Board.

Course Help: Good study habits are absolutely essential to your success in this course. If you feel you are having difficulty keeping up with work, please talk to me as soon as possible so we can figure out a plan to

get you and your study habits back on track. I will make every effort to assist you but please restrict your in-person inquiries to our office hours and immediately after class.

Regrade requests: Errors, oversights, and misinterpretations may occur. If there is an error in your grade (e.g., the total number of points incorrectly added) or you feel that the grade you received is not commensurate for your solution then you may submit a regrade request. For quizzes and programming assignments, you must return the assignment with an attached written request detailing why you think your grade should be reconsidered. This regrade request should occur within 7 days after the graded assignment in question has been returned to the class. For exams, no regrade requests will be accepted until exactly one week after the graded exam has been returned. To submit a regrade request, you must: 1) review the posted exam solution, and 2) attach a written request explaining why I should reconsider your grade. You must hand me your exam with the attached request either before or after the class one week after the exams are returned. Note that by submitting a regrade request you understand that your whole work can be re-evaluated and not only the problems you requested.

Course description: This class covers the principles of dynamics of particles, rigid bodies, and selected nonrigid systems with emphasis on engineering applications. Kinematic and analysis of dynamics problems using graphical, computer and analytical vector techniques. Absolute and relative motion analysis. Work-energy, impact and impulse-momentum.

Measurable Outcomes: Students will demonstrate their ability to:

1. Select and define appropriate coordinate systems for particle and rigid body problems, and determine the unknowns among position, velocity and acceleration, given a set of constraints on the kinematics of a particle or body.
2. Derive differential equations of motion for a particle, using a variety of force models, such as gravity, coulomb friction, viscous damping and spring stiffness, and solve the equations for selected particle problems.
3. Choose and apply the appropriate work/energy and impulse/momentum relations to find relationships between dynamic states of a particle, and solve for the dynamic states in selected particle problems.
4. Derive differential equations of motion for a rigid body using Newtonian mechanics, and solve the equations for selected problems.
5. Choose and apply the appropriate integral relationships of work/energy, linear and angular impulse/momentum to find relationships between dynamic states of a rigid body in plane motion, and solve these equations for selected plane motion problems.
6. Write computer programs that apply the dynamics principles learned in the class to solve engineering problems.

Academic Integrity

Under no circumstances may you submit another person's work for credit. For the products of a team work (e.g. a design project), all team members should submit their work together. SUNY Poly's current Code of Academic Conduct regarding plagiarism and other inappropriate academic activities are in the Student Handbook (Page 49-53, available at http://www.sunyit.edu/pdf/student_handbook.pdf).

Social Justice Statement

SUNY Poly is committed to social justice. I concur with the commitment and expect to maintain a positive learning environment based upon open communication, mutual respect, and nondiscrimination. SUNY Poly does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sex orientation, color, or national origin. Any suggestions on how to further such a positive and open environment in this class will be appreciated and given serious consideration. If you are in need of accommodations due to a documented disability, please see me as soon as possible. I will need a copy of your current accommodations plan. If you do not have a current plan, please contact Suzanne Sprague (suzanne.spraguesunyit.edu) in the Disability Services Office located in the Career Services Suite, B104, Kunsela Hall, 315-792-7170, to develop an accommodations plan. This plan must be updated each semester.

Accommodations for Students with Disabilities: In compliance with the Americans with Disabilities Act of 1990 and with Section 504 of the Rehabilitation Act, SUNY Polytechnic Institute is committed to ensuring educational access and accommodations for all its registered students seeking access to meet course requirements and fully participate in programs or activities. SUNY Poly students with documented disabilities and medical conditions are encouraged to request these services by registering with the Disability Services Office and discussing their need for accommodations. For information or an appointment contact Suzanne Sprague, Disability Services Coordinator, at the Disability Services Office, located in room B101 Kunsela Hall or by phone (315) 792-7170; or email Suzanne.sprague@sunyit.edu.

	Date	Topics	Sections
		Particle Kinematics	
1	1/19	Introduction, straight line motion	11.1-11.3
	1/21	curvilinear motion of particles, Cartesian system	11.4-11.6, 11.9-11.12
2	1/26	Path coordinates (n-t and r-θ)	11.13,11.14
	1/28	Path coordinates wrap up	
		Particle Kinetics	
3	2/2	Newton's 2nd law, EOM	12.1-12.5
	2/4	Angular momentum of a particle	12.7-12.9
4	2/9	Work-energy of particles, power & efficiency	13.1-13.5
	2/11	Potential energy, conservation of energy	13.6, 13.8
5	2/16	Work-energy wrap up	
	2/18	**First exam**	
6	2/23	Impulse-momentum of particles	13.10-13.11
	2/25	Impact	13.12-13.15
7	3/1	impulse-momentum wrap-up	
	3/3	System of particles	14.1-14.8
8	3/8	Spring break	
	3/10	Spring break	
		Rigid body Kinematics	
9	3/15	Introduction, translation & fixed-axis rotation	15.1-15.4
	3/17	General plane motion, absolute and relative velocity analysis	15.5-15.6
10	3/22	Instantaneous center of rotation	15.7
	3/24	Absolute and relative acceleration analysis	15.8
		Absolute motion analysis (parametric analysis)	15.9
11	3/29	Rotating reference frame	15.10-15.11
	3/31	**Second exam**	
		Rigid body Kinetics	
12	4/5	EOM for rigid bodies, angular momentum	16.1, 16.2, 16.3, 16.6, 16.7
	4/7	Constrained plane motion	16.8
13	4/12	Force, Mass, and Acceleration wrap up	16.1-16.8
	4/14	Work-energy of rigid bodies, power	17.1-17.7
14	4/19	Impulse-momentum of rigid bodies	17.8-17.10
	4/21	**Third exam**	
15	4/26	Deriving EOM of rigid bodies	Class notes
	4/28	Deriving EOM of rigid bodies	(LDOC-4/30)