MAE 6210 (Analytical Dynamics) Spring 3 Credits

Course Administration

INSTRUCTOR:	Qing Chang, 310 Mechanical Engineering E-mail: qc9nq@virginia.edu
LECTURE HOURS:	MW 2:00pm -3:15pm, Mechanical Engr Bldg 213
OFFICE HOURS:	MW 3:30pm – 5:00pm or by appointment.
Overview:	Analytical dynamics is the foundation of modern mechanics and is important to both applied and theoretical work. This class seeks to develop classical analytical dynamics from a modern mathematical viewpoint. We will cover the Lagrangian formulation. This course will move quickly into material that a student would not encounter in a typical undergraduate dynamic course. While we will again use "toy" problems, with focus on the insights that the analytical approach gives to the understanding of system dynamics.
TEXT:	No required text. Some useful books: - Advanced Dynamics by Donald T. Greenwood, Cambridge Publications. - Principles of Dynamics (2nd edition) by Donald T. Greenwood, Prentice Hall - Advanced Engineering Dynamics by Jerry H. Ginsberg
PREREQUISITE:	Undergraduate Level Dynamics, Ordinary differential equations, Matrix theory
HOMEWORK:	About one homework assignment per week. Each homework is due one week after it is assigned. • Each homework must be turned in **at the beginning of the class** on the specified due date in order to be considered as on time. • Late homework will receive half credit before the solutions are posted and will **not** be accepted after that.
EXAMS:	1 Midterm 1 Final Exam • Midterm will be scheduled in class, unless otherwise stated. Extra time might be allowed for both exams. • No makeup exam unless arranged prior to the exam.
GRADING:	Homework 20% 1 Midterm Exams 40% Final (comprehensive) 40%
BLACKBOARD:	All homework assignments/solutions will be posted on the Blackboard course account.

I use email and blackboard exclusively to communicate with you off class. It is your responsibility to make sure that your email id is a current one on the blackboard system. I suggest that you use a university email id for this class; it is free and official. I am not responsible for the emails not delivered to your commercially available email accounts.

COURSE CONTENT: Particles kinematics and dynamics, Rigid Body motion and dynamics, Fundamentals of mechanics, Newton's laws, Lagrangian formulation: constraints and configuration manifolds, Lagrange's equations, central force motion, nonpotential forces

Tentative Schedule

Week 1: Introduction to Particle Dynamics (Review of particle kinematics, Newton's Law of Motion)

Week 2: Introduction to Particle Dynamics (Review of particle kinematics, Newton's Law of Motion)

Week 3,4: Introduction to Particle Dynamics (Work and Energy; Momentum and Impulse)

Week 5: Kinematics of a rigid body

Week 6, 7: Dynamics of a rigid body

Week 8: Midterm Exam

Week 9, 10: Lagrange's equation

Week 12: Equations of motion: differential approach

Week 13: Equations of motion: integral approach

Week 14: Review

Week 15: Final Exam