EGS 2321 Engineering Analysis – Dynamics
Instructor: Dr. Kwabena Ofosu, P.E.

<u>Homework Project</u>

Objectives:
The purpose of this component of your semester work in this course is to provide students the opportunity to apply some of the methods and concepts learned in this class to a real-life dynamics problem.

Rules and requirements:
You may choose **any** topic that interests you. You may work individually or in groups of up to four (4), however group efforts shall be commensurate with the size of the group and each group member shall clearly identify their contribution to the group's overall output.

Reports shall be turned in according to a schedule that will be posted on the class website detailing the requirements for each submittal. You may change your topic over the course of the semester if new course material we cover garners your interest in something else. However homework's shall still be turned in on time according to the current topic you have declared to the instructor. Towards the end of the semester, a final report shall be turned in and students shall prepare a short *PowerPoint* presentation for the class. A detailed schedule of submittal dates will be communicated to the class in due course.

Scope of Projects:
The project is not intended to be an original research, so you may present a topic that has been researched by others or has been widely reported elsewhere. Alternately, you may review and vet a published academic paper, journal article, or official technical report.

Any topic chosen must be approved by the instructor to ensure it is substantial and relevant to the course material, and can be completed within our schedule. You are not required to conduct a detailed review of previous relevant studies, though it may be informative in your specific case. The project shall have a computational component and you should be able to explain the details of your calculations. It is recommended you avoid topics that will require substantial analysis from other fields beyond the scope of dynamics.

Resources:
If relevant, you may apply computational tools learned in other classes for example *Mathcad*, *Matlab*, or any computer programming tools that will enable you to work rapidly and thoroughly through your calculations. Please note however that this is not required, and the focus of the exercise is the dynamics concepts and how they are applied, not the programming or computational skills.

Assistance and difficulties:
As with any effort to conduct some sort of research, especially if you are doing this for the first time, you may run into difficulties, hit a dead end or simply get lost. It is important you talk to the instructor as soon as possible if you find yourself in this situation. Although this instructor may not be an expert in the particular topic you are pursuing, we may be able to share ideas or direct you into a more amenable path to a worthwhile project.

Possible Projects:
The following topics rolled off the top of my head and are by no means an exhaustive list of possible topics:

Sports
Analysis of the dynamics of kicking a field goal
Analysis of a pitching a baseball
Baseball and cricket: Which is more hazardous to the batter?
Developing the best path for a racing car on a given track
Gymnastics: What are some of the relevant dynamics considerations?
What impacts are boxers and wrestlers exposed to?
Dynamics of golf

Space and Rocketry
Analysis of the launch and/or flight of your favorite space vehicle
How is a satellite put in orbit?
The dynamics of rendezvous
Analysis of the gravitational interactions in our solar system or galactic neighborhood

Traffic Engineering
Analysis of fatal crashes
Traffic flow analysis
Guardrail and Crash Attenuators: Are they as safe as advertized?
Shockwave analysis
Safety on our roadways and at intersections
Bicycle and pedestrian considerations at signalized intersections

Transportation Systems
A review of current high speed rail systems

Mechanical Engineering
Basic dynamics in engines
How does the new KERS system work in auto racing cars?
Machine design

Power Generation
Wind turbines versus hydropower
Efficiency of power generation systems. Do they really stack up to the claims?

Military
Ballistics
Flight dynamics
Body armor

Home Improvements
Hurricane resistant roofs: How are they rated, and on what basis?
My lawnmower: What do all those numbers actually mean?
Building performance during an earthquake