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

Homework 1

Due Date:

Objectives:
The objective of this assignment is to connect the applicable concepts we have learned thus far to your project. You are to then perform sample calculations and work through various scenarios.
[As of the date of posting this document we have covered topics from Rectilinear Kinematics through Space Mechanics]

To achieve these objectives you must address the following;

Methodology: (30 points)
How do you justify applying a particular method to your problem? For example to analyze the dynamics of a free-throw in basketball, relevant methods include: projectile motion, general curvilinear motion, cylindrical components, and normal and tangential components. Give reasons why you selected any of the methods to analyze your problem. How did you determine that your problem is better analyzed using say relative motion rather than absolute-dependant motion for instance. If your project involves several methods, enumerate them and explain how they may be applicable to each phase of the analysis. For example putting a satellite into orbit involves an initial powered flight phase which may be described using rectilinear or curvilinear kinematics, at some point the launch vehicle or its payload is injected into orbit which is best modeled using central-force motion/ orbital mechanics. If your space vehicle reenters Earth atmosphere, at some point of its reentry it becomes a projectile.

Data: (20 points)
Identify all input parameters and explain how you got the values. For example for a projectile problem, how did you get the initial velocity? Did you obtain it from another report? Did you compute it yourself based on other data? Whatever the case may be, explain it or give the necessary reference so that a third party may look it up and verify. If you are analyzing a satellite for example, how did you obtain the initial velocity at the instant of free-flight orbit? How does your value compare with other known comparable satellites or space vehicles currently in service?

Calculations: (30 points)
Present calculations for numerous and various scenarios of your problem by varying the input parameters and obtaining new results. For example if you are analyzing the flight of a golf ball, how does changing the initial velocity or launch angle affect the range of the golf ball projectile? Does it result in the golfer being more successful than otherwise? If you are applying computer programming skills, this is where it will make a difference by enabling you to rapidly run many simulations. Report any relevant findings whether they are positive or negative outcomes.

Conclusions and Recommendations: (20 points)
Identify any improvements that can be made. Identify further analyses that we are yet to cover in class that can provide additional insights, if applicable. For example if you are analyzing a corner kick in

soccer, so far we will assume the ball does not spin during flight. However when we cover the topic Rigid Body Kinematics we shall study this in detail.

Group members:
The output of a group shall be commensurate with the size of the group. For example a group of three presenting say two scenario calculations will be considered insufficient. If you are working in a group, provide a tentative breakdown of each member's contribution to this submittal. A contribution shall involve some analysis or computational input. For example a group member cannot be responsible solely for typing up the reports, she or he must have some substantial contribution involving dynamics, data collection or processing, scenario calculations, or computer programming.