Guidelines

The main objective of the project is to give you the opportunity to further develop the differential equation theories developed in the class and apply them to solve some interesting differential equation models. Please follow the following steps:

- Form a group of 3 to 5 of your friends.

- Select one of the following topics.

- Fill the following form by clicking Here!

- Nominate one of the group to communicate with me.

- Send me the topic name (from the below list) with the list of the students.

Template

I am expecting a written report (a Paper) from each group. The report should be Each group 5-8 pages. I am also expecting this report to be professional quality and should contain the following:

- Title-page.

- Abstract.

- Introduction.

- Methods.

- Results and Discussions.

- Conclusion.

- References.

- Any source codes and input/output files should be included as Appendix

Authors' Contributions: Each group should include a section at the end of the paper called "Authors' Contributions". In this section, you should report the contribution of each member in your group. If all members of the team fulfill their responsibilities correctly, then each member will receive the same points for the project.

List of Projects

1. Transfer Functions
   Related to Laplace transforms, Transfer Functions are a compact description of the dynamical properties of a system. Particularly useful for vibrating mechanical systems and signal processing.

2. Numerical Methods
   Solving differential equations on a computer is very useful. There's also lots of different ways to do it: Euler, Runge-Kutta, BDF, etc. One of the important features of a numerical method for solving differential equations is it's stability properties: what kind of equations will it work on?

3. Control Theory
   Another engineering application, control theor studies how external inputs to a system of differential equations can be controlled to give a desired response.

4. Coronavirus and differential equations
   SIR model and how it works

5. Population Dynamics
   Ordinary differential equations can model many interesting

phenomena in biology and ecology. They can be used to find the equilibrium populations for various situations, including predators and prey, species competing for resources, and species in a symbiotic relationship. There are many important applications, including environmental concerns and disease propagation.

6. Machine Learning for solving differential equations:

7. Something in your engineering domain, which you think is linked to DE!

   Please discuss it with me first.

Marking

Evaluation criteria of the project:

Assessment Dimensions 100%	Grading Scale/Indicators		
	Exemplary 8→10	Satisfactory 6→Lass than 8	Unsatisfactory 4→Less than 6
Aim & Purpose 10%	• Covers a significant contemporary topic that is much related to the course outcomes. • Employs an original approach to study the selected topic.	• Covers a topic that is much related to the course outcomes. • Employs a logical approach to study the selected topic.	• Purpose of term paper is not clear. • A poor approach is used to study the selected topic.
Completeness 30%	• All required elements and components of term paper (Abstract, Introduction, Main Body, Conclusions, and Resources) are evidently addressed and included. • All issues related to the topic are noticeably addressed, and outlined.	• All required elements and components of term paper (Abstract, Introduction, Main Body, Conclusions, and Resources) are included. • All issues related to the topic are discussed.	• Some required elements are missing. • Not all issues related to the topic are discussed.
Content & Organization 25%	• Sections are well organized and clearly presented. • Sections and sequenced concepts are creatively and logically ordered, with clear transition sentences. • Presentation of the term paper elements shows an accurate and through understanding of all aspects of the chosen topic. • Reveals the student ability to powerfully use Technology in preparing written document.	• Sections are organized and clearly presented. • Sections are logically ordered. • Presentation of the elements of term paper shows an understanding of all aspects of the chosen topic. • Reveals the student ability to use Technology in preparing written document.	• Sections are poorly organized • Sections are illogically ordered. • Presentation of the elements of term paper shows that student has gained the minimum understanding of the basic aspects of the selected topic • Provides no evidence for familiarity with using Technology in preparing written document.
Writing Quality 15%	• Almost entirely free of spelling, punctuation, and grammatical errors. • Sections are well written with strong sentence structure. • Ideas and concepts are presented in a coherent and clear manner.	• A few spelling, punctuation, and grammatical errors are detected. • Sections are clearly written with good sentence structure. • Ideas and concepts are presented in a clear manner.	• Several spelling, punctuation, and grammatical errors are detected. • Sections are unclearly written with weak sentence structure.
Resources 10%	• Good quality significant recourses are effectively utilized in writing the Term Paper. • Resources are clearly and correctly listed and cited.	• Some of the recourses utilized in writing the Term Paper are significant. • Resources are clearly and correctly listed and cited.	• Most of the recourses utilized in writing the Term Paper are insignificant. • Resources are incorrectly listed and cited.
Overall Layout 10%	• Gives clear evidence of the excellent effort put in preparing the Term Paper. • Reveals the writer ability to powerfully use Technology in preparing written document. • Has attractive visual appeal.	• Gives evidence of the effort put in preparing the Term Paper. • Reveals the writer ability to use Technology in preparing written document.	• Shows no evidence for the effort put in preparing the Term Paper. • Provides no evidence for familiarity with using Technology in preparing written document.