RECESS TERM YEAR I

TEC 1301: Workshop Practice

Brief Description of Course:

Drawing from the concepts covered in Engineering Mathematics I and II, this course is designed to consolidate and advance analytical techniques for solution of ordinary differential equations; and introduces concepts fundamental to the study of other courses in Computer Engineering. The major themes covered include integral transforms, series solutions to ordinary differential equations and special functions.

Objectives of the Course:

The objectives of this course are to:

Introduce the student to Integral Transforms and their application to the solution of Ordinary Differential Equations

Introduce the Power Series solution technique to Ordinary Differential Equations Expose the student to some special functions fundamental to engineering specifically Gamma, Beta, Bessel and Legendre An important emphasis of the course is to develop problem solving skills and proof skills by working on specific problems in which it is natural to look at special or simpler cases in order to try to discover patterns. An integral part of the process of mathematical thinking is to wander into blind alleys, sometimes being frustrated, before ultimately obtaining a solution or proof. In this process mathematical scientists often work together with colleagues, and this group work and sharing of ideas often adds great value to a mathematical investigation. A major goal of the course is to give a balanced introductory treatment of the area of partial differential equations (PDE) so that a student appreciates their power in modelling engineering problems.

Expected Outcomes:

Upon completion of this course, the student should be able to:

- Apply the knowledge of ordinary differential equations in solving engineering problems.
- Discuss and apply the power series solutions to ordinary differential equations.
- To solve problems related to discovering patterns in engineering.
- To use and apply the knowledge of PDE to mathematical modeling problems.

Course Content:

1. **Fourier and Laplace Transformations: (10 Hours)**

Introduction to Direct and Inverse Fourier Transformation and their application in solving differential equations often found in engineering problems.

2. **Series Solutions of Ordinary Differential Equations: (12 Hours)**

Motivation for use of Series; Series Solutions about Ordinary Points; Series Solution about Singular Points the Frobenius' Method.

3. Gamma and Beta Functions: (8 Hours)

Integral Definition of Gamma and Beta Functions, Properties of Gamma and Beta Functions; Definition of Gamma Function for Negative Values of Argument; Generalization of the Laplace Transform by Means of the Gamma function. Other Applications of Gamma Function.

4. Bessel Functions: (4 Hours)

Brief Introduction to Bessel Functions and their applications in Mechanical Engineering.

5. *Legendre Functions:* (6 Hours)

Brief introduction to Legendre Functions and their applications in Mechanical Engineering..

6. Applied Statistics: (10 Hours)

Introduction and Data Description and statistics at various levels, Experiments and Sample Spaces Statistical Modelling, and graphical presentation, numerical characterisation and summarisation of data. collection and utilisation of data to interpret situations and events

7. Applied probability (10 hours)

Introduction to probability, review of Set Theory, , Definition and Assignment of Probabilities,

Delivery Methods:

The course will be taught by using lectures and tutorials

Assessment Methods:

Course work (assignments and tests) and final examination and their relative contributions to final grade are shown as follows:

Requirement	**Percentage contribution**
Course work	40%
Final examination	60%
Total	**100%**

References

- Erwin Kreyszig,Advanced Engineering Mathematics 7th Edition,John Wiley and sons,1993.
- Walpole,Myers,Probability and Statistics for Engineers and scientists,6th edition,Prentice Hall 1998.