**B.Tech. (Sem III)**

**Subject Code: 01MA0301**

**Subject Name: Applied differential equations**

**(ALL BRANCHES EXCEPT IT/CE)**

**Objective:** The subject aims to make the learner able to apply the knowledge of differential equations and transforms to solve core Engineering and real world problems.

**Credits Earned: 5** Credits

**Course Outcomes:** After completion of this course, student will be able to

- Expand various functions in terms of sine and cosine functions.
- Classify andapply the standard methods to solve ordinary and partial differential equations.
- Apply Laplace transform and Fourier series to solve differential equations.
- Apply the knowledge of differential equations and its solutions to evaluate engineering problems.

**Teaching and Examination Scheme**

| Teaching Scheme (Hours) | | | Credits | Theory Marks | | | Tutorial/ Practical Marks | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| Theory | Tutorial | Practical | | ESE (E) | Mid Sem (M) | Internal (I) | Viva (V) | Term work (TW) | |
| 4 | 2 | - | 5 | 50 | 30 | 20 | 25 | 25 | 150 |

**Contents:**

| Unit | Topics | Contact Hours |
|---|---|---|
| 1 | **Fourier series:**Periodic functions, Fourier series of functions of any period**,**Fourier series of Even and odd functions, Half range Expansions, Fourier integrals. | 14 |

| | | |
|---|---|---|
| 2 | **Laplace Transforms:** Laplace transforms definition, Laplace transforms of some elementary functions, Inverse transforms, Linearity and shifting properties, Laplace transforms of derivatives and integrals,Differentiation and integrations of Transforms, Convolution theorem and its application to obtain inverse Laplace transform, Laplace transform of periodic functions, Unit step function, Unit impulse function (Dirac delta function), second shifting property, Applications of Laplace transforms to solve ODE and system of ODE. | 16 |
| 3 | **Linear Differential Equations :**Solution of homogeneous linear differential equations with constant coefficients, Non homogeneous linear differential equations , particular integrals by Inverse Operators and Variation of Parameters, Euler-Cauchy's differential equationswith variable coefficients, Power Series solution of ODE. | 10 |
| 4 | **Partial Differential Equations :**Formation of PDE, Methods of solutions, Lagrange's linear partial differential equation , Special types of Nonlinear PDE of the first order, method of separation of variables. | 10 |
| 5 | **Applications of differential equations:** Application of ODE**:** Mechanical vibration system, Electrical circuit system, Application of PDE: Heat, wave, Laplace equations and their solution by method of separation of variables and Fourier series. | 10 |
| | **Total Hours** | **60** |

**Recommended Textbooks:**

1. Erwin Kreyszig: Advanced Engineering Mathematics, 8th Ed., Jhon Wiley & Sons, India,1999.

**Reference Books:**

1. M. D. Weir *et al*: Thomas' Calculus, 11th Ed., PearsonEduaction, 2008.
2. Stewart James: Calculus Early Transcendental, 5th Ed., Thomson India, 2007
3. Wylie & Barrett: Advanced Engineering Mathematics, Mc graw Hill pub.
4. Greenberg M D: Advanced Engineering Mathematics, 2nd ed., Pearson.

**Suggested Theory distribution:**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

| Distribution of Theory for course delivery and evaluation | | | | | |
|---|---|---|---|---|---|
| Remember | Understand | Apply | Analyze | Evaluate | Create |
| 20% | 20% | 30% | 15% | 10% | 5% |

**Instructional Method:**

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

Web site: http://mathworld.wolfram.com/

http://en.wikipedia.org/wiki/Math