

<b>COURSE TITLE</b>	<b>APPLIED MATHEMATICS FOR CHEMICAL ENGINEERS</b>
<b>COURSE CODE</b>	<b>01MA0305</b>
<b>COURSE CREDITS</b>	<b>4</b>

**Objective:**

- 1 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.

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

- 1 Classify and apply the standard methods to solve ordinary and partial differential equations.
- 2 Apply Laplace transform and Inverse laplace transform to solve differential equations.
- 3 Apply the differential equations to solve engineering problems.
- 4 Apply statistical methods to solve different real life problems
- 5 Apply probability distribution related concepts on given data set.

**Pre-requisite of course:**Basics of Integration, Derivatives, Trigonometry.

**Teaching and Examination Scheme**

<b>Theory Hours</b>	<b>Tutorial Hours</b>	<b>Practical Hours</b>	<b>ESE</b>	<b>IA</b>	<b>CSE</b>	<b>Viva</b>	<b>Term Work</b>
3	1	0	50	30	20	25	25

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Laplace Transforms</b> Laplace transforms definition, Laplace transforms of Trigonometric functions and other elementary functions, Inverse Laplace transforms, Linearity, first shifting and second 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), Inverse Laplace transform using shifting properties, Inverse Laplace by Partial fractions., Applications of Laplace transforms to solve first and Higher ordered differential equations.	10
2	<b>Linear Differential Equations</b> Order and degree of differential equations, types of solutions,, 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 equations with variable coefficients,, Ordinary points and Singular Points and its classification. Power Series solution of ODE.	12

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
3	<b>Partial Differential Equations</b> Formation of PDE by removing arbitrary Constants and arbitrary functions, Linear and Non-Linear PDE and solutions, Lagrange's linear partial differential equation, Special types of Nonlinear PDE of the first order,, method of separation of variables.	10
4	<b>Probability and Statistics</b> Definitions of Probability and sampling theorems, Conditional probability,, Mean, Median, Mode and Standard Deviation, Variance , Discrete and Continuous random variable, Discrete Distribution Function., Probability Distribution: Poisson, Normal and Binomial distributions.	10
<b>Total Hours</b>		<b>42</b>

#### **Suggested List of Experiments:**

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Tutorial 1</b> Laplace Transform, Inverse Laplace Transform, Applications of Laplace and Inverse Laplace Transform	6
2	<b>Tutorial 2</b> Homogeneous differential equations., Nonhomogeneous differential equations	4
3	<b>Tutorial 3</b> Formation of PDE and solution of PDE, Non linear PDE and Variable separable Method	4
4	<b>Tutorial 4</b> Probability and random variables, Probability distribution	4
<b>Total Hours</b>		<b>18</b>

#### **Textbook :**

- 1 "Calculus Early Transcendental", 5th Ed., , Stewart James,, Thomson India, , 2007
- 2 Advanced Engineering Mathematics", C. R. Wylie, L. C. Barrett, Mc Graw Hill,, 1995

#### **References:**

- 1 "Mathematical statistics", "Mathematical statistics", H.C. Saxena and J. N. Kapur,, S. Chand,, 1960

#### **Suggested Theory Distribution:**

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

Distribution of Theory for course delivery
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<b>Remember / Knowledge</b>	<b>Understand</b>	<b>Apply</b>	<b>Analyze</b>	<b>Evaluate</b>	<b>Higher order Thinking / Creative</b>
20.00	30.00	30.00	20.00	0.00	0.00

**Instructional Method:**

- 1 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.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

**Supplementary Resources:**

- 1 <https://archive.nptel.ac.in/courses/111/106/111106139/>