COURSE CONTENT

PROBABILITY DISTRIBUTIONS ANDCOMPLEX VARIABLES								
IVSemester: MECH								
CourseCode	**Category**	**Hours/ Week**			**Credits**	**Maximum Marks**		
2530007	**Basic Science**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100
ContactClasses: 48	**TutorialClasses:Nil**	**PracticalClasses:Nil**				**TotalClasses:48**		
Prerequisites:Mathematics courses of first year of study.								

Course Overview:

The course covers advanced topics of probability and complex variables with applications. Probability theory is the branch of mathematics that deals with modelling uncertainty, and random variate distributions play an exceptional role in designing data-driven technology, known as data-centric engineering. They also have various applications in telecommunications and other engineering disciplines. The course includes random variables, probability distributions, hypothesis testing, confidence intervals, and linear regression. There is an emphasis placed on real-world applications to engineering problems. The course focuses on Advanced Engineering Mathematics, which provides the relevant mathematical tools required to analyse engineering problems and scientific professions. The course includes complex functions and differentiation, complex integration, power series expansion of complex functions. The mathematical skills derived from this course form a necessary base for analytical and design concepts encountered in the program.

Course Objectives:

1. The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
2. The basic ideas of statistics including measures of central tendency, correlation and regression.
3. The statistical methods of studying data samples.
4. Differentiation and integration of complex valued functions.
5. Evaluation of integrals by using Cauchy's integral formula and Cauchy's residue theorem.
6. Expansion of complex functions by using Taylor's and Laurent's series.

Course Outcomes: After Completion of the Course, Students should be able to

1. Apply the binomial distribution and its Poisson approximation to model real-world discrete data scenarios.
2. Apply the Normal distribution and Sampling to model real-world data
- scenarios.
3. Explain the concept of hypothesis testing and the procedure for performing large sample tests for proportions and means.
4. Illustrate the Milne-Thomson method for constructing analytic functions.
5. Identify the Taylor and Laurent series expansions for analytic functions.

UNIT-I: Random Variables and Probability distributions

Concept of a Random variables: Discrete and continuous random variables and their properties, Expectation of Random Variables, Variance of random variables.

Discrete probability distributions: Binomial and Poisson distributions.

UNIT-II: Continuous probability distributions and Sampling

Uniform distribution - Normal distribution - Area under the Normal Curve - Applications of the Normal Distribution- Normal Approximation to the Binomial distributions. Fundamental Sampling Distributions: Random Sampling - Some important Statistics - Sampling Distributions - Sampling Distribution of Means - Central Limit Theorem.

UNIT-III: Tests of Hypotheses (Large and Small Samples)

Statistical Hypothesis, General Concepts, Testing a Statistical Hypothesis, Test of a single mean, difference of means, single proportion and difference of proportion for large samples, F-distribution.

UNIT-IV: Complex Differentiation

Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), Finding harmonic conjugate-Milne Thomson method-Elementary analytic functions (Exponential, Trigonometric, logarithm) and their properties.

UNIT-V: Complex Integration

Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem

(All theorems without Proof)

TEXTBOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers,35th Edition, 2010.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics For Engineers & Scientists,9thEd. Pearson Publishers.

REFERENCEBOOKS:

1. Fundamentals of Mathematical Statistics, Khanna Publications, S.C. Guptha and V.K. Kapoor.
2. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. J. W. Brown and R.V. Churchill, Complex Variables and Applications, 7th Edition, Mc-GrawHill,2004.

ELECTRONIC RESOURCES:

1. **https://www.youtube.com/watch?v=j9WZyLZCBzs**
2. **https://www.youtube.com/watch?v=UnzbuqgU2LE**
3. **https://www.youtube.com/watch?v=gI5y3RZe9fk**
4. **https://www.youtube.com/watch?v=l87zHfGW3Z4**
5. **https://www.youtube.com/watch?v=ccIw3vGW0Rg&list=PLeIE3weEKo4aamYts4iA_Ymb8ULYm82WR**
6. **https://www.youtube.com/watch?v=TP8PDIl7gxo&list=PLeIE3weEKo4b3ixjoqqIPVgHROQykVa69**

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Definitions and terminology
4. Assignments
5. Model question paper–I
6. Model question paper–II
7. Lecture notes
8. E-Learning Readiness Videos(ELRV)