Course Code	Course/Subject Name	Credits
MEC401	**Applied Mathematics –IV$^{@}$**	**4**

Objectives:
1. To inculcate an ability to relate engineering problems to mathematical context.
2. To provide a solid foundation in mathematical fundamentals required to solve engineering problem.
3. To study the basic principles of Vector analyses, statistics and probability and complex integration.
4. To prepare students for competitive exams.

Outcomes: Learner should be able to ….
1. Use matrix algebra with its specific rules to solve the system of linear equations.
2. Understand and apply the concept of probability distribution and sampling theory to engineering problems.
3. Apply principles of vector differential and integral calculus to the analysis of engineering problems.
4. Identify, formulate and solve engineering problems.

Module	Details	Hrs
1	**Matrices** 1.1 Brief revision of vectors over a real field, inner product, norm, Linear Dependance and Independence and orthogonality of vectors. 1.2 Characteristic polynomial, characteristic equation, characteristic roots and characteristic vectors of a square matrix, properties of characteristic roots and vectors of different types of matrices such as orthogonal matrix, Hermitian matrix, Skew-Hermitian matrix, Cayley Hamilton theorem (without proof) Functions of a square matrix, Minimal polynomial and Derogatory matrix.	**09**
2	**Vector calculus** 2.1 Brief revision of Scalar and vector point functions, Gradient, Divergence and curl. 2.2 Line integrals, Surface integrals, Volume integrals. Green's theorem(without proof) for plane regions and properties of line integrals, Stokes theorem(without proof), Gauss divergence theorem (without proof) related identities and deductions.(No verification problems on Stoke's Theorem and Gauss Divergence Theorem)	**11**
3	**Non Linear Programming** 3.1 Unconstrained optimization, problems with equality constraints Lagranges Multiplier method. 3.2 Problem with inequality constraints Kuhn-Tucker conditions.	**06**
4	**Probability Distributions** 4.1 Discrete and Continuous random variables, Probability mass and density function, Probability distribution for random variables, Expected value, Variance. 4.2 Probability Distributions: Binomial, Poisson and Normal Distributions. For detailed study.	**10**
5	**Sampling Theory** 5.1 Sampling distribution. Test of Hypothesis. Level of significance, critical region. One tailed and two tailed tests. Interval Estimation of population parameters. Large and small samples. 5.2 Test of significance for Large samples: Test for significance of the	**10**

	difference between sample mean and population means, Test for significance of the difference between the means of two samples.	
	5.3 Student's t-distribution and its properties. Test of significance of small samples: Test for significance of the difference between sample mean and population means, Test for significance of the difference between the means of two Samples, paired t-test.	
	5.4 Analysis of Variance(F-Test): One way classification, Two-way classification(short-cut method)	
	5.5 Chi-square distribution and its properties, Test of the Goodness of fit and Yate's correction.	
6	**Correlation and Regression** 6.1 Correlation,Co-variance, Karl Pearson Coefficient of Correlation & Spearman's Rank Correlation Coefficient (non-repeated & repeated ranks) 6.2 Regression Coefficients & lines of regression	**06**

@ Course common to Mech/Auto/Prod/Civil

Theory Examination:
1. Question paper will comprise of total 6 questions, each of 20 Marks.
2. Only 4 questions need to be solved.
3. Question 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature (for example suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

Internal Assessment:

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems or course project.

Reference Books:
1. Fundamentals of Mathematicals Statistics, S C Gupta & V K Kapoor, S. Chand & Co
2. Higher Engineering Mathematics, Dr B. S. Grewal, Khanna Publication
3. Elements of Applied mathematics, P N & J N Wartikar, Pune VidyarthiGruhaPrakashan
4. Advanced Engineering Mathematics, E Kreyszing, Wiley Eastern Limited
5. Operations Research, S.D. Sharma, S. Chand & CO.
6. Vector Analysis by Murray R. Spiegel, Shaum Series
7. Operations Research, Kantiswarup, Manmohan, P K Gupta, S. Chand & CO.