SCHEME OF COURSE WORK

Course Details:

Course Title	NUMERICAL METHODS, PROBABILITY AND STATISTICS		
Course Code	22BM1111	**L T P C**	**3 0 0 3**
Program:	**B.Tech.**		
Specialization:	**Electrical and Electronics Engineering**		
Semester	**IV Semester**		
Prerequisites	• Fundamentals of Set theory and calculus. • Basic concepts of Probability and Discrete Random Variables.		

PROGRAM OUTCOMES:

1. A graduate of Electrical and Electronics Engineering will be able to apply the knowledge of mathematics, science, engineering fundamentals to solve complex Electrical and Electronics Engineering problems.
2. A graduate of Electrical and Electronics Engineering will be attaining the capability to identify, formulate and analyse problems related to Electrical and Electronics Engineering.
3. A graduate of Electrical and Electronics Engineering will be in a position to design solutions for system components and processes that meet the specified needs with appropriate consideration for public health and safety.
4. A graduate of Electrical and Electronics Engineering will be able to conduct experiments, perform analysis and interpretation of data by using research methods such as design of experiments to synthesize the information and to provide valid conclusions.
5. A graduate of Electrical and Electronics Engineering will be able to select and apply appropriate techniques from the available resources.
6. A graduate of Electrical and Electronics Engineering will be able to carry out their professional practice in Electrical and Electronics Engineering by appropriately considering and weighing the issues related to society.
7. A graduate of Electrical and Electronics Engineering will be able to understand the impact of the professional engineering solutions on environmental safety and legal issues.
8. A graduate of Electrical and Electronics Engineering will be transform into responsible citizens by resorting to professional ethics and norms of the engineering practice.
9. A graduate of Electrical and Electronics Engineering will be able to function effectively in individual capacity as well as a member in diverse teams and in multidisciplinary streams.
10. A graduate of Electrical and Electronics Engineering will be able to communicate fluently with the engineering community and society, and will be able to prepare reports and make presentations effectively.

11. A graduate of Electrical and Electronics Engineering will be able to apply knowledge of the engineering and management principles to managing projects and finance in multidisciplinary environments.
12. A graduate of Electrical and Electronics Engineering will be engage themselves in independent and life-long learning to continuing professional practice in their specialized areas of Electrical and Electronics Engineering.

Course Outcomes (COs): At the end of the Course, Student will be able to

1	determine numerical solution of algebraic and transcendental equations and discuss different difference operators.
2	use interpolation techniques for data analysis and numerically solve initial value problems.
3	examine, analyze, and compare various Probability distributions.
4	determine confidence intervals for population parameters..
5	prepare null and alternative hypothesis and test its validity based on random samples.

Course Outcome versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	2										
CO-2	3	2										
CO-3	3	2		2								
CO-4	3	2			2							
CO-5	3	2			2							

3 - Strongly correlated, *2* - *Moderately* correlated, 1-weakly correlated, *Blank* - *No correlation*

Assessment Methods:	Assignment / Quiz / Seminar / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	Topic / Contents	Course Outcomes	Sample Questions	Teaching - Learning Strategy	Assessment Method & Schedule
1	Review of basic concepts in Solution of algebraic and transcendental equations.	---		Lecture / Problem solving	---
2	Solution of algebraic and transcendental equations: bisection method, method of false position, Newton's method.Continuous	**CO-1**	Find the real root of the equation $cosx = xe^x$ using the regular falsi method corrected to four decimal places.	Lecture / Problem solving	Assignment (Week 3 - 4)/ Quiz -I (Week -8)/ Mid-Test 1 (Week 9)
3	Finite differences: Forward differences, Backward differences, Central differences, Differences of a	**CO-1**	Form a table of difference for the function $f(x) = x^3 + 5x - 7$ for x= -1, 0, 1, 2, 3, 4, 5. Continue the	Lecture / Problem	Mid-Test 1 (Week 9)/ Assignment

	polynomial, Other Difference operators, Relations between the operators .		table to obtain f(6).	solving	(Week 3 - 4)/ Quiz -I (Week-8)
4	Newton's interpolation formulae- Newton's forward interpolation formula Newton's backward interpolation formula,	**CO-1**	Using Newton,s interpolation formula find the value of the f(1.2) up to three decimals, given that f(1)=3.49, f(1.4)=4.82, f(1.8)=5.96, f(2.2)=6.5.	Lecture / Problem solving	Mid-Test 1 (Week 9)/ Quiz -I (Week -8)
5	Interpolation with un equal intervals: Lagrange interpolation, Inverse interpolation. Population and sample, Sampling distribution of the mean (σ known), Central Limit theorem (without Proof) and Problems	**CO-1**	Use the Lagranges formula to find the form of f(x) for the given data x: 0, 2, 3, 6 f(x): 648, 704, 729, 792	Lecture / Problem solving	Mid-Test 1 (Week 9) / Quiz -I (Week -8)
6	Numerical solutions of Ordinary differential equations: Euler's Method, Modified Euler's Method, Sampling distribution of the mean(σ unknown), Point Estimation, Maximum error and determination of sample size.	**CO-2**	Apply modified Euler's method to find an approximate value of y when x=1.2 in steps of 0.1, given that $\frac{dy}{dx} = x + y$ and y(1) = 1.	Lecture / Problem solving	Mid-Test 1 (Week 9)/ Quiz -I (Week -8)
7	Numerical solutions of Ordinary differential equations: Euler's Method, Modified Euler's Method Interval Estimation (Large sample and small sample) Runge-Kutta method of order 4 and revision	**CO-2**	Apply the fourth order Rungr-Kutta method to find an approximate value of y when x=1.2 in steps of 0.1, given that $\frac{dy}{dx} = x^2 + y^2$ and y(1) = 1.5.	Lecture / Problem solving	Mid-Test 1 (Week 9)/ Quiz -I (Week -8)
8	Review of basic concepts in Probability and Discrete Random variables Tests of Hypotheses (Introduction, Null hypotheses, Alternative hypotheses, Type –I,II errors, Level of significance, Hypotheses concerning one mean (Large and Small samples)	**CO-3**	A sample of 64 students have a mean weight of 70Kgs. Can this sample be regarded as a sample from a population with mean weight 65Kgs and standard deviation 25Kgs.	Lecture / Problem solving	Mid-Test 1 (Week 9)/ Quiz -I (Week -8)
9	**Mid-Test 1**				
10	Random variables - Probability density, Distribution. Calculating probabilities from Probability density, Determining Mean and Variance using Probability density Inference concerning two means (Large and Small samples), Paired t-test.	**CO-3**	1. If $f(x) = \frac{1}{18}(2x + 3),\ for\ 2 \leq x \leq 4$ is density function, find $P(2 \leq X \leq 3)$ 2. Find Mean and Variance of the continuous density function $f(x) = \frac{3}{2}(1 - x^2), 0 \leq x \leq 1$A random sample of size 81 is taken from a population with $\sigma = 0.9$ and $\bar{x} = 20.8$. Construct a 95% confidence interval for the population mean.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week-17)/ Assignment (113-14)

11	Normal Distribution- Density and Properties. Calculating Normal Probabilities, Estimation of Proportions, Hypotheses concerning one Proportion, Hypotheses concerning several Proportions	**CO-3**	In a Normal distribution, 7 % of the items are under 35 and 89 % are under 63. Determine the mean and variance of the distribution..	Lecture / Problem solving	Assignment (Mid-Test 2 (Week 18) / Quiz -II (Week -17)/ Assignment (13-14)
12	Normal Approximation to Binomial Distribution, Poisson distribution, Normal distribution: calculating normal probabilities.	**CO-4**	1. Find the mean and variance of uniform distribution 2. If 62% of clouds seeded with silver iodide show spectacular growth, what is the probability that among 40 clouds seeded with silver iodide at most 20 will show spectacular growth?	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
13	Population and sample, Sampling distribution of the mean (σ known), sampling distribution of the mean (σ unknown),and Problems	**CO-4**	When we sample from infinite population what happens to the standard error of the mean if the sample size is (i) increased from 50 to 200 (ii) decreased from 640 to 40.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
14	Sampling distribution of the mean(σ unknown), Point Estimation, Maximum error and determination of sample size.	**CO-5**	The tensile strength of a new composite can be modeled as a normal distribution. A random sample of size 25 specimens has mean 45.3 and standard deviation 7.9. Does this information tend to support or refute the claim that the mean of the population is 40.5?	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
15	Interval Estimation (Large sample and small sample)	**CO-5**	Five independent measurements of the flash point of Diesel oil gave the values 144, 147, 146, 142, 144. Assuming normality, determine a 99% confidence interval for the mean.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
16	Estimation of Proportions, Estimation of variance	**CO-5**	The machine puts out 16 imperfect articles in a sample of 500. After machine is overhead, it puts out 3 imperfect articles in a batch of 100. Has the machine improved.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
17	Hypotheses concerning one variance, Hypotheses concerning several Proportions	**CO-5**	The machine puts out 16 imperfect articles in a sample of 500. After machine is overhead, it puts out 3 imperfect articles in a batch of 100. Has the machine improved.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Quiz -II (Week -17)
18	**Mid-Test 2**				
19/20	**END EXAM**				