ADVANCE ENGINEERING MATHEMATICS

Vision of Institute

Vision:
To become a renowned centre of outcome based learning, and work towards academic, professional, cultural and social enrichment of the lives of individuals and communities.

Mission of Institute

- Focus on evaluation of learning outcomes and motivate students to inculcate research aptitude by project based learning.
- Identify areas of focus and provide platform to gain knowledge and solutions based on informed perception of Indian, regional and global needs.
- Offer opportunities for interaction between academia and industry.
- Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.

Vision of the Department

"The vision of our institute is to provide the professional and active learners to the IT challenging world. By providing the technical surroundings and scientific excellence environment, we serve as a valuable resource for industry and society."

Mission of the Department

- To generate the adequate knowledge by promoting the extracurricular activities and technical education.
- To provide the graduates best technology services to fulfill its commitment of technical and education of the highest quality.
- To anticipate and meet the information technology needs of alumni, graduates, faculty and staff as they pursue their educational and professional goals.

ADVANCE ENGINEERING MATHEMATICS SYLLABUS:-

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

II Year- III Semester: B.Tech. (Information Technology)

3IT2-01: Advanced Engineering Mathematics

Credit- 3
3L+0T+0P

Max. Marks : 150 (IA:30,ETE:120)
End Term Exam: 03 Hours

SN	CONTENTS	Hours
1	**Random Variables:** Discrete and Continuous random variables, Joint distribution, Probability distribution function, conditional distribution. Mathematical Expectations: Moments, Moment Generating Functions, variance and correlation coefficients, Chebyshev's Inequality, Skewness and Kurtosis.	7
2	**Binomial distribution**, Normal Distribution, Poisson Distribution and their relations, Uniform Distribution, Exponential Distribution. Correlation: Karl Pearson's coefficient, Rank correlation. Curve fitting. Line of Regression.	5
3	**Historical development**, Engineering Applications of Optimization, Formulation of Design Problems as a Mathematical Programming Problems, Classification of Optimization Problems	8
4	**Classical Optimization using Differential Calculus:** Single Variable and Multivariable Optimization with & without Constraints, Langrangian theory, Kuhn Tucker conditions	6
5	**Linear Programming:** Simplex method, Two Phase Method and Duality in Linear Programming. Application of Linear Programming: Transportation and Assignment Problems.	14
	TOTAL	40

PROGRAM OUTCOMES (ANNEXURE 1)

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life –long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Subject and Code: ADVANCE ENGINEERING MATHEMATICS (3IT2-01)
Semester: III [L/T/P - 3/0/0]

External marks	:	120
Internal marks	:	30
Total marks	:	150

Course Outcomes (COs): Graduates will be able to:

CO1: To learn the concepts and principles of Random variables and Probability distribution.
CO2: To learn the formulation of different mathematical problems into optimization problems.
CO3: Apply the principles of optimization using differential calculus.
CO4: To understand the concepts of Linear Programming.

Mapping of CO's with PO's:

Sem	Subject	Code	L/T/P	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1

																2
III	Advance Engineering Mathematics	3IT2-02	L	To learn the concepts and principles of Random variables and Probability distribution.	H	L	L		L	L	L		L	L		L
			L	To learn the formulation of different mathematical problems into optimization problems.	H	L	L		L	L	L		L	L		L
			L	Apply the principles of optimization using differential calculus. .	H	L	L		L	L	L		L	L		L
			L	To understand the concepts of Linear Programming.	H	L	L		M	L	L		L	L		L

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE, JAIPUR			
Department of Information Technology			
LECTURE PLAN			
Subject:3IT2-01 : Advanced Engineering Mathematics		**Year/sem: II/ III**	
	No. of Lecture Req./(Avl.) : 40/(40)		
Semester Starting Date: 16/07 /2018	**Semester Ending Date: 24/11/2018**		
Unit No./ Total lec. Req.	**Topics**	**Lect. Req.**	**Lect. No.**
Unit-1 (07)	Random Variables, Discrete and Continuous Random Variables, Joint Distribution	1	1
	Probability Distribution function, Conditional distribution, Mathematical	1	2

	Expectations		
	Moments, Moment Generating Functions	2	4
	Variance and Correlation Coefficients	1	5
	Chebyshev's Inequality, Skewness and Kurtosis	2	7
Unit-2 (05)	Binomial Distribution, Normal Distribution	1	8
	Poisson Distribution and their Relations	1	9
	Uniform Distribution, Exponential Distribution	1	10
	Correlation: Karl Pearson's coefficient	1	11
	Rank correlation, Curve fitting	1	12
Unit-3 (8)	Historical Development	2	14
	Engineering Applications of Optimization	2	16
	Formulation of Design Problems as a Mathematical Programming Problems	2	18
	Classification of Optimization Problems	2	20
Unit-4 (6)	Classical Optimization using Differential Calculus	1	21
	Single Variable and multivariable Optimization with & without Constraints	3	24
	Langrangian theory	1	25
	Kuhn Tucker conditions	1	26
Unit-5 (14)	Linear Programming	1	27
	Simplex method	4	31
	Two Phase Method and Duality in Linear Programming	3	34
	Application of Linear Programming	2	36
	Transportation Problems	2	38
	Assignment Problems	2	40

Recommended Books:

1. Fundamentals of Mathematical Statistics By S. C. Gupta and V. K. Kapoor Sultan Chand and Sons
2. An Introduction to Applied Probability By Blake, John Wiley and Sons
3. Introduction to Operation Research By F. S. Hillier and G. j. Lieberman, Tata McGraw Hill
4. Operation Research By Kanti Swaroop, P. K. Gupta & Manmohan, Sultan Chand & Sons

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE
Department of Information Technology

COURSE: B. Tech **SEMESTER: III[rd]** **SECTION: A+B**
SUBJECT: Advance Engineering Mathematics **SESSTION: (2018-2019)** **CODE: 3IT2-01**

Weak Students Assignment (CO1)

CO1: To learn the concept and principles of Random variable and probability distribution.

Q1.The first four moments of distribution about the value 5 are -4, 22,-117and 560, obtain the moments about (i) mean and (ii) origin.

Q2.If 10% of the pens manufactured by the company are defective, find the probability that a box of 12pens contain

- **(i) Exactly two pens defective pens,**
- **(ii) At least two pens defective pens,**
- **(iii) No defective pens,**

Q3. Recurrence Relation for the central Moments of the Poisson Distribution.

Weak Students Assignment (CO2)

CO2. To learn the formulation of different mathematical problems into optimization problems.

Q1. A company produces two types of leather belts A and B. The respective profits are Rs.10 and Rs. 5 per belts. The supply of raw material is sufficient for making 850 belts per day. For A , a special type of buckle is required and 500 are available per day. There are 700 buckles available for belt B per day. Belt A, requires twice as much time as that required for belt B. The company can produce 500 belts if all of them were of type A. Formulate a model for the above problem.

Q2.A paper mill produces two grade of paper namely A and B, it cannot produce more than 400 tons of grade A and 300 tons of B in a weak. There are 160 production hours in a week. It requires 0.2 and 0.4 hours to produce a tons of products A and B respectively with corresponding profits of Rs. 200 and Rs. 500per ton. Formulate the above as a LPP.

Q3. Write the 12 application of optimization technique in engineering.

Q4. There are two types of fertilizers F_1 and F_2. F_1 consists of 10% nitrogen and 6% phosphoric acid and F_2 consists of 5% nitrogen and 10% phosphoric acid. After testing the soil conditions, a farmer finds that she needs atleast 14kg of nitrogen and 14 kg of phosphoric acid for her crop. If F_1 costs Rs 6/kg and F_2 costs Rs 5/kg, determine requirements are met at a minimum cost. What is the minimum cost?

CO3: Apply the principles of optimization using differential calculus.

Q1. State Kuhn Tucker condition,

Max $Z= 2X_1+3X^2 -(X_1^2 +X_2^2 + X_3^2)$

Subject to $X_1 + X_2 \leq 1,$

$2X_1 + 3X_2 \leq 6,$

$X_1, X_2 \geq 0$

Q2. Find the extreme points of the function

f $(X,Y) = X^3 + 2y^3+ 3X^2+ 12Y^2 +24$**, and determine their nature.**

Q3. Minimize $f(X) = \frac{1}{2}(X_1^2+X_2^2+X_3^2)$

Subject to $g_1(X) = X_1-X_2 =0$

$g_1(X) = X_1+ X_2 + X_3 -1 = 0$

by (a) direct substitution (b) constrained variation.

Weak Students Assignment (CO4)

CO4.To understands the concepts of Linear Programming.

Q1. Solve the LPP by using Big – M method.
Min. $Z = X_1+X_2$
Subject to $2X_1+ X_2 \geq 4$
$X_1 + 7X_2 \geq 7$
And $X_1, X_2 \geq 0$

Q2. Solve Transportation Problem by using VAM method

	W1	W2	W3	W3	Availability
F1	19	30	50	10	7
F2	70	30	40	60	9
F3	40	8	70	20	18
Requirements	5	8	7	14	

Q3. There are five jobs to be assigned, to five machines and the associated cost matrix is as below. Determine the optimal assignment.

Jobs	Machines				
↓	I	II	III	IV	V
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15