

**FR. Conceicao Rodrigues College Of Engineering**

Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

**Department of Humanities & Sciences**

**F.E. (Electronics) (semester IV) (2018-2019)**

**Lesson Plan**

**Subject: Applied Mathematics IV (EXS401)**

**Credits-5**

**Syllabus:**

Programme Structure for Bachelor of Engineering (B.E.) – Electronics Engineering (Rev. 2016)

Module No.	Unit No.	Topics	Hrs.
1		<b>Calculus of Variation:</b>	06
2	1.1	Euler's Langrange equation, solution of Euler's Langrange equation (only results for different cases for Function) independent of a variable, independent of another variable, independent of differentiation of a variable and independent of both variables	
	1.2	Isoperimetric problems, several dependent variables	
	1.3	Functions involving higher order derivatives: Rayleigh-Ritz method	
		<b>Linear Algebra: Vector Spaces</b>	06
	2.1	Vectors in n-dimensional vector space: properties, dot product, cross product, norm and distance properties in n-dimensional vector space.	
	2.2	Vector spaces over real field, properties of vector spaces over real field, subspaces.	
3	2.3	The Cauchy-Schwarz inequality, Orthogonal Subspaces, Gram-Schmidt process.	
		<b>Linear Algebra: Matrix Theory</b>	10
	3.1	Characteristic equation, Eigen values and Eigen vectors, properties of Eigen values and Eigen vectors	
	3.2	Cayley-Hamilton theorem (without proof), examples based on verification of Cayley- Hamilton theorem.	
	3.3	Similarity of matrices, Diagonalisation of matrices.	
4	3.4	Functions of square matrix, derogatory and non-derogatory matrices.	
		<b>Probability</b>	10
	4.1	Baye's Theorem (without proof)	
	4.2	Random variable: Probability distribution for discrete and continuous random variables, Density function and distribution function, expectation, variance.	
	4.3	Moments, Moment Generating Function.	
5	4.4	Probability distribution: Binomial distribution, Poisson & normal distribution (For detailed study)	
		<b>Correlation</b>	04
	5.1	Karl Pearson's coefficient of correlation, Covariance, Spearman's Rank correlation,	
6	5.2	Lines of Regression.	
		<b>Complex integration</b>	12
	6.1	Complex Integration: Line Integral, Cauchy's Integral theorem for simply connected regions, Cauchy's Integral formula.	
	6.2	Taylor's and Laurent's Series	
	6.3	Zeros, singularities, poles of $f(z)$ , residues, Cauchy's Residue theorem.	
	6.4	Applications of Residue theorem to evaluate real Integrals of different types.	
<b>Total</b>			<b>48</b>

## **Course Outcomes:**

*Upon completion of this course students will be able to:*

- a) SOLVE practical problems using Correlation ,Regression , Binomial, Poisson & Normal distributions
- b) Evaluate contour integrals using Cauchy's theorems
- c) *Diagonalise the matrix using Eigen values and Eigen vectors*
- d) *Verify properties of Vector Space and to write a set of Orthogonal vectors from the set of independent vectors*
- e) *Optimize the integral functions using Calculus of Variation*

## Mapping of CO and PO/PSO

Relationship of course outcomes with program outcomes: Indicate 1 (low importance), 2 (Moderate Importance) or 3 (High Importance) in respective mapping cell.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EXS401.1	2											
EXS401.2	1											
EXS401.3	3											
EXS401.4	2											
EXS401.5	1											
TOTAL	9											
CO-PO MATRIX	1.8											

## Justification

PO1 Justification: PO1:A.M.-IV provides the complete basic mathematical knowledge required for identifying and analysing

## CO Assessment Tools:

**EXS401.1:** Direct Methods(80%): Test1+ Tut1+Tut2+End Exam

$$CO1dm = 0.3test1+0.1 tut1+0.1tut2+.5 end exam$$

InDirect Methods(20%): Course exit survey

$$CO1idm$$

$$EXS401.1 = 0.8*CO1dm + 0.2* CO1idm$$

**EXS401.2:** Direct Methods(80%): Tut3+prelim exam+ end exam

$$CO2dm = 0.3test2+0.1 tut3+0.1tut4+.5 end exam$$

InDirect Methods(20%): Course exit survey

$$CO2idm$$

$$\text{FEC101.2} = 0.8 * \text{CO2dm} + 0.2 * \text{CO2idm}$$


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**EXS401.3:** Direct Methods(80%): Tut4+End Exam

$$\text{CO3dm} = 0.2 \text{ tut4} + 0.2 \text{ tut5} + 0.6 \text{ end exam}$$

InDirect Methods(20%): Course exit survey

$$\text{CO3idm}$$

$$\text{EXS401.3} = 0.8 * \text{CO3dm} + 0.2 * \text{CO3idm}$$


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**EXS401.4:** Direct Methods(80%):Tut 5+End Exam

$$\text{CO3dm} = 1. \text{ end exam}$$

InDirect Methods(20%): Course exit survey

$$\text{CO4idm}$$

$$\text{EXS401.4} = 0.8 * \text{CO4dm} + 0.2 * \text{CO4idm}$$

**EXS401.5:** Direct Methods(80%):Tut 6+End Exam

$$\text{CO3dm} = 1. \text{ end exam}$$

InDirect Methods(20%): Course exit survey

$$\text{CO4idm}$$

$$\text{EXS401.4} = 0.8 * \text{CO4dm} + 0.2 * \text{CO4idm}$$

### **Course Outcomes Target:**

*Upon completion of this course students will be able to:*

- a) **EXS401.1** SOLVE practical problems using Correlation , Regression , Binomial, Poisson & Normal distributions  
 TARGET RANGE : 2.5
- b) **EXS401.2** *Diagonalise the matrix using Eigen values and Eigen vectors*  
 TARGET RANGE : 2.5
- c) **EXS401.3** Evaluate contour integrals using Cauchy's theorems  
 TARGET RANGE : 2.5
- d) **EXS401.4** *Verify properties of Vector Space and to write a set of Orthogonal vectors from the set of independent vectors*  
 TARGET RANGE : 2.5
- e) **EXS401.5** *Optimize the integral functions using Calculus of Variation*  
 TARGET RANGE : 2.5

Applied Mathematics 4			Academic Year: 2018-19	
ELECTRONICS			Semester: IV	
Sr. No.	Name of the Topic		Executed Date	Remark
<b>EXS401.1</b> SOLVE practical problems using Correlation , Regression , Binomial, Poisson & Normal distributions				
1	Correlation coefficient	7/1/2019	7/1/2019	CO1 : 13  Leave on 18/o1/2019  Extra lecture on 25 <sup>th</sup> Jan
2	Rank Correlation coefficient	8/1/2019	8/1/2019	
3	Regression line	11/1/2019	11/1/2019	
4	Revision problems	14/1/2019	14/1/2019	
5	P.M.F and P.D.F.	16/1/2019	16/1/2019	
6	C.D.F	17/1/2019	17/1/2019	
7	M.G.F. Mean and Variance	18/1/2019	21/1/2019	
8	Revision Problems	21/1/2019	23/1/2019	
9	Binomial Distribution	23/1/2019	24/1/2019	
10	Poisson Distribution	24/1/2019	25/1/2019	
11	Normal Distribution	25/1/2019	25/1/2019	
12	Revision Problems	28/1/2019	28/1/2019	
13	Fitting of Binomial and Poisson Distribution	30/1/2019	30/1/2019	
<i>Diagonalise the matrix using Eigen values and Eigen vectors</i>				
14	Eigen values and Properties	1/2/2019	1/2/2019	CO2: 7
15	Caley – Hamilton theorem	11/2/2019	7/2/2019	
16	Problems on above topics	18/2/2019	8/2/2019	
17	Function of square matrix	20/2/2019	11/2/2019	
18	Derogatory matrix	21/2/2019	18/2/2019	
19	Diagonalizable matrix	22/2/2019	20/2/2019	
20	Revision Problems	25/2/2019	22/2/2019	
<b>EXS401.3</b> Evaluate contour integrals using Cauchy's theorems				
21	Complex Integration	27/2/2019	25/2/2019	CO3: 10 4,5,6 Feb UT2
22	Cauchy Theorem	28/2/2019	1/3/2019	
23	Corollary of Cauchy Theorem	01/3/2019	06/3/2019	
24	Cauchy Integral Formula	6/3/2019	7/3/2019	
25	Problems on above	7/3/2019	8/3/2019	
26	Taylors series	8/3/2019	11/3/2019	

27	Laurent's series	11/3/2019	12/3/2019	
28	Residue	13/3/2019	13/3/2019	
29	Application of Residue to evaluate real Integral of typeI	14/3/2019	14/3/2019	
30	Application of Residue to evaluate real Integral of typeII	18/3/2019	18/3/2019	
<b>EXS401.4</b> <i>Verify properties of Vector Space and to write a set of Orthogonal vectors from the set of independent vector</i>				
31	Vector Space	20/3/2019	20/3/2019	CO4: 7
32	Subspace	22/3/2019	22/3/2019	
33	Basis of Vector Space	25/3/2019	22/3/2019	
34	Independent Vector function	27/3/2019	25/3/2019	
35	Linear Combination of vectors	28/3/2019	27/3/2019	
36	Orthogonal vectors	29/3/2019	28/3/2019	
37	Orthogonal Basis	1/4/2019	29/3/2019	
<b>EXS401.5</b> <i>Optimize the integral functions using Calculus of Variation</i>				
38	Euler's equation for one independent variable	3/4/2019	1/4/2019	CO5: 03
39	Euler's equation for more than one independent variable	4/4/2019	3/4/2019	
40	Revision Problems	5/4/2019	4/4/2019	