

**SE Electronics Engineering
Semester IV
Syllabus of Theory Subjects**

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
EXS 401	Applied Mathematics IV	04	--	01	04	--	01	05

Subject Code	Subject Name	Examination Scheme								
		Theory Marks				End Sem. Exam	Tutorial as Term Work	Practical	Oral	Total
		Internal assessment			Ave. Of Test 1 and Test 2					
		Test 1	Test 2							
EXS401	Applied Mathematics IV	20	20	20	80	25	--	--	125	

Course Prerequisite: Applied Mathematics III

Course Objective:

This course will present the method of calculus of variations (CoV), basic concepts of vector spaces, matrix theory, concept of ROC and residue theory with applications.

Expected Outcome:

Students in this course will apply the method of CoV to specific systems, demonstrate ability to manipulate matrices and compute eigenvalues and eigenvectors, Identify and classify zeros, singular points, residues and their applications. After completion of this course students will be:

Module No.	Unit No.	Topics	Hrs.
1.0	1.0	Calculus of variation	10
	1.1	a. 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	b. Isoperimetric problems, several dependent variables	
	1.3	Functions involving higher order derivatives: Rayleigh-Ritz method	
2.0	2.0	Linear Algebra: Vector spaces	12
	2.1	Vectors in n-dimensional vector space: properties, dot product, norm and distance properties in n-dimensional vector space.	
	2.2	Metric spaces, vector spaces over real field, properties of vector spaces over real field, subspaces.	
	2.3	Norms and normed vector spaces	
	2.4	Inner products and inner product spaces	
	2.5	The Cauchy-Schwarz inequality, Orthogonal Subspaces, Gram-Schmidt process	
3.0	3.0	Linear Algebra: Matrix Theory	15
	3.1	Characteristic equation, Eigen values and Eigen vectors, properties of Eigen values and Eigen vectors	
	3.2	Cayley-Hamilton theorem, examples based on verification of Cayley-Hamilton theorem	
	3.3	Similarity of matrices, Diagonalisation of matrix	
	3.4	Functions of square matrix, derogatory and non-derogatory matrices	
	3.5	Quadratic forms over real field, reduction of Quadratic form to a diagonal canonical form, rank, index, signature of quadratic form, Sylvester's law of inertia, value-class of a quadratic form of definite, semi- definite and indefinite	
	3.6	Singular Value Decomposition	
4.0	4.0	Complex Variables: Integration	15
	4.1	Complex Integration: Line Integral, Cauchy's Integral theorem for simply connected regions, Cauchy's Integral formula	
	4.2	Taylor's and Laurent's series	
	4.3	Zeros, singularities, poles of f(z), residues, Cauchy's Residue theorem	
	4.4	Applications of Residue theorem to evaluate real Integrals of $\int_0^{2\pi} f(\sin\theta, \cos\theta)d\theta \quad \text{and} \quad \int_{-\infty}^{\infty} f(x)dx$	
		Total	52

Recommended books:

1. *A Text Book of Applied Mathematics* Vol. I & II by P.N.Wartilar & J.N.Wartikar, Pune, Vidyarthi Griha Prakashan., Pune
2. *Mathematical Methods in science and Engineering* , A Datta (2012)
3. *Higher Engg. Mathematics* by Dr. B.S. Grewal, Khanna Publication
4. Todd K.Moon and Wynn C. Stirling, *Mathematical Methods and algorithms for Signal Processing*, Pearson Education..
5. Kreyszig E., *Advanced Engineering Mathematics*, 9th edition, John Wiley, 2006.
6. *Linear Algebra* Hoffman & Kunze (Indian editions) 2002
7. *Linear Algebra* Anton & Torres(2012) 9th Indian Edition.
8. *Complex Analysis* – Schaum Series.

Internal Assessment (IA):

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the test will be considered as final IA marks

End Semester Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. The students need to solve total 4 questions.
- 3: Question No.1 will be compulsory and based on entire syllabus.
- 4: Remaining questions (Q.2 to Q.6) will be set on all the modules.
- 5: Weightage of marks will be as per Blueprint.

Term Work:

At least **08** assignments covering entire syllabus must be given during the **Class Wise Tutorial**. The assignments should be students' centric and an attempt should be made to make assignments more meaningful, interesting and innovative. Term work assessment must be based on the **overall performance** of the student with **every assignment graded from time to time**. The grades should be converted into marks as per the **Credit and Grading System** manual and should be **added and averaged**. The grading and term work assessment should be done based on this scheme.