SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Applied Mathematics	LP: MA22251
Common to all branches except Marine Engineering	Rev. No: 0
Regulation: 2022	Date: 24/03/2023
Sub. Code / Sub. Name : MA22251 APPLIED MATHEMATICS-II **Unit : I - VECTOR CALCULUS**	

UNIT SYLLABUS: VECTOR CALCULUS

Gradient, divergence and curl - Directional derivative - Vector identities – Irrotational and solenoidal vector fields - Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's theorem in a plane, Gauss divergence theorem and Stokes'theorem (excluding proofs) – Verification and application in evaluating line, surface and volume integrals.

OBJECTIVE:

•To know the basics of vector calculus comprising of gradient, divergence and curl and line, surface and volume integrals along with the classical theorems involving them

Session No	Topics to be covered	Ref	Teaching Method
1	Problems in Gradient, Divergence, Curl, Directional derivative	RT2-pg 570	BB / PPT
2	Problems in Vector identities	RT2-pg 571-582	
3	Irrotational and solenoidal vector fields	RT2-pg 571-582	
4	Tutorial class		
5	Line integral over a plane curve, Surface integral, Volume integral	RT2-pg 590-593	
6	Area of a curved surface		
6	Green's Theorem, Gauss divergence Theorem and Stokes' Theorem (excluding proof)	RT2-pg 609-612	
7	Problems on Green's Theorem	RT2-pg 609-612	
8	Problems on Gauss divergence Theorem	RT2-pg 602-608	
9	Problems on Stokes' Theorem	RT2-pg 613-619	
10	Verifications and Extra Problems	RT2-pg 613-618	
11	Verification and application in evaluating line, surface and volume integrals	RT2-pg 618-619	
12	Tutorial class		
Content beyond syllabus covered (if any): Applications of Vector Calculus in Fluid Mechanics and Electromagnetism			

*** Session duration: 50 minutes**

Sub. Code / Sub. Name: MA22251 APPLIED MATHEMATICS - II

Unit: II-ORDINARY DIFFERENTIAL EQUATIONS

UNIT SYLLABUS: ORDINARY DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS

Differential equations of first order – Equations of the first order and first degree – Linear equations – Higher order linear differential equations with constant coefficients - Method of variation of parameters - Cauchy's and Legendre's linear equations - Simultaneous first order linear equations with constant coefficients – Applications of Linear differential equations – Oscillatory electrical circuit – Deflection of beams.

Objective: To solve differential equations of certain types, including systems of differential equations that they might encounter in the same or higher semesters

Session No	Topics to be covered	Text and References Book	Teaching Method
13	Solution of differential equations of first order, and first degree linear equations	T2-pg 471-485	BB / PPT
14	Particular integrals of exponential, algebraic expression, and trigonometric functions	T2-pg 471-485	
15	Tutorial class		
16	Particular integrals of the combinations of exponential and trigonometric expressions	T2-pg 471-485	
17	Particular integrals of the combinations of exponential and algebraic expressions	T2-pg 471-485	
18	Tutorial class		
19	Method of Variation of parameters	T2-pg 486-488	
20	Cauchy's homogeneous linear differential equation	T2-pg 490-493	
21	Legendre's linear differential equation	T2-pg 493-495	
22	Simultaneous first order linear equations with constant coefficients	T2-pg 496-500	
23	Applications of Linear differential equations: Oscillatory electrical circuit and deflection of beams.		
24	CAT-I		

Content beyond syllabus covered (if any): Differential equations play an important role in modelling virtually every physical, technical, or biological process, from celestial motion, to bridge design, to interactions between neurons.

*** Session duration: 50 minutes**

Sub. Code / Sub. Name: MA22251 APPLIED MATHEMATICS - II

Unit: III- LAPLACE TRANSFORM

UNIT SYLLABUS: LAPLACE TRANSFORM

Conditions for existence - Transform of elementary functions - Transforms of unit step function and impulse functions – Basic properties – Shifting theorems - Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Initial and final value theorems - Transform of periodic functions. Inverse Laplace transforms - Convolution theorem – Application to solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

Objective:

- To have a sound knowledge of Laplace transform and its properties.
- To solve certain linear differential equations using the Laplace transform technique which have applications in other subjects of the current and higher semesters.

Session No	Topics to be covered	Ref	Teaching Method
25	Definition of Laplace transform and Sufficient conditions for existence	T2-pg 726-732	BB / PPT
26	Transform of elementary functions	T2-pg 726-732	
27	Basic properties and Shifting theorems	T2-pg 726-732	
28	Transform of derivatives and integrals	T2-pg 735-738	
29	Derivatives and integrals of transforms	T2-pg 738-740	
30	Tutorial class		
31	Transform of unit step function and unit impulse function	T2-pg 756-761	
32	Definition of Inverse Laplace transform as contour Integral	T2-pg 740-747	
33	Tutorial class	-	
34	Convolution theorem (excluding proof)	T2-pg 748-750	
35	Initial and Final value theorems	T2-pg 748-750	
36	Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques	T2-pg 750-754	

Content beyond syllabus covered (if any): Laplace transforms is used extensively in Electrical Engineering

*** Session duration: 50 minutes**

Sub. Code / Sub. Name: MA22251, APPLIED MATHEMATICS - II

Unit: IV- ANALYTIC FUNCTION

UNIT SYLLABUS: ANALYTIC FUNCTION

Analytic functions - Necessary and sufficient conditions (Cauchy-Riemann equations) - Properties of analytic function - Harmonic conjugates - Construction of analytic functions - Conformal mapping – Mapping by functions $W = Z + C$, CZ, $1/Z$, Z_2 – Joukowski's transformation- Bilinear transformation.

Objective:
- To understand analytic functions and their interesting properties.
- To know conformal mappings with a few standard examples that have direct application

Session No	Topics to be covered	Ref	Teaching Method
37	Introduction to functions of a complex variable	T2-pg 656	BB / PPT
38	Definition – Analytic Function, Derivatives of Analytic Function and properties of analytic function	T2-pg 674	
39	Necessary and Sufficient conditions for a function to be analytic	T2-pg 673	
40	Harmonic conjugate	7-pg 22.6	
41	Construction of Analytic Functions by using Milne's ThomsonMethod	T2-pg 677-678	
42	Construction of Analytic Functions by using Milne's ThomsonMethod	T2-pg 677-678	
43	CAT-II		
44	Conformal Mapping: Transformations z + a, az	R2-ch25.1-25.7	
45	Transformations 1/z, z^2	R2-ch25.1-25.7	
46	Joukowski's transformation	R2-ch25.1-25.7	
47	Bilinear transformation	R2-ch25.9	
48	Tutorial class		
Content beyond syllabus covered (if any):			

*** Session duration: 50 minutes**

Sub. Code / Sub. Name: MA22251 APPLIED MATHEMATICS - II

Unit: V- COMPLEX INTEGRATION

UNIT SYLLABUS: COMPLEX INTEGRATION

Cauchy's integral theorem - Cauchy's integral formula - Taylor's and Laurent's series expansions - Singular points - Residues - Cauchy's Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semi-circular contour.

Objective: To grasp the basics of complex integration and the concept of contour integration which is important for evaluation of certain integrals encountered in practice.

Session No	Topics to be covered	Ref	Teaching Method
49	Complex Integration	7-ch 23.23.1	BB / PPT
50	Cauchy integral Theorem	7-ch23.2,23.3	
51	Cauchy's integral formula	T2-pg 696-701	
52	Problems	T2-pg 696-701	
53	Taylor Series expansion	T2-pg 704-708	
54	Laurent series expansion	T2-pg 704-708	
55	Tutorial class	T2-pg 704-708	
56	Singularities and Residues	T2-pg 708-709	
57	Cauchy's Residue Theorem, Application of residue theorem for evaluation of real integrals	T2-pg 710-715	
58	Use of circular contour and semi-circular contour.	T2-pg 716-722	
59	Use of circular contour and semi-circular contour.	T2-pg 716-722	
60	CAT-III		
Content beyond syllabus covered (if any):			

*** Session duration: 50 minutes**

Sub. Code / Sub. Name: MA22251 APPLIED MATHEMATICS - II

TEXT BOOKS:

1. Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, "Advanced Engineering Mathematics", 10 th Edition, John Wiley, (2015).
2. Grewal .B.S, Grewal .J.S "Higher Engineering Mathematics",43rd Edition, Khanna Publications, Delhi, (2015).

REFERENCES:

1. Dass, H.K., and Rajnish Verma, "Higher Engineering Mathematics", S.Chand Private Ltd., 2011.
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2013).
3. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", 9th edition, Laxmi Publications(p) Ltd., 2014.

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