Department of Applied Mathematics	LP: MA22355
Common to Automobile Engineering, Biotechnology, Mechanical and Automation Engineering	Rev. No: 0
Regulation: 2022	Date: 02/08/2023
Sub. Code / Sub. Name : MA22355, PARTIAL DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS	
Unit: III- SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS	

UNIT SYLLABUS: SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS
Solution of algebraic and transcendental equations: Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Gauss Seidel Iterative methods - Matrix Inversion by Gauss Jordan method - Eigen values of a matrix by Power method.

OBJECTIVE:

- Learn the solution of algebraic, transcendental equations, system of linear equations.

Session No.	Topics to be covered	Ref.	Teaching Method
1	Newton Raphson method	R2 Ch-22, 1371-1373	BB / PPT
2	Newton Raphson method	R2 Ch-22, 1371-1373	
3	Solution of linear system of equations	R2 Ch-22, 1382	
4	Gauss elimination method	R2 Ch-22, 1382-1383	
5	Pivoting	R2 Ch-22, 1384	
6	Tutorial class	Worksheet	
7	Gauss Jordan method	R2 Ch-22, 1384-1385	
8	Gauss Seidel Iterative methods	R2 Ch-22, 1395-1396	
9	Matrix Inversion by Gauss Jordan method	R2 Ch-22, 1384-1385	
10	Tutorial class	Worksheet	
11	Eigen values of a matrix by Power method	R1 Ch-20, 876-887	
12	Eigen values of a matrix by Power method	R1 Ch-20, 876-887	
Content beyond syllabus covered (if any): Solution of algebraic and transcendental equations are used extensively in Mechanical Engineering, Automation Engineering, and Bio Technology.			

*** Session duration: 50 minutes**

Sub. Code / Sub. Name: MA22355, PARTIAL DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS	
Unit: IV- INTERPOLATION AND APPROXIMATION	

UNIT SYLLABUS: INTERPOLATION AND APPROXIMATION

Interpolation with unequal intervals – Lagrange's interpolation – Method-Newton's divided difference interpolation – Finite difference operators and its relations – Interpolation with equal intervals – Newton's forward and backward difference formulae.

OBJECTIVE:

- To Understand the concept of interpolation and approximation.

Session No	Topics to be covered	Ref.	Teaching Method
13	Interpolation with unequal intervals	R3 Pg 109-110	BB / PPT
14	Lagrange's interpolation	R3 Pg 110-113	
15	Lagrange's interpolation	R3 Pg 110-113	
16	Method-Newton's divided difference interpolation	R3 Pg 113-118	
17	Method-Newton's divided difference interpolation	R3 Pg 113-118	
18	Tutorial class	Worksheet	
19	FAT-I		
20	Finite difference operators and its relations	R2 Ch-22, 1320-1322	
21	Finite difference operators and its relations	R2 Ch-22, 1316-1325	
22	Interpolation with equal intervals	R2 Ch-22, 1326-1328	
23	Newton's forward and backward difference formulae	R2 Ch-22, 1316-1319	
24	Tutorial class	Worksheet	
Content beyond syllabus covered (if any):			

*** Session duration: 50 minutes**

Sub. Code / Sub. Name: MA22355 PARTIAL DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS

Unit: V- INITIAL AND BOUNDARY VALUE PROBLEMS IN DIFFERENTIAL EQUATIONS

UNIT SYLLABUS: INITIAL AND BOUNDARY VALUE PROBLEMS IN DIFFERENTIAL EQUATIONS

Finite difference solution of ordinary differential equations - Finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

OBJECTIVE:

- To Understand how to solve initial and boundary value problems in differential equations.

Session No.	Topics to be covered	Ref.	Teaching Method
25	Finite difference solution of ordinary differential equations	R2 Ch-25, 1487-1488	BB / PPT
26	Finite difference solution of ordinary differential equations	R2 Ch-25, 1487-1488	
27	Finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain	R2 Ch-25, 1491-1498	
28	Finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain	R2 Ch-25, 1491-1498	
29	More problems on finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain	R2 Ch-25, 1491-1498	
30	One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods	R2 Ch-25, 1506-1510	
31	Tutorial class	Worksheet	
32	One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods	R2 Ch-25, 1506-1510	
33	One dimensional wave equation by explicit method.	R2 Ch-25, 1510-1512	
34	One dimensional wave equation by explicit method.	R2 Ch-25, 1510-1512	
35	Tutorial class	Worksheet	
36	FAT-II		
Content beyond syllabus covered (if any):			

*** Session duration: 50 minutes**

Sub. Code / Sub. Name: MA22355, PARTIAL DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS
Unit : I - PARTIAL DIFFERENTIAL EQUATIONS

UNIT SYLLABUS: PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations - Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear homogeneous partial differential equations of second and higher order with constant coefficients.

OBJECTIVE:

- To know the Skilled at the techniques of solving partial differential equations.

Session No.	Topics to be covered	Ref.	Teaching Method
37	Formation of partial differential equations	R2 Ch-16, 862-865	BB / PPT
38	Singular integrals	R2 Ch-16, 866-867	
39	Solutions of standard types of first order partial differential equations	R2 Ch-16, 862-865	
40	Solutions of standard types of first order partial differential equations	R2 Ch-16, 876-881	
41	Tutorial class	Worksheet	
42	More problems in standard types of first order partial differential equations	R2 Ch-16, 876-881	
43	Lagrange's linear equation	R2 Ch-16, 870-871	
44	Lagrange's linear equation	R2 Ch-16, 870-871	
45	Linear homogeneous partial differential equations of second and higher order with constant coefficients.	R2 Ch-16, 884-893	
46	Linear homogeneous partial differential equations of second and higher order with constant coefficients.	R2 Ch-16, 884-893	
47	More problems in linear homogeneous partial differential equations of second and higher order with constant coefficients.	R2 Ch-16, 884-893	
48	Tutorial class	Worksheet	
Content beyond syllabus covered (if any): Applications of partial differential equations in Fluid Mechanics and Electromagnetism			

*** Session duration: 50 minutes**

Sub. Code / Sub. Name: MA22355 PARTIAL DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS

Unit: II- APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

UNIT SYLLABUS: APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS Classification of partial differential equations – Fourier series – Half range Fourier sine and cosine series - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction in Cartesian form (excluding insulated edges) – Steady state solution two dimensional heat equation in polar form (circular, semicircular and quadrant plate).

OBJECTIVE:

- To Understand the application of partial differential equations in heat transfer problems.

Session No.	Topics to be covered	Ref.	Teaching Method
49	Classification of partial differential equations	Worksheet	LCD/BB
50	Fourier series	R1 Ch.11, pg. 474-482	
51	Half range Fourier sine and cosine series	R1 Ch.11, pg. 483-491	
52	Solutions of one dimensional wave equation	R1 Ch.11, pg. 543-544	
53	One dimensional equation of heat conduction	R1 Ch.11, pg. 557	
54	Tutorial class	Worksheet	
55	Steady state solution of two dimensional equation of heat conduction in Cartesian form (excluding insulated edges)	R1 Ch.11, pg. 558-567	
56	Steady state solution of two dimensional equation of heat conduction in Cartesian form (excluding insulated edges)	R1 Ch.11, pg. 558-567	
57	Tutorial class	Worksheet	
58	Steady state solution two dimensional heat equation in polar form (circular, semicircular and quadrant plate)	R1 Ch.11, pg. 585-592	
59	Steady state solution two dimensional heat equation in polar form (circular, semicircular and quadrant plate)	R1 Ch.11, pg. 585-592	
60	FAT-III		

Content beyond syllabus covered (if any): Partial 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: MA22355 PARTIAL DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS

TEXT BOOKS:

1. Grewal .B.S, Grewal .J.S "Higher Engineering Mathematics", 43rd Edition, Khanna Publications, New Delhi, 2015.
2. Kandasamy. P, Thilagavathy. K and Gunavathy. K., "Engineering Mathematics Volume III", 4th Edition, S. Chand & Company ltd, New Delhi, 2008.
3. Grewal. B.S. and Grewal. J.S., Numerical methods in Engineering and Science, Khanna Publishers, 11th Edition, New Delhi, 2017.

REFERENCES:

1. Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, "Advanced Engineering Mathematics", 10th Edition, John Wiley, 2015.
2. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", 9th edition, Laxmi Publications (p) Ltd., 2014.
3. Sankara Rao. K., Numerical methods for Scientists and Engineers, Prentice Hall of India Private, 3rd Edition, New Delhi, 2007.
4. Venkataraman. M.K. Numerical Methods in Science and Engineering, National Publishers, 2001.

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Remarks *:		
Remarks *:		