KL UNIVERISTY
FIRST SEMESTER 2010-11
Course Handout
Academic Division

Dated: 07-07-2010

Course No. : MATH C 205
Course Title : Engineering Mathematics-III
Course Structure : 3-1-0
Course coordinator : Mr MKRS Veera Kumar
Instructors : Mr BV Appa Rao, Ch. Srinivasa Kumar

1. Course Description:

Bessel's equations and Legendre's equations are very useful to engineering and technology. Partial differential equations are useful for heat conduction problem solving. Numerical Techniques & Methods are not only useful for scientists but for engineers. Interpolation is useful for estimation of various quantities in space sciences. Numerical solution of ordinary and partial differential equations are also useful for engineers.

2. Scope and Objective of the Course:

The object and scope of this course is to use mathematical applications of special functions, series solutions of differential equations, partial differential equations and numerical methods in the engineering research

3. Books:

(i) Textbook:

1. B.S. Grewal, "Higher Engineering Mathematics" , Khanna Publication, 40th Edition

(ii) Reference Book:

a. N.P. Bali, Usha Paul, "Higher Engineering Mathematics", Lakshmi Publications, 6th Edition
b. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition

4. Syllabus:

Unit I:

Series solution of Differential Equations: Introduction, Series solution, Validity series solution, general method, forms of series solutions, Bessel's equation, recurrence formulae for $J_n(x)$, generating functions for $J_n(x)$, Orthogonality of Bessel's functions, Legendre's equation, Rodrigue's formula, Legendre polynomials, generating function and recurrence relations for $P_n(x)$, Orthogonality of Legendre polynomials

Unit II:

Partial Differential Equations: Introduction, Formation of partial differential equations, Solutions of partial differential equations, equations solvable by direct integration, linear equations of the first order, non-linear equations of the first order, Charpit's method, homogeneous linear equations with constant coefficients, rules for finding the complementary function and particular integral, working procedure to

solve homogeneous linear equations of any order, non-homogeneous linear equations, non-linear equations of the second order-Monge's method

Unit III:

Numerical Techniques: Introduction, Solutions of algebraic and transcendental equations, Bisection method, method of false position, Newton-Raphson's method, solution of linear simultaneous equations, direct methods of solution-Gauss elimination method, Gauss-Jordan method, iterative methods of solution-Jacobi's method, Gauss-Seidal method

Unit IV:

Finite Differences and Interpolation: Finite differences, differences of a polynomial, Factorial notation, relations between the operators, Newton's interpolation formula, central difference interpolation formulae-Gauss's interpolation formula, Stirling's formula, Bessel's formula, Interpolation with unequal intervals-Lagrange's formula, Newton's divided difference formula, Inverse interpolation, Numerical differentiation, Numerical integration-Newton-Cote's formula, Trapezoidal rule, Simpson's 1/3 rd and $3/8^{th}$ rule, Weddle's rule

Unit V:

Numerical solution of Ordinary and Partial Differential Equations: Introduction, Picard's method, Taylor's series method, Euler's method, modified Euler's method, Runge- Kutta method (All these methods are only for first equations), Classification of second order partial differential equations, solution of Laplace's and Poisson's equations

5.Course Plan:

Lect. No.	Objective	Topics	Ref.
1	Unit I: Series solution of D.E	Introduction, Series solution	T.B. 16.1
2	Oridinary points & Regular Singular Points	Validity series solution	T.B. 16.2
3	Recurrence relations	General method	T.B. 16.3
4	Frobenius Method	Forms of series solutions	T.B. 16.4
5	$J_n(x), J_{-n}(x)$	Bessel's equation	T.B. 16.5
6	Solutions of boundary value problems	Recurrence formulae for $J_n(x)$	T.B. 16.6
7	Expressing as an exponential function	Generating functions for $J_n(x)$	T.B. 16.9
8	Fourier-Bessel expansion	Orthogonality of Bessel's functions	T.B. 16.11
9	Applying for boundary value problems for spheres	Legendre's equation	T.B. 16.13
10	$P_n(x)$ as nth	Rodrigue's formula	T.B. 16.14(1)

	derivative of $(x^2-1)^n$		
11	$P_0(x)$, $P_1(x)$,…	Legendre polynomials	T.B. 16.14(2)
12	$P_n(1)$, $P_n(-1)$	Generating function and Recurrence relations for $P_n(x)$	T.B. 16.15
13	Fourier-Legendre expansions	Orthogonality of Legendre polynomials	T.B. 16.17
14	Unit II: P.D.E.	Introduction, Formation of partial differential equations	T.B. 17.1, 2
15	Complete Integrals	Solutions of partial differential equations, equations solvable by direct integration	T.B. 17.3
16	Lagrange's equation	Linear equations of the first order, Non-linear equations of the first order	T.B. 17.5,6
17	Standard Forms I, II	Linear equations of the first order, Non-linear equations of the first order	T.B. 17.6
18	Standard Forms III, IV	Linear equations of the first order, Non-linear equations of the first order	T.B. 17.6
19	Subsidiary Equations	Charpit's method	T.B. 17.7
20	Auxiliary Equations	Homogeneous linear equations with constant coefficients, Rules for finding the complementary function and particular integral	T.B.17.8-17.10
21	C.F. & P.I.	Working procedure to solve homogeneous linear equations of any order	T.B. 17.11
22	Complete solutions	Non-homogeneous linear equations	T.B. 17.12
23	Rr+Ss+Tt=V	Non-linear equations of the second order-Monge's method	T.B. 17.13
24	Unit III: Numerical Techniques Approximate solutions	Introduction, Solutions of algebraic and transcendental equations, Bisection method	T.B. 28.1
25	Finding roots to accuracy	Method of false position	T.B. 28.2(2)
26	Newton's iteration formula	Newton-Raphson's method	T.B. 28.2(3)
27	Evaluation of unknowns	Solution of linear simultaneous equations, Direct methods of solution-Gauss elimination method	T.B. 28.6(1)
28	Elimination of unknowns	Gauss-Jordan method	T.B. 28.6(2)
29	Solving system of equations	Iterative methods of solution-Jacobi's method	T.B. 28.7(1)
30	Modification of Jacobi's method	Gauss-Seidal method	T.B. 28.7(2)

31	Unit IV: Finite Diff. & Interpolation Shift Operators, Average Operators	Finite differences, Differences of a polynomial, Factorial notation, Relations between the operators	T.B. 29.1,2,3(1),4
32	Newton's Forward & Backward formulae	Newton's interpolation formulae,	T.B. 29.5
33	Gauss forward and backward formulae	Central difference interpolation formulae- Gauss's interpolation formula	T.B. 29.6,6(1)
34	Odd differences below central line	Stirling's formula, Bessel's formula	T.B. 29.6(3),6(4)
35	Unequal spaced values of x	Interpolation with unequal intervals- Lagrange's formula, Newton's divided difference formula	T.B. 29.8,8(1),8(3)
36	Lagrange's formulaand using forward differences formulae	Inverse interpolation, Numerical differentiation	T.B. 29.9,8(1)
37	Quadrature formula	Numerical integration -Newton-Cote's formula	T.B. 29.12,10(1)
38	Single variable applications	Trapezoidal rule, Simpson's 1/3 rd rule	T.B. 29.10(2),10(3)
39	Single variable applications	Simpson's 3/8th rule, Weddle's rule	T.B. 29.10(4),10(5)
40	Calculating	Simpson's 3/8th rule, Weddle's rule	
41	Unit V: Numerical solutions of O.D.E. & P.D.E. Successive Approximation	Introduction, Picard's method	T.B. 31.1
42	Numerical solutions	Taylor's series method	T.B. 31.3
43	Aproximate Solutions	Euler's method, modified Euler's method	T.B. 31.4, 31.5
44	Approximate values	Runge- Kutta method (All these methods are only for first equations)	T.B. 31.7
45	Elliptic, parabolic & Hyperbolic types	Classification of second order partial differential equations,solution of Laplace's and Poisson's equations	T.B. 32.1,5,6

6.Self learning material:

UNIT	TOPIC	SOURCE	BOOK
III	Iterative Methods of solution Newton-Raphson method Regula Falsi Method	2.3,2.4	Souce Book 1
III	Solutions of algebraic and transcendental equations, Bisection Method	2.2.	Souce Book 1
IV	Finite differences, Operators	4.3	Souce Book 1
IV	Lagrange's formula Newton's Divided difference interpolation	4.2	Souce Book 1
IV	Numerical Differentiation Numerical Integration:-Newton Cote's Methods, Trapezoidal Method , Simpson's Method	Chapter 5	Souce Book 1
V	Euler's Method Taylor's series method Runga-Kutta Method	6.3,6.4,6.4	Souce Book 1

7.Evaluation Scheme:

Component	Duration (minutes)	% Weightage	Marks	Date & Time	Venue
Test-1	50 Min	10	10	09-08-2010 9.30 to 10.20 A.M	CSE001,004, 005,101,102, 105,106,201, 204,205,301, 509, NSH
Test-2	50 Min	10	10	13-09-2010 9.30 to 10.20 A.M	CSE001,004, 005,101,102, 105,106,201, 204,205,301, 509, NSH
Assignement submission		5	5	Continuous	
Assignment Test	50 Min	5	5	25-10-2010 9.00 to 10.20 A.M	CSE001,004, 005,101,102, 105,106,201, 204,205,301, 509, NSH
Quiz	30 Min	5	5	25-10-2010 9.00 to 10.20 A.M	CSE001,004, 005,101,102, 105,106,201, 204,205,301, 509, NSH
Regular Lab Evaluation	Continuous	0	0		
Comprehensive Lab Exam	3 Hrs	0	0		
Comprehensive Exam	3 Hrs	60	60		
Attendance for Theory & Tutorial		5	5	Continuous	
Attendance for Lab		0	0	Continuous	

8. Chamber consultation hour: Informed in the class in first week.

9. Notices: All notices regarding the course will be put in E-learning website.

10.Tutorial: Tutorial will be conducted by the respective in charge faculty. The tutorials are planned to supplement the material taught in the lectures and clear doubts. Student must attend registered section for tutorial in the respective classroom. Class assignment, class tests and other evaluation components will also be conducted during tutorials. Students must actively participate in the tutorial and come prepared for it.

Course Coordinator