FOURTH SEMESTER

MTS4 C04:MATHEMATICS-4

5 hours/week 3 Credits 75 Marks[Int.15 + Ext. 60]

Text Advanced Engineering Mathematics(6/e) : Dennis G Zill Jones & Bartlett Learning, LLC(2018)ISBN: 978-1-284-10590-2

Module I 21 hrs

Ordinary Differential Equations 1.1: Definitions and Terminology- definition, Classification by Type, Classification by Order, Classification by Linearity, Solution, Interval of Definition, Solution Curve, Explicit and Implicit Solutions, Families of Solutions, Singular Solution, Systems of Differential Equations 1.2: Initial Value Problems-First- and Second-Order IVPs, Existence of solution 1.3: Differential Equations as Mathematical Models- some specific differentialequation models in biology, physics and chemistry. 2.1: Solution Curves without Solution-Direction Fields [‘Autonomous FirstOrder DEs’ omitted] 2.2: Separable Equations- definition. Method of solution, losing a solution, An Integral-Defined Function 2.3: Linear Equations-definition, standard form, homogeneous and non homogeneous DE, variation of parameter technique, Method of Solution, General Solution, Singular Points, Piecewise-Linear Differential Equation, Error Function 2.4: Exact Equations- Differential of a Function of Two Variables, Criteria for an exact differential, Method of Solution, Integrating Factors, 2.5: Solutions by Substitution-Homogeneous Equations, Bernoulli’s Equation, Reduction to Separation of Variables 2.6: A Numerical Method- Using the Tangent Line, Euler’s Method [upto and including Example 2; rest omitted]

Module II 22 hrs

Higher Order Differential Equations 3.1: Theory of Linear Equations- Initial-Value and Boundary-Value Problems [Existence and Uniqueness (of solutions), Boundary-Value Problem ] Homogeneous Equations [Differential Operators, Superposition Principle, Linear Dependence and Linear Independence, Wronskian] Nonhomogeneous Equations [Complementary Function, Another Superposition Principle ] 3.2: Reduction of Order- a general method to find a second solution of linear second order equation by reducing to linear first order equation 3.3: Homogeneous Linear Equations with Constant Coefficients- Auxiliary Equation, Distinct Real Roots , Repeated Real Roots , Conjugate Complex Roots, Higher-Order Equations , Rational Roots [‘Use of computer’ part omitted] 3.4: Undetermined Coefficients- Method of Undetermined Coefficients for finding out particular solution 3.5: Variation of parameter- General solution using Variation of parameter technique 3.6: Cauchy-Euler Equations- Method of solution, Distinct Real Roots, Repeated Real Roots, Conjugate Complex Roots 3.9: Linear Models & Boundary Value Problems- Deflection of a Beam, Eigenvalues and Eigenfunctions [upto and including Example 3: the rest is omitted]

Module III 19 hrs

Laplace Transforms 4.1: Definition of Laplace Transform- definition, examples, linearity, Transforms of some basic functions, Sufficient Conditions for Existence of transform, 4.2: Inverse Transform and Transforms of Derivative- Inverse Transforms:- A few important inverse transforms, Linearity, Partial Fractions, Transforms of Derivatives, Solving Linear ODEs 91 4.3: Translation Theorems- Translation on the s-axis, first translation theorem, its inverse form, Translation on the t-axis, Unit step function, second translation theorem. Its Inverse form , Alternative Form of second translation theorem. Beams 4.4: Additional Operational Properties- Derivatives of Transforms, Transforms of Integrals-convolution, convolution theorem (without proof) and its inverse form, Volterra Integral Equation, Series Circuits [‘Post Script— Green’s Function Redux’ omitted],Transform of a Periodic Function 4.5: The Dirac delta Function- Unit Impulse, The Dirac Delta Function and its transform,

Module IV 18 hrs

12.1: Orthogonal Functions- Inner Product, Orthogonal Functions, Orthonormal Sets, Vector Analogy, Orthogonal Series Expansion, Complete Sets, 12.2: Fourier Series-Trigonometric Series, Fourier Series, Convergence of a Fourier Series, Periodic Extension, Sequence of Partial Sums, 12.3: Fourier Cosine and Sine Series- Even and Odd Functions., Properties, Cosine and Sine Series, Gibbs Phenomenon, Half-Range Expansions, Periodic Driving Force, 13.1: Separable Partial Differential Equations- Linear Partial Differential Equation, Solution of a PDE, Separation of Variables ( Method ), Superposition Principle, Classification of Equations (- hyperbolic, parabolic, elliptic) 13.2: Classical PDE’s and BVP’s- Heat Equation, Wave Equation, Laplace’s Equation, Initial Conditions, Boundary Conditions, Boundary-Value Problems (‘Variations’ omitted) 13.3: Heat Equation- Solution of the BVP ( method of Separation of Variables)

References:

1 Peter V O’Neil: Advanced Engineering Mathematics(7/e) Cengage Learning(2012)ISBN: 978-1-111-42741-2

2 Erwin Kreyszig : Advanced Engineering Mathematics(10/e) John Wiley & Sons(2011) ISBN: 978-0-470-45836-5

3 Alan Jeffrey: Advanced Engineering Mathematics Harcourt/Academic Press(2002) ISBN: 0-12-382592-X

4 Glyn James: Advanced Modern Engineering Mathematics(4/e) Pearson Education Limited(2011) ISBN: 978-0-273-71923-6