K.S.INSTITUTE OF TECHNOLOGY, BANGALORE

(AFFLIATED TO VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM)

DEPARTMENT OF MATHEMATICS

(Common to all Branches)

Course Title: Engineering Mathematics -I **Course Code : 15MAT11**
Credits: 04 **L-T-P : 3-2-0**
Contact Hours/Week : 04 **Total Hours: 50**
Exam. Marks : 80 **IA Marks : 20**
Exam. Hours : 03

MODULE	RBT Levels	No. of Hrs
Module I: Differential Calculus-1 Differential Calculus -1: determination of nth order derivatives of Standard functions - Problems. Leibnitz's theorem (without proof)- problems. Polar Curves - angle between the radius vector and tangent,angle between two curves, Pedal equation of polar curves.Derivative of arc length - Cartesian, Parametric and Polar forms(without proof) - problems. Curvature and Radius of Curvature – Cartesian, Parametric, Polar and Pedal forms(without proof) - problems	**L1 & L2**	**10**
MODULE-II: Differential Calculus -2 Taylor's and Maclaurin's theorems for function of onevariable(statement only)- problems. Evaluation of Indeterminateforms. Partial derivatives – Definition and simple problems, Euler'stheorem(without proof) – problems, total derivatives, partialdifferentiation of composite functions- problems. Definition andevaluation of Jacobians	**L1 & L 2**	**10**
MODULE- III: VectorCalculus: Derivative of vector valued functions, Velocity, Acceleration andrelated problems, Scalar and Vector point functions. Definition ofGradient, Divergence and Curl-problems. Solenoidal and Irrotational vector fields. Vector identities - div(ϕA), curl (ϕA),curl(grad ϕ), div(curl A).	**L1 & L2**	**10**
MODULE IV:Integral Calculus: Reduction formulae - (m and n are positive integers), evaluation of these integrals withstandard limits (0 to $\pi/2$) and problems. **Differential Equations** **Solution of first order and first degree differential equations** – Exact, reducible to exact and Bernoulli's differential equations.Orthogonal trajectories in Cartesian and polar form. Simpleproblems on Newton\'s law of cooling.	**L1 & L2**	**10**
MODULE-V:Linear Algebra Rank of a matrix by elementary transformations, solutionof system of linear equations - Gauss-elimination method, Gauss–Jordan method and Gauss-Seidel methodEigen values and Eigen vectors, Rayleigh's power method to findthe largest Eigen value and the corresponding Eigen vector.Linear transformation, diagonalisation of a square matrix .Reduction of Quadratic form to Canonical form	**L1 & L2**	**10**

Course outcomes:
To enable the students to apply the knowledge of Mathematics in various engineering fields by making them to learn the following:

- nth derivatives of product of two functions and polar curves.
- Partial derivatives
- Vector calculus
- Reduction formulae of integration; To solve First order differential equations.
- Solution of system of linear equations , quadratic forms.

Question paper pattern:

*The question paper will have ten full questions carrying equal marks.
*Each full question consisting of 16 marks.
*There will be two full questions (with a maximum of four sub questions) from each module.
*Each full question will have sub question covering all the topics under a module.
*The students will have to answer five full questions, selecting one full question from each module.

Graduate Attributes (as per NBA)

1. Engineering Knowledge
2. Problem Analysis
3. Life-Long Learning
4. Accomplishment of Complex Problems

Text Books: -

- **B.S. Grewal**: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015

E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016

Reference Books:

- **B.V.Ramana**: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.

Gupta C.B., Singh S.R. and Mukesh Kumar: "Engineering Mathematics for Semester I & II", Mc-Graw Hill Education (India) Pvt.Ltd., 2015.

Useful websites:

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/

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DEPARTMENT OF MATHEMATICS

ENGINEERING MATHEMATICS II

(Common to all Branches)

Course Title: Engineering Mathematics –II **Course Code : 15MAT21**
Credits: 04 **L-T-P : 3-2-0**
Contact Hours/Week : 04 **Total Hours: 50**
Exam. Marks : 80 **IA Marks : 20**
Exam. Hours : 03

MODULE	RBT Levels	No. of Hrs
Module I: **Linear differential equations with constant coefficients:** Solutions of second and higher order differential equations - inverse differential operator method, method of undetermined coefficients and method of variation of parameters.	**L1 & L2**	**10**
MODULE-II **Differential equations-2:** **Linear differential equations with variable coefficients:** Solution of Cauchy's and Legendre's linear differential equations. **Nonlinear differential equations** - Equations solvable for p, equations solvable for y, equations solvable for x, general and singular solutions, Clairauit's equations and equations reducible to Clairauit's form.	**L1, L2 & L3**	**10**
MODULE- III **Partial Differential equations:** Formulation of Partial differential equations by elimination of arbitrary constants/functions, solution of non-homogeneous Partial differential equations by direct integration, solution of homogeneous Partial differential equations involving derivative with respect to one independent variable only. Derivation of one dimensional heat and wave equations and their solutions by variable separable method.	**L1, L2&L3**	**10**
MODULE IV **Integral Calculus:** **Double and triple integrals:** Evaluation of double and triple integrals. Evaluation of double integrals by changing the order of integration and by changing into polar co-ordinates. Application of double and triple integrals to find area and volume. . **Beta and Gamma functions:** definitions, Relation between beta and gamma functions and simple problems..	**L1& L2**	**10**

MODULE V **Laplace Transform** Definition and Laplace transforms of elementary functions. Laplace transforms of , and $\frac{f(t)}{}$ (without proof) , periodic functions and unit-step function- problems **Inverse Laplace Transform** Inverse Laplace Transform - problems, Convolution theorem to find the inverse Laplace transforms(without proof) and problems, solution of linear differential equations using Laplace Transforms.	**L1, L2&L3**	**10**

Course outcomes: On completion of this course,students are able to learn

* Make use of Inverse differential operator method to obtain the solution of Ordinary Differential Equations and their applications.
* Construct the Partial Differential Equations and obtain the solution by direct integration method.
* Solve the Cauchy's, Legendre and non linear differential equations.
* Identify the double and triple integral and evaluate them by change of order and variables.
* Apply Laplace transforms method to obtain the solution of linear differential equations. Develop the differential equations on LRC circuits, Vibration of springs, Deflection of beams and Navier stokes equation and obtain the solution

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Graduate Attributes (as per NBA)

1. Engineering Knowledge
2. Problem Analysis
3. Life-Long Learning
4. Accomplishment of Complex Problems

Text Books: -

- **B.S. Grewal**: Higher Engineering Mathematics, Khanna Publishers, 42rd Ed., 2013
- Kreyszig, "Advanced Engineering Mathematics " - Wiley, 2013

Reference Books:

- B.V.Ramana "Higher Engineering M athematics" Tata Mc Graw-Hill, 2006
- N P Bali and Manish Goyal, "A text book of Engineering mathematics" , Laxmi publications, latest edition.
- H. K Dass and Er. Rajnish Verma ,"Higher Engineerig Mathematics", S. Chand publishing,1st edition, 2011.

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DEPARTMENT OF MATHEMATICS

ENGINEERING MATHEMATICS-III
(Common to all Branches)

Course Title: Engineering Mathematics - III | **Course Code : 15MAT31**
Credits: 04 | **L-T-P : 4-0-0**
Contact Hours/Week : 04 | **Total Hours: 50**
Exam. Marks : 80 | **IA Marks : 20**
Exam. Hours : 03

MODULE	RBT Levels	No. of Hrs
MODULE-I **Fourier Series**: Periodic functions, Dirichlet's condition, Fourier Series of periodic functions with period 2π and with arbitrary period $2c$. Fourier series of even and odd functions. Half range Fourier Series, practical harmonic analysis-Illustrative examples from engineering field.	**L1, L2 & L4**	**10**
MODULE-II **Fourier Transforms:** Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transform. **Z-transform:** Difference equations, basic definition, z-transform-definition, Standard z-transforms, Damping rule, Shifting rule, Initial value and final value theorems (without proof) and problems, Inverse z-transform. Applications of z-transforms to solve difference equations.	**L2, L3 & L4**	**10**
MODULE- III **Statistical Methods:** Review of measures of central tendency and dispersion. Correlation-Karl Pearson's coefficient of correlation-problems. Regression analysis- lines of regression (without proof) –problems **Curve Fitting:** Curve fitting by the method of least squares- fitting of the curves of the form, $y = ax + b$, $y = ax^2 + bx + c$ *and* $y = ae^{bx}$. **Numerical Methods:** Numerical solution of algebraic and transcendental equations by Regula- Falsi Method and Newton-Raphson method.	**L3**	**10**
MODULE IV **Finite differences**: Forward and backward differences, Newton's forward and backward interpolation formulae. Divided differences- Newton's divided difference formula. Lagrange's interpolation formula and inverse interpolation formula (all formulae without proof)-Problems. **Numerical integration:** : Simpson's $(1/3)^{th}$ and $(3/8)^{th}$ rules, Weddle's rule (without proof) –Problems.	**L3**	**10**
MODULE-V **Vector integration:** Line integrals-definition and problems, surface and volume integrals-definition, Green's theorem in a plane, Stokes and Gauss-divergence theorem(without proof) and problems. **Calculus of Variations:** Variation of function and Functional, variational problems. Euler's equation, Geodesics, hanging chain, problems.	**L3 & L4** **L2 & L4**	**10**

Course Outcomes: On completion of this course, students are able to:

- Make use of Fourier series to analyze wave forms of periodic functions
- Make use of Fourier transforms and Z - transforms to analyze wave forms of non periodic functions
- Identify statistical methods to find correlation and regression lines, also numerical methods to solve transcendental equations.
- Utilize Numerical techniques for various finite difference technique problems
- Construct Greens, divergence and Stokes theorems for various engineering applications Solve the problems on signals and systems, heat conduction, and control; engineering by using various numerical techniques

Question paper pattern:

- The question paper will have **ten** full questions carrying equal marks.
- Each full question consisting of **16** marks.
- There will be **two** full questions (with a **maximum** of **four** sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer **five** full questions, selecting **one** full question from each module.

Graduate Attributes (as per NBA)

1. Engineering Knowledge
2. Problem Analysis
3. Life-Long Learning
4. Accomplishment of Complex Problems

Text Books:

1. *B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.*
2. *E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2015.*

Reference books:

1. *N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.*
2. *B.V.Ramana: "Higher Engineering M athematics" Tata McGraw-Hill, 2006.*
3. *H. K. Dass and Er. RajnishVerma: "Higher Engineerig Mathematics", S. Chand publishing, 1st edition, 2011.*

We links and Video Lectures:

1. *http://nptel.ac.in/courses.php?disciplineID=111*
2. *http://wwww.khanacademy.org/*
3. *http://www.class-central.com/subject/math*

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DEPARTMENT OF MATHEMATICS

ENGINEERING MATHEMATICS-IV

(Common to all Branches)

Course Title: Engineering Mathematics - IV | **Course Code : 15MAT41**
Credits: 04 | **L-T-P : 4-0-0**
Contact Hours/Week : 04 | **Total Hours: 50**
Exam. Marks : 80 | **IA Marks : 20**
Exam. Hours : 03

MODULE	RBT Levels	No. of Hrs
MODULE-I Numerical Methods: Numerical solution of ordinary differential equations of first order and first degree, Taylor's series method, modified Euler's method, Runge - Kutta method of fourth order.Milne's and Adams-Bashforth predictor and corrector methods (No derivations of formulae).	**L1,L2 & L 3**	**10**
MODULE-II **Numerical Methods**: Numerical solution of second order ordinary differential equations, Runge-Kutta method and Milne's method. **Special Functions**: Series solution-Frobenious method. Series solution of Bessel's differential equation leading to Jn(x)-Bessel's function of first kind. Basic properties and orthogonality. Series solution of Legendre's differential equation leading to Pn(x)-Legendre polynomials. Rodrigue'sformula, problems	**L1, L3**	**10**
MODULE- III Complex Variables: Review of a function of a complex variable, limits, continuity, differentiability. Analytic functions-Cauchy-Riemann equations in cartesian and polar forms. Properties and construction of analytic functions. Complex line integrals-Cauchy's theorem and Cauchy's integral formula, Residue, poles, Cauchy's Residue theorem (without proof) and problems.Transformations: Conformal transformations, discussion of transformations: w=z2, w=e2, w=z+(1/z)(z≠0) and bilinear transformations-problems	**L3**	**10**
MODULE IV Probability Distributions: Random variables (discrete and continuous), probability mass/density functions. Binomial distribution, Poisson distribution. Exponential and normal distributions, problems.Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation, covariance, correlation coefficient.	**L1, L2 & L3**	**10**
MODULE-V **Sampling Theory**: Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, confidence limits for means, student's t-distribution, Chi-square distribution as a test of goodness of fit.**Stochastic process:**Stochastic processes, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability simple problems.	**L1,L2 & L3**	**10**

Course Outcomes: On completion of this course, students are able to:

1.Solve first and second order ordinary differential equation arising in flow problems using single step and multistep numerical methods.
2. Illustrate problems of potential theory, quantum mechanics and heat conduction by employing notions and properties of Bessel's functions and Legendre's polynomials.
3. Explain the concepts of analytic functions, residues, poles of complex potentials and describe conformal and Bilinear transformation arising in field theory and signal processing.
4. Develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, information theory and design engineering.
5. Demonstrate testing of hypothesis of sampling distributions and illustrate examples of Markov chains related to discrete parameter stochastic process.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question consisting of 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

1. Engineering Knowledge

2. Problem Analysis

3. Life-Long Learning

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- N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers,7 th Ed., 2010.
- B.V.Ramana: "Higher Engineering M athematics" Tata McGraw-Hill, 2006..2
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