BTAM 101Engineering Mathematics-I
Objective/s and Expected outcome

"Math and basic science are certainly the foundations of any engineering program. This fact will not change in the foreseeable future" said by Ellis et al. Engineering Mathematics is an essential tool for describing and analyzing engineering processes and systems. Mathematics also enables precise representation and communication of knowledge. Core mathematics courses have broader objectives than just supporting engineering programs. The learning objectives of core mathematics courses can be put into three categories: (1) Content Objectives: Students should learn fundamental mathematical concepts and how to apply them. (2) Skill Objectives: Students should learn critical thinking, modeling/problem solving and effective uses of technology. (3) Communication Objectives: Students should learn how to read mathematics and use it to communicate knowledge. The students are expected to understand the fundamentals of the mathematics to apply while designing technology and creating innovations.

PART A

1. Differential Calculus: Curve tracing: Tracing of Standard Cartesian; Parametric and Polar curves; Curvature of Cartesian, Parametric and Polar curves.

2. Integral Calculus: Rectification of standard curves; Areas bounded by standard curves; Volumes and surfaces of revolution of curves; Applications of integral calculus to find centre of gravity and moment of inertia.

3. Partial Derivatives: Function of two or more variables; Partial differentiation; Homogeneous functions and Euler‟s theorem; Composite functions; Total derivative; Derivative of an implicit function; Change of variable; Jacobians.

4. Applications of Partial Differentiation: Tangent and normal to a surface; Taylor‟s and Maclaurin‟s series for a function of two variables; Errors and approximations; Maxima and minima of function of several variables; Lagrange‟s method of undetermined multipliers.

PART B

5. Multiple Integrals: A brief introduction of cylinder, cone and standard conicoids. Double and triple integral and their evaluation, change of order of integration, change of variable, Application of double and triple integration to find areas and volumes.

6. Vector Calculus: Scalar and vector fields, differentiation of vectors, velocity and acceleration. Vector differential operators: Del, Gradient, Divergence and Curl, their physical interpretations. Formulae involving Del applied to point functions and their products. Line, surface and volume integrals.

7. Application of Vector Calculus: Flux, Solenoidal and Irrotational vectors. Gauss Divergence theorem. Green‟s theorem in plane, Stoke‟s theorem (without proofs) and their applications.

Suggested Readings / Books

1. Thomes, G.B, Finney, R.L. Calculus and Analytic Gemetry, Ninth Edition, Peason Education.

2. Kreyszig, E., Advanced Engineering Mathematics, Eighth edition, John wiley.

3. Peter. V. O‟ Nil, Advanced Engineering Mathematics, Wordsworth Publishing Company.

4. Jain, R.K and Lyengar, S.R.K., Advanced Engineering Mathematics, Narosa Publishing Company.

5. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi.
6. Taneja, H.C., Engineering Mathematics, Volume-I & Volume-II, I.K. Publisher.
7. Babu Ram, Advance engineering Mathematics, Pearson Education.
8. Bindra,. J.S., Applied Mathematics, Volume-I, Kataria Publications.

BTAM102 Engineering Mathematics-II
Objective/s and Expected outcome:

The learning objectives of core mathematics courses can be put into three categories:
Content Objectives: Students should learn fundamental mathematical concepts and how to apply them. **Skill Objectives:** Students should learn critical thinking, modeling/problem solving and effective uses of technology. **Communication Objectives:** Students should learn how to read mathematics and use it to communicate knowledge. The students are expected to understand the fundamentals of the mathematics to apply while designing technology and creating innovations.

PART A

1. Ordinary Differential Equations of first order
Exact Differential equations, Equations reducible to exact form by integrating factors; Equations of the first order and higher degree. Clairaut's equation. Leibniz's linear and Bernoulli's equation

2. Linear Ordinary Differential Equations of second & higher order
Solution of linear Ordinary Differential Equations of second and higher order; methods of finding complementary functions and particular integrals. Special methods for finding particular integrals: Method of variation of parameters, Operator method. Cauchy's homogeneous and Legendre's linear equation, Simultaneous linear equations with constant coefficients.

3. Applications of Ordinary Differential Equations
Applications to electric R-L-C circuits, Deflection of beams, Simple harmonic motion, Simple population model.

PART B

4. Linear Algebra
Rank of a matrix, Elementary transfonnations, Linear independence and dependence of vectors, Gauss-Jordan method to find inverse of a matrix, reduction to normal form, Consistency and solution of linear algebraic equations, Linear transformations, Orthogonal transformations, Eigen values, Eigen vectors, Cayley-Hamilton Theorem, Reduction to diagonal form, orthogonal, unitary, Hermitian and similar matrices.

5. Infinite Series
Convergence and divergence of series, Tests of convergence (without proofs): Comparison test, Integral test, Ratio test, Rabee's test, Logarithmic test, Cauchy's root test and Gauss test. Convergence and absolute convergence of alternating series

6. Complex Numbers and elementary functions of complex variable
De-Moivre's theorem and its applications. Real and Imaginary parts of

exponential, logarithmic, circular, inverse circular, hyperbolic, inverse hyperbolic functions of complex variables. Summation of trigonometric series. (C+iS method)

Suggested Readings / Books:

1. Kreyszig,E., Advanced Engineering Mathematics, Eighth edition, John Wiley.
2. Michael D. Greenberg., Advanced Engineering Mathematics, Second Edition, Pearson Education.
3. Peter. V. O'Nil, Advanced Engineering Mathematics, Wadsworth- Publishing Company.
4. Jain, R.K. and Iyengar, S.R.K., Advanced Engineering Mathematics, Narosa Publishing House, New Delhi.
5. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, Delhi.
6. Pipes, L.A. and Harvill, L.R., Applied Mathematics for Engineers and Physicists, McGraw Hill
7. Taneja, H. C., Engineering Mathematics, Volume-I & Volume-II, 1. K. Publisher.
8. Babu Ram, Advance Engineering Mathematics, Pearson Education.
9. Bindra, J. S., Applied Mathematics, Volume-II, Kataria Publications.

BTAM 301 Engineering Mathematics-III

Unit I Fourier Series: Periodic functions, Euler's formula. Even and odd functions, half range expansions, Fourier series of different wave forms.

Unit II Laplace Transforms: Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function, periodic functions, applications to solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equations.

Unit III Special Functions: Power series solution of differential equations, Frobenius method, Legendre's equation, Legendre polynomial, Bessel's equation, Bessel functions of the first and second kind. Recurrence relations, equations reducible to Bessel's equation.

Unit IV Partial Differential Equations: Formation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients.

Unit V Applications of PDEs: Wave equation and Heat conduction equation in one dimension.
Two dimensional Laplace equation in Cartesian Coordinates, solution by the method of separation of variables.

Unit VI Functions of Complex Variable: Limits, continuity and derivative of the function of complex variable, Analytic function, Cauchy-Riemann equations, conjugate functions, harmonic functions; Conformal Mapping: Definition, standard transformations, translation, rotation, inversion, bilinear. Complex Integration: Line integrals in the complex plane, Cauchy's theorem,

Cauchy's integral formula and derivatives of analytic function. Taylor's and Laurent's expansions
(without proofs), singular points, poles, residue, Integration of function of complex variables using the method of residues.

Suggested Readings/ Books:

- Kreyszing, E., Advanced Engineering Mathematics, Eighth edition, John Wiley, New Delhi.
- Grewal, B. S., Higher Engineering Mathematics, Khanna Publishers, New Delhi.
- Ian N. Sneedon, Elements of Partial Differential Equations, McGraw- Hill, Singapore, 1957.
- Peter. V. O'Nil, Advanced Engineering Mathematics, Wadsworth Publishing Company.
- Taneja, H. C., Engineering Mathematics, Volume-I & Volume-II, I. K. Publisher.
- Babu Ram, Advance Engineering Mathematics, Pearson Education.
- Bindra, J. S., Applied Mathematics, Volume-III, Kataria Publications.
- Advanced Engineering Mathematics, O'Neil, Cengage Learning.

BTAM302 Mathematics-III

Objective/s and Expected Outcome: To teach computer based Engineering Mathematics to students.

After this course the student will be able to solve complex computer oriented problems.

1. Fourier series: Periodic Functions, Euler's Formula. Even and odd Functions, Half range expansions,
Fourier series of different waveforms. **[**

2. Laplace transformations: Laplace transforms of various standard functions, properties of Laplace
transform.

3. Partial Differential Equations: Formation of Partial Differential Equations, linear Partial Differential
Equations, Homogeneous Partial Differential Equations with constant coefficients.

4. Functions of complex variables: Limits, continuity and derivatives of the function of complex variables,
Analytic function, Cauchy- Riemann equations, conjugate functions.

5. Linear Systems and Eigen- Values: Gauss – elimination method, gauss- Jordan method, Gauss- Seidel
iteration method, Rayleigh's Power method for Eigen values and Eigenvectors.

6. Differential Equations: Solutions of Initial values problems using Eulers, modified Eulers method and
Runge- kutta (upto fourth order) methods.

7. Probability distribution: Binomial, Poisson and Normal distribution.

8. Sampling Distribution & testing of Hypothesis: Sampling, Distribution of means and variance, Chi-
Square distribution, t- distribution, F- distribution. General concepts of hypothesis, Testing a statistical
Hypothesis, One and two tailed tests, critical region, Confidence interval estimation. Single and two
sample tests on proportion, mean and variance.

Suggested Readings/ Books:

1. E. Kreyszig,**" Advanced EngineeringMathematics"**, 5th Edition,Wiley Enstern 1985.

2. P. E. Danko, A. G. Popov, T. Y. A. Kaznevnikova, **"Higher Mathematics in Problems and Exercise"**, Part 2, Mir Publishers, 1983.
3. Bali, N. P., **"A Text Book on EngineeringMathematics"**, Luxmi Pub., New Delhi.
4. Peter V.O'Neil,**" Advanced Engineering Mathematics"**, Cengage Learning

BTCS402 Mathematics-III

Objective/s and Expected Outcome: To teach computer based Engineering Mathematics to students.

After this course the student will be able to solve complex computer oriented problems.

Part- A

1. Fourier series: Periodic Functions, Euler's Formula. Even and odd Functions, Half range expansions,
Fourier series of different waveforms.

2. Laplace transformations: Laplace transforms of various standard functions, properties of Laplace
transform.

3. Partial Differential Equations: Formation of Partial Differential Equations, linear Partial Differential
Equations, Homogeneous Partial Differential Equations with constant coefficients.

4. Functions of complex variables: Limits, continuity and derivatives of the function of complex variables,
Analytic function, Cauchy- Riemann equations, conjugate functions.

Part- B

5. Linear Systems and Eigen- Values: Gauss - elimination method, gauss- Jordan method, Gauss- Seidel
iteration method, Rayleigh's Power method for Eigen values and Eigenvectors.

6. Differential Equations: Solutions of Initial values problems using Eulers, modified Eulers method and
Runge- kutta (upto fourth order) methods.

7. Probability distribution: Binomial, Poisson and Normal distribution.

8. Sampling Distribution & testing of Hypothesis: Sampling, Distribution of means and variance, Chi-
Square distribution, t- distribution, F- distribution. General concepts of hypothesis, Testing a statistical
Hypothesis, One and two tailed tests, critical region, Confidence interval estimation. Single and two
sample tests on proportion, mean and variance.

Suggested Readings/ Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 5th Edition, Wiley Enstern 1985.
2. P. E. Danko, A. G. Popov, T. Y. A. Kaznevnikova, Higher Mathematics in Problems and Exercise, Part 2, Mir
Publishers, 1983.
3. Bali, N. P., A Text Book on Engineering Mathematics, Luxmi Pub., New Delhi.

BTEE-505 NUMERICAL AND STATISTICAL METHODS

Floating-Point Numbers: Floating-point representation, Rounding, Chopping, Error analysis, Condition and instability. **Non-Linear Equations:** Bisection, Fixed-point iteration and Newton-Raphson methods, Order of convergence. **Linear Systems and Eigen-Values:** Gauss-elimination method (using Pivoting strategies) and Gauss-Seidel Iteration method. Rayleigh's power method for Eigen-values and Eigen-vectors **Interpolation:** Lagrange's formula with error, divided difference, Newton's divided difference formula **Numerical Integration:** Newton-Cote's quadrature formula (with error) and Gauss-Legendre quadrature formula. **Differential Equations:** Solution of initial value problem using Taylor Series, Euler's and Runge- Kutta (up to fourth order) methods Statistical Methods **Random Variables:** Definition, Probability distribution, Distribution functions, probability distribution function (pdf) and cumulative distribution function (cdf), Expectation and Variance. **Special Probability Distributions:** Binomial, Poisson, Geometric, Uniform, Normal and Exponential distributions. **Sampling Distributions:** Population and samples, Concept of sampling distributions, Sampling distribution of mean, Chi-square, t and F distributions (pdf only). Tests of Hypotheses: Basic ideas, Important tests based on normal, Chi-square, t and F distribution. **Curve Fitting:** Method of least squares, Fitting of simple curves using this method, Regression and Correlation: (Two variables case only) **BOOKS RECOMMENDED:** 1. Jain M.K., Iyengar, S.R.K., and Jain R.K., *Numerical Methods for Scientific and Engineering Computation,* New Age International (2008) 5th ed. 2. Conte, S.D and Carl D. Boor, *Elementry Numerical Analysis: An Algorithmic approach,* Tata McGraw Hill, New York (2005). *3.* Johnson, R., Miller, I. and Freunds, J., *Probability and Statistics for Engineers,* Pearson Education(2005) 7th ed. 4. Gerald C.F and Wheatley P.O*., Applied Numerical Analysis,* Pearson Education (2008) 7th ed. 5. Mathew, J.H., *Numerical Methods for Mathematics, Science and Engineering,* Prentice Hall Inc.J (2002). *6.* Meyer, P.L*., Introductory Probability and Statistical Applications,* Oxford (1970) 2nd ed. *7.* Walpole, Ronald E., Myers, Raymond H., Myers, Sharon L. and, Keying Ye, *Probability and Statistics for Engineers and Scientists,* Pearson Education (2007) 8th ed 8. Sastry S.S., *Introductory Methods of Numerical Analysis*, Prentice Hall (India), (2002), 3rd ed.

BTEE-507 Laboratory-VIII (Numerical Analysis)

Note: Atleast TEN experiments are to be performed in a semester. list of experiments is given below:

List of Experiments: To Develop algorithms/programs in C or C++ or FORTRAN-77/90/95 or MatLab language for the following methods

1. Lagrange's formula with error, divided difference for interpolation,
2. Newton's divided difference method for interpolation and extrapolation.
3. Bisection method for finding a real root of an equation.
4. Newton Raphson method for finding a real root of an equation.
5. Iteration method for finding a real root of an equation.
6. Gauss elimination method for solving simultaneous linear algebraic equations.
7. Gauss Jordan method for solving simultaneous linear algebraic equations.
8. Simpson's 1/3rd rule for numerical integration.
9. Newton's forward interpolation formula.
10. Lagrange's method for interpolation.
11. Euler's method for solving ordinary differential equations.
12. Runge-Kutta (up to fourth order) method for solving ordinary differential equations.

13. Curve fitting (linear and polynomial)