Detail Course Structures

of

Foundation Sciences

COURSE INFORMATION SHEET

Course code: MA24101

Course title: Mathematics I

Pre-requisite(s): Basic Calculus, Basic Algebra

Co- requisite(s): ---

Credits: L: 3 T: 1 P: 0 C:4

Class schedule per week: 3 Lectures, 1 Tutorial.

Class: BTech.

Semester / Level: I / 1

Branch: All

Name of Teacher:

Course Objectives: This course enables the students to understand:

1.	infinite sequences and series
2.	theory of matrices including elementary transformations, rank and its application in consistency of system of linear equations, eigenvalues, eigenvectors etc.
3.	multivariable functions, partial differentiation, properties and applications of partial derivatives.
4.	integrals of multivariable functions viz. double and triple integrals with their applications
5.	properties like gradient, divergence, curl associated with derivatives of vector point functions and integrals of vector point functions

Course Outcomes: After the completion of this course, students will be able to

CO1	decide the behavior of sequences and series using appropriate tests.
CO2	handle problems related to the theory of matrices including elementary transformations, rank and its application in consistency of system of linear equations, eigenvalues, eigenvectors etc.
CO3	get an understanding of partial derivatives and their applications in finding maxima - minima problems
CO4	apply the principles of integrals (multivariable functions viz. double and triple integrals) to solve a variety of practical problems in engineering and sciences
CO5	get an understanding of gradient, divergence, curl associated with derivatives of vector point functions and integrals of vector point functions and demonstrate a depth of understanding in advanced mathematical topics, enhance and develop the ability of using the language of mathematics in engineering

Syllabus

MA24101 Mathematics – I 3-1-0-4

MODULE – I: Sequences and Series

Sequences, Convergence of Sequence. Series, Convergence of Series, Tests for Convergence: Comparison tests,Cauchy's Integral test, Ratio test, Cauchy's root test, Raabe's test, Gauss test, Alternating series, Leibnitz test, Absolute and Conditional Convergence.

[9L]

MODULE – II: Matrices

Rank of a Matrix, elementary transformations. Vectors, Linear Independence and Dependence of Vectors. Consistency of system of linear equations. Eigenvalues, Eigenvectors, Cayley - Hamilton theorem.

[9 L]

MODULE – III: Advance Differential Calculus

Function of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Chain rules, Jacobians and its properties, Taylor series for function of two variables, Maxima – Minima.

[9 L]

MODULE – IV: Advance Integral Calculus

Double integrals, double integrals in polar coordinates, Change of order of integration, Triple Integrals, cylindrical and spherical coordinate systems, transformation of coordinates, Applications of double and triple integrals in areas and volumes.

[9 L]

MODULE – V: Vector Calculus

Scalar and vector point functions, gradient, directional derivative, divergence, curl. Line Integral, Work done, Conservative field, Green's theorem in a plane, Surface and volume integrals, Gauss – divergence theorem, Stoke 's theorem.

[9 L]

Text Books:

1. M. D. Weir, J. Hass and F. R. Giordano: Thomas' Calculus, 11th edition, Pearson Educations, 2008E.
2. H. Anton, I. Brivens and S. Davis, Calculus, 10th Edition, John Wiley and sons, Singapore Pte. Ltd., 2013.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint.2010.

Reference Books:

1. M. J. Strauss, G. L. Bradley And K. J. Smith, Calculus, 3rd Ed, Dorling.Kindersley (India) Pvt. Ltd. (P Ed), Delhi, 2007.
2. David C. Lay, Linear Algebra and its Applications (3rd Edition), Pearson Ed. Asia, Indian Reprint, 2007.
3. Robert Wrede & Murray R. Spiegel, Advanced Calculus, 3rd Ed., Schaum's outline series, McGraw-Hill Companies, Inc.,2010.
4. D. G. Zill and W.S. Wright, Advanced Engineering Mathematics, Fourth Edition, 2011.

Gaps in the Syllabus (to meet Industry/Profession requirements)

1. Making students solve engineering problems using the studied concepts.
2. Experimentally visualising the analytical concepts.
3. Difficult to produce extensive proves of the state of the art definitions and theorems.

POs met through Gaps in the Syllabus

3, 4, 12

Topics beyond syllabus/Advanced topics/Design

1. Proofs of the said theorems
2. For students to come up with innovative ideas and carry out project works during the running semester is beyond syllabus
3. Industrial visits to train them of the challenges in the industry and support students to doProjects at industries

POs met through Topics beyond syllabus/Advanced topics/Design

2, 3, 4, 12

Course outcome (co) attainment assessment tools & evaluation procedure

Direct assessment

COURSE INFORMATION SHEET

Course code: MA24103

Course title: Mathematics II

Pre-requisite(s):

Co- requisite(s): Mathematics - I

Credits: L: 3 T: 1 P: 0 C:4

Class schedule per week: 3 Lectures, 1 Tutorial.

Class: BTech

Semester / Level: II / 1

Branch: All

Name of Teacher:

Course Objectives: This course enables the students to understand

1.	various methods to solve linear differential equations of second and higher order
2.	special functions viz. Legendre's and Bessel's and different properties associated with them
3.	diverse mathematical techniques for solving partial differential equations of first order, along with their applications in wave and heat equations using Fourier series
4.	the theory of functions of a complex variable, complex differentiation and integration
5	about random variables and elementary probability distribution.

Course Outcomes: After the completion of this course, students will be able to

CO1	investigate the occurrence of ordinary differential equations in real-life problems and identify the suitable methods available for their solutions.
CO2	develop skills to solve and implement various forms of differential equations and special functions in diverse domains.
CO3	learn to solve various forms of partial differential equations arising in real-world.
CO4	gain an understanding of complex variable functions and their properties in science and engineering.
CO5	comprehend and apply the concept of probability distributionsin solving problems related to uncertainty.

Syllabus

MA24103 **MATHEMATICS – II** 3-1-0-4

MODULE – I: Ordinary Differential Equations – I

Linear differential equations, Wronskian, Linear independence and dependence of solutions. Linear differential equations of 2nd and higher order with constant coefficients, Operator method, Euler – Cauchy's form of linear differential equation, Method of variation of parameters. **[9 L]**

MODULE – II: Ordinary Differential Equations – II

Ordinary and singular points of differential equation, Power and Frobenius' series solutions (root differ by non integer and equal roots). Bessel's differential equation, Bessel function of first kind and its important properties. Legendre's differential equation, Legendre's polynomial and its important properties.

[9 L]

MODULE – III: Fourier series and Partial Differential Equations

Fourier series: Euler formulae for Fourier series, Half range Fourier series.

Partial Differential Equations: Method of separation of variables and its application in solving one dimensional wave and heat equations. **[9L]**

MODULE – IV: Complex Variable-Differentiation & Integration

Function of a complex variable, Analyticity, Analytic functions, Cauchy – Riemann equations.

Cauchy's theorem, Cauchy's Integral formula, Taylor and Laurent series expansions. Singularities and its types, Residues, Residue theorem. **[9L]**

MODULE – V: Applied Probability

Discrete and continuous random variables, cumulative distribution function, probability mass and density functions, expectation, variance. Introduction to Binomial, Poisson and Normal Distribution. **[9L]**

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. D. G. Zill and W.S. Wright, Advanced Engineering Mathematics, Fourth Edition, 2011.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGrawHill, 2004.
4. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing, 3rd Ed, 2009.
5. R. A. Johnson, I. Miller and J. Freund: Probability and Statistics for Engineers, PHI
6. S. C. Gupta and V.K. Kapoor: Fundamental of Mathematical Statistics, Sultan Chandand Sons

Reference Books:

1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
4. G. F. Simmons, Differential Equations with Applications and Historical Notes, TMH, 2nd ed., 2003.
5. P. L. Meyer: Introductory Probability and Statistical Applications, Oxford & IBH.

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2. Experimentally visualising the analytical concepts.
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POs met through Topics beyond syllabus/Advanced topics/Design

2, 3, 4, 12

Course outcome (co) attainment assessment tools & evaluation procedure

Direct assessment

Assessment tool	% contribution during co assessment
Mid semester examination	25
End semester examination	50
Quiz (s)	10
Assignment	10
Assessment	5

Assessment components	CO1	CO2	CO3	CO4	CO5
Mid semester examination	√	√	√		
End semester examination	√	√	√	√	√
Quiz (s)	√				
Assignment				√	
Assessment	√	√	√	√	√

Indirect assessment –

1. Student feedback on course outcome