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 behaviour 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

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Syllabus

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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 do Projects at
   industries

POs met through Topics beyond syllabus/Advanced topics/Design
   2, 3, 4, 12

<u>Course outcome (co) attainment assessment tools & evaluation procedure</u>
<u>Direct assessment</u>

Assessment tool	% contribution during co assessment
Mid semester examination	25

End semester examination	50
Quiz (s)	10+10
Assignment	5

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

Indirect assessment –

1. Student feedback on course outcome

Mapping of course outcomes onto program outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	2	1	1	1	1	3	3	2	2	2	3	3
CO2	3	2	2	2	1	1	2	1	3	3	2	2	2	3	3
CO3	3	3	2	2	1	1	1	1	3	3	2	2	2	3	3
CO4	2	2	3	1	1	1	1	1	3	3	2	2	2	3	3
CO5	3	3	3	3	3	1	1	1	1	1	1	2	2	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If satisfying< 34%=1, 34-66% =2, > 66% = 3

CD Code	Course delivery methods
CD1	Lecture by use of boards/lcd projectors/ohp projectors
CD2	Tutorials/assignments
CD3	Seminars
CD4	Mini projects/projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of nptel materials and internets

CD9	Simulation

Mapping Between COs and Course Delivery (CD) methods

Course Outcome	Course Delivery Method Used
CO1	CD1, CD7, CD 8
CO2	CD1 and CD9
CO3	CD1, CD2 and CD3
CO4	CD1 and CD2
CO5	CD1 and CD2