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 singular 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 distributions in 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 2^{nd} 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., McGraw Hill, 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 Chand and 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.

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

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+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