Academic Course Description

BHARATH University
Faculty of Science and Humanities
Department of Mechanical Engineering

BMA201 ENGINEERING MATHEMATICS - II

Second Semester, 2015-16 (Even Semester)

Course (catalog) description

In this course, in the first Chapter we introduce the concepts Higher order linear differential equations with constant coefficients , Method of variation of parameters , Cauchy's and Legendre's linear equations and simultaneous first order linear equations with constant coefficients.

In the second chapter we introduces to the concepts and definitions of Gradient, divergence and curl ,Directional derivatives – Irrational and Solenoidal vector fields, vector integration, Green's theorem in a plane , Gauss divergence theorem and Stoke's theorem (without proofs) and simple applications involving cubes and rectangular parallelepipeds

In The third Chapter we introduce the concepts Functions of a complex variable ,Analytic functions , Necessary conditions, Cauchy-Riemann equation and sufficient conditions (without proofs) ,Harmonic and orthogonal properties of analytic functions – Harmonic conjugate – construction of analytic functions and conformal mapping : W= Z+C,CZ , 1/Z and bilinear transformation.

In the fourth Chapter we introduce the concept Complex integration – Statement and application of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of Residue theorem to evaluate real integrals – Unit circle and semi-circular contour (excluding ploes on boundaries).

In the fifth Chapter we introduce the concepts of Mean , Median ,Mode – Moments – Skewness and Kurtosis – correlation – Rank Correlation – Regression –Chi square test – 2 x 2, m x n .

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Compulsory/Elective course **:** Compulsory for all branch students
Credit & Contact hours : 3 & 60
Course Coordinator : Dr.Deepa

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Mr.P.Bhathmanaban	All first Year Students	FIRST YEAR MAIN BULIDING		**bhathrns@gmail.com**	9.00-9.50 AM
Mrs. K.Janaki	All First Year Students	FIRST YEAR MAIN BULIDING		**Janu89lava@gmail.com**	12.45-1.15 PM

Relationship to other courses:

Pre –requisites **:** Mathematics I

Assumed knowledge : The students will have a physics and mathematics background obtained at a high school (or Equivalent) level. In particular, working knowledge of basic mathematics including integration , differential equations, Ordinary differentiation, series concepts .

Internatinal Editions, 1993.
3. D. P. Kothari and I. J. Nagrath "Electric machines" Tata McGraw-Hill Education, 2004
4. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill Edition,2004.

Computer usage: Nil

Professional component

General	-	0%
Basic Sciences	-	100%
Engineering sciences & Technical arts	-	0%
Professional subject	-	

Broad area : Complex Analysis, Vector Calculus, Statistics, Differential Equations.

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	February 2nd week	Session 1 to 14	2 Periods
2	Cycle Test-2	March 2nd week	Session 15 to 28	2 Periods
3	Model Test	April 3rd week	Session 1 to 45	3 Hrs
5	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

To develop problem solving skills and understanding of Mathematics. This course emphasizes:	Correlates to program outcome		
	H	M	L
1. To develop an understanding of the fundamental s in ODE	b,c,d,j	a,f,k	e,g
2. To develop the ability to solve problems in Vector Calculus	b,c,f	a,d,g,h	j
3. To understand the concepts of Analytic Functions	a,d,e	b,g	j,k
4. To develop students problem solving techniques in Complex Integration	a,d,e	b,g,h,k	f,j
5. to learn basic concepts of **S**tatistics	a	a,b,c,d,g	j,k

H: high correlation, M: medium correlation, L: low correlation

Draft Lecture Schedule

Session	Topics	Problem solving (Yes/No)	Text / Chapter
	UNIT I ORDINARY DIFFERENTIAL EQUATIONS		
1.	Higher order linear differential equations with constant coefficients	Yes	[T1]
2.	Types to find Complementary Function	Yes	
3.	Types to find particular Integral	Yes	
4.	Method of variation of parameters	Yes	
5.	Cauchy's Linear equation	Yes	
6.	Legendre's linear equations	Yes	
7.	Simultaneous first order linear equations with constant coefficients.	Yes	
	UNIT II VECTOR CALCULUS		
8.	Gradient, divergence and curl	Yes	[T2]
9.	Directional derivatives	Yes	
10.	Irrotational and Solenoidal vector fields	Yes	
11.	vector integration	Yes	
12.	Green's theorem in a plane	Yes	
13.	Gauss divergence theorem		
14.	Stoke's theorem		
15.	simple applications involving cubes and rectangular parallelepipeds		
	UNIT III ANALYTIC FUNCTIONS		
16.	Functions of a complex variable	Yes	[T3]
17.	Analytic functions	Yes	
18.	Necessary conditions, Cauchy-Riemann equation and sufficient conditions	Yes	
19.	Harmonic and orthogonal properties of analytic functions	Yes	
20.	Harmonic conjugate.	Yes	
21.	construction of analytic functions	Yes	
22.	Conformal mapping: W= Z+C,CZ , 1/Z and bilinear transformation.	Yes	
	UNIT IV COMPLEX INTEGRATION		
23.	Complex integration	Yes	[T4]
24.	Statement and application of Cauchy's integral theorem and Cauchy's integral formula	Yes	
25.	Taylor and Laurent expansions	Yes	
26.	Singular points	Yes	
27.	Residues	Yes	
28.	Residue theorem	Yes	
29.	Application of Residue theorem to evaluate real integrals	Yes	
30.	Unit circle and semi-circular contour (excluding	Yes	

	ploes on boundaries).		
UNIT V STATISTICS			
31.	Mean	Yes	[T5]
32.	Median	Yes	
33.	Mode	Yes	
34.	Moments	Yes	
35.	Skewness and Kurtosis	Yes	
36.	correlation	Yes	
37.	Rank Correlation	Yes	
38.	Regression	Yes	
39.	Chi square test – 2 x 2, m x n .	Yes	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignment / Seminar / Online Test / Quiz	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by: P.Bhathmanaban, Assistant professor , Department of Mathematics

Addendum

ABET Outcomes expected of graduates of B.Tech / MECH / program by the time that they graduate:

a) The ability to apply knowledge of mathematics, science, and engineering fundamentals.

b) The ability to identify, formulate and solve engineering problems.

c) The ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

d) The ability to design and conduct experiments, as well as to analyze and interpret data

e) The ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

f) The ability to apply reasoning informed by the knowledge of contemporary issues.

g) The ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

h) The ability to understand professional and ethical responsibility and apply them in engineering practices.

i) The ability to function on multidisciplinary teams.

j) The ability to communicate effectively with the engineering community and with society at large.

k) The ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.

l) The ability to recognize the need for, and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION:
Mechanical Engineering graduates are enthusiastic to provide strong foundation in mathematical, scientific and engineering fundamentals necessary to analyze, formulate and solve engineering problems in the field of Mechanical Engineering.

PEO2: CORE COMPETENCE:
Mechanical Engineering graduates have competence to enhance the skills and experience in defining problems in the field of Mechanical Engineering and Technology design and implement, analyzing the experimental evaluations, and finally making appropriate decisions.

PEO3: PROFESSIONALISM:
Mechanical Engineering graduates made competence to enhance their skills and embrace new thrust areas through self-directed professional development and post-graduate training or education.

PEO4: PROFICIENCY:
Mechanical Engineering graduates became skilled to afford training for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS:
Mechanical Engineering graduates are morally merged to apply the ethical and social aspects of modern Engineering and Technology innovations to the design, development, and usage of new products, machines, gadgets, devices, etc.

Course Teacher	Signature
Mr.P.Bhathmanaban Mrs. K.Janaki	

Course Coordinator **HOD/MECH**

Dr.Deepa