

## Academic Course Description

BHARATH University  
 Faculty of Science and Humanities  
 Department of Mathematics

**BMA201 ENGINEERING MATHEMATICS - II**  
**Second Semester, 2016-17 (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 introduce 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 poles 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 –  $2 \times 2, m \times n$ .

**Compulsory/Elective course:** Compulsory for all branch students  
 Credit hours : 3 credits  
 Course Coordinator : Mr.P.Bhathmanaban, Asst. Professor

**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 : BP2101 Engineering Physics –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.

Following courses : BMA301 ENGINEERING MATHEMATICS 3

**Syllabus Content**

**UNIT I ORDINARY DIFFERENTIAL EQUATION 12**

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Cauchy’s and Legendre’s linear equations - simultaneous first order linear equations with constant coefficients.

**UNIT II VECTOR CALCULUS 12**

Gradient, divergence and curl –Directional derivatives –Irrotational and solenoidal vector fields – vector integration– Green’s theorem in a plane, Gauss divergence theorem and Stoke’s theorem (without proofs) – simple applications involving cubes and rectangular parallelepipeds.

**UNIT III ANALYTIC FUNCTIONS 12**

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 – conformal mapping:  $W= Z+C$ ,  $CZ$ ,  $1/Z$  and bilinear transformation.

**UNIT IV COMPLEX INTEGRATION 12**

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 poles on boundaries).

**UNIT V STATISTICS 12**

Mean, Median, Mode – Moments –Skewness and Kurtosis – Correlation – Rank Correlation – Regression –Chi square test for contingency tables.

**Computer usage:** Nil

**Professional component**

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

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

**Test Schedule**

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	January 4th week	Session 1 to 14	2 Periods
2	Cycle Test-2	February 4th week	Session 15 to 28	2 Periods
3	Model Test	March 4th 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 fundamentals 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 Statistics	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
<b>UNIT I ORDINARY DIFFERENTIAL EQUATIONS</b>			
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	
<b>UNIT II VECTOR CALCULUS</b>			
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		
<b>UNIT III ANALYTIC FUNCTIONS</b>			
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	
<b>UNIT IV COMPLEX INTEGRATION</b>			
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 poles on boundaries).	Yes	

**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	-	5%
Assignment	-	5%
Attendance	-	10%
Final exam	-	70%

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

**Dated :**

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## **Addendum**

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

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multidisciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

## **Program Educational Objectives**

### **PEO1: PREPARATION**

Civil Engineering graduates will have knowledge to apply the fundamental principles for a successful profession and/or for higher education in Civil Engineering based on mathematical, scientific and engineering principles, to solve realistic and field problems that arise in engineering and non engineering sectors

### **PEO2: CORE COMPETENCE**

Civil Engineering graduates will adapt to the modern engineering tools and construction methods for planning, design, execution and maintenance of works with sustainable development in their profession.

### **PEO3: PROFESSIONALISM**

Civil Engineering Graduates will exhibit professionalism, ethical attitude, communication and managerial skills, successful team work in various private and government organizations both at the national and international level in their profession and adapt to current trends with lifelong learning.

### **PEO4: SKILL**

Civil Engineering graduates will be trained 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**

Civil Engineering graduates will be installed with ethical feeling, encouraged to make decisions that are safe and environmentally-responsible and also innovative for societal improvement.

<b>Course Teacher</b>	<b>Signature</b>
Mr.P.Bhathmanaban	

**Course Coordinator**

**HOD/Civil**