

**G. PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY**

Nandikotkur Road, Kurnool- 518002

**DEPARTMENT OF HUMANITIES AND SCIENCE****B.TECH I YEAR****COURSE DESCRIPTION**

<b>Course Code</b>	:	<b>15A54201</b>			
<b>Course Title</b>	:	<b>ENGINEERING MATHEMATICS-II</b>			
<b>Regulation</b>	:	<b>R15-JNTUA</b>			
<b>Course Structure</b>	:	Lectures	Tutorials	Practical	Credits
		3	1	-	3
<b>Course Coordinator</b>	:	Mrs.SHAHINA NIKHATH			
<b>Team of Instructors</b>	:	Mr.G.SIDDESH BABU,Mr.A.SRI HARI, Miss R.MAHA RANI			

**I. COURSE OVERVIEW:**

The course focuses on more advanced Engineering Mathematics topics which provide with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. The course includes Laplace transforms, Fourier series and transform, partial differential equations and applications, Z-Transforms. The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program and provide various types of numerical methods for which algorithms and programs can be written.

**II. PREREQUISITE(S):**

Level	Credits	Periods / Week	Prerequisites
UG	3	4	Basic mathematics, Diff and Integration

**III. Marks Distribution:**

Sessional Marks	University End Exam Marks	Total Marks
<p>Midterm Test</p> <p>There shall be three midterm examinations. Each midterm examination consists of essay paper, objective paper and assignment.</p> <p>The essay paper is for 10 marks of 60 minutes duration and shall contain 4 questions. The student has to answer 2 questions, each carrying 5 marks.</p> <p>The objective paper is for 10 marks of 20 minutes duration. It consists of 10 multiple choice and 10 fill-in-the blank questions, the student has to answer all the questions and each carries half-mark.</p> <p>First midterm examination shall be conducted for the first unit of syllabus and second midterm for two and three units of syllabus and third midterm examination shall be conducted for the remaining portion. Five marks are earmarked for assignments. There shall be three assignments in every theory course. Assignments are usually issued at the time of commencement of the semester. These are of problem solving in nature with critical thinking. Marks shall be awarded considering the average of three midterm tests in each course.</p>	70	100

#### IV. Evaluation Scheme:

S.No	Component	Duration (hours)	Marks
1	I MID EXAMINATION	1hr 50 min	30
2	II MID EXAMINATION	1hr 50 min	30
3	EXTERNAL EXAMINATION	3hrs	70

#### V. Course Educational Objectives:

The goal of this course is to provide students with better understanding of and preparation for which are Mathematics applicable in most of engineering branches.

At the end of the course, the students will be able to:

I. Apply Laplace transforms, inverse Laplace transforms and Applications of Laplace transforms.

II. Develop functions in a Fourier series and Fourier transforms.

III. Apply Partial differential equations in solving heat and wave equations

IV. Apply Z-Transforms, Inverse Z-Transforms And solve Difference Equations.

#### VI. Course Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

1. **Apply** Laplace and Inverse Laplace transforms to standard functions.
2. **Use** partial fractions to find inverse Laplace transforms and in convolution theorem.
3. **Apply** Laplace transforms for solving ordinary differential equations.
4. **Demonstrate** Dirichlet's conditions by using them to evaluate infinite series
5. **Explain** fundamental understanding of Fourier series and be able to give Fourier expansions of a given function
6. **Determine** the Fourier transform of elementary functions from the definition
7. **Apply** the partial differential equation for solving engineering problems.
8. **Solve** the heat equation and wave equation in subject to boundary conditions.
9. **Apply** Z-Transforms, Inverse Z-Transforms And solve Difference Equations.

VII. How Course Outcomes are assessed:

Program Outcomes		Level	Proficiency assessed by
a	An ability to apply knowledge of mathematics, science and engineering fundamentals to the conceptualization of engineering models ( <b>Fundamental Engineering Analysis Skills</b> ).	H	Assignments, Exercises
b	An ability to design and conduct experiments, as well as analyze and interpret the data ( <b>Information retrieval skills</b> ).	N	--
c	An ability to design, implement and evaluate desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety, and sustainability ( <b>Creative Skills</b> ).	N	--
d	An ability to function effectively as an individual and as a member or a leader in multidisciplinary teams ( <b>Team Work</b> ).	N	--
e	An ability to identify, formulate and apply appropriate techniques, resources and to solve engineering problems ( <b>Engineering Problem Solving Skills</b> ).	S	Assignments, Exercises
f	An understanding of professional ethics and responsibilities of engineering practice ( <b>Professional Integrity</b> ).	N	--
g	An ability to communicate effectively with the engineering community and society at large such as writing effective reports and making effective presentations ( <b>Communication Skills</b> ).	N	--
h	Understanding of the impact of engineering solutions in a global, economic, environmental and societal context ( <b>Engineering impact assessment skills</b> ).	N	--
i	An ability to engage in life-long learning and an understanding of the need to keep current of the developments in the specific field of practice ( <b>Continuing education awareness</b> ).	S	Seminars Discussions
j	Knowledge of contemporary issues like increased use of portable devices, rising health care costs and etc. which influence engineering design ( <b>Social awareness</b> ).	N	--
k	An ability to use current techniques, skills and modern engineering tools necessary to analyze engineering practice ( <b>Practical engineering analysis skills</b> ).	N	--
l	An ability to apply creativity in design and development of electronic circuits, equipment, components, sub-systems and systems ( <b>Software and Hardware Interface</b> ).	N	--
m	An ability to recognize the importance of professional developments by pursuing post graduate studies or facing competitive examinations that offer challenging and rewarding careers in designing ( <b>Successful Career and Immediate Employment</b> ).	S	Exams, Discussions

N = None

S = Supportive

H = Highly Related

## VIII SYLLABUS

### UNIT – I

Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function.

Differentiation and integration of transform – Application of Laplace transforms to ordinary differential equations of first and second order.

### UNIT – II

Fourier Series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd periodic continuation – Half-range Fourier sine and cosine expansions- Parseval's formula- Complex form of Fourier series.

### UNIT – III

Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

### UNIT – IV

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Method of separation of variables – Solutions of one dimensional wave equation, heat equation and two-dimensional Laplace's equation under initial and boundary conditions.

### UNIT – V

Z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

### TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.

### REFERENCES:

1. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.
2. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India

**IX.Course Plan:**

The course plan is meant as a guideline. There may probably be changes.

Lecture No.	Learning Objective	Topics to be covered	Reference
1-2	<b>Laplace transforms</b> of standard functions	<b>Define</b> Laplace transform and apply for standard functions	<b>T-2&amp;R-1,2</b>
3-5	Shifting Theorems and unit step function	<b>Define</b> and apply shifting theorems	<b>T-1 &amp; R-2</b>
6-10	Theorems of Laplace transforms	<b>Describe</b> the Theorems and apply	<b>T-1 &amp; R-2</b>
10-11	Inverse Laplace transforms	<b>Define</b> Inverse Laplace transforms and apply for standard functions also by partial fractions	<b>T-1 &amp; R-2</b>
12-14	Theorems of Inverse Laplace transforms	<b>Describe</b> the Theorems and apply	<b>T-1 &amp; R-2</b>
15-18	<b>Applications</b> to ODE	<b>Apply</b> Laplace transforms for ODE	<b>T-1 &amp; R-2</b>
19-20	To able to understand the concept of Fourier series and its importance in engineering stream.	Fourier Series	<b>T2 &amp; R1</b>
21-22	To able to know how to find Fourier coefficients using Euler's formulae.	Determination of Fourier coefficients	<b>T2 &amp; R1</b>
23-24	To able to know and understand Fourier series of even and odd functions.	Fourier series of Even and odd functions	<b>T2 &amp; R1</b>
25-26	To know about Fourier series of functions defined in arbitrary interval.	Fourier series in an arbitrary interval	<b>T2 &amp; R1</b>
27-28	To know about Fourier series of functions with even and odd periodic continuation.	Even and odd periodic continuation	<b>T1 &amp; R2</b>
29-30	To understand Fourier series expansions of even and odd functions.	Half-range Fourier sine and cosine expansions	<b>T1 &amp; R2</b>
31-32	To able to know about the importance of Fourier integral theorem	Fourier integral theorem (statement only)	<b>T2 &amp; R1</b>
33-35	To able to understand about Fourier sine and cosine integrals	Fourier sine and cosine integrals.	<b>T2 &amp; R1</b>
36-37	To able to know the concept of Fourier transform and its importance in engineering.	Fourier transform	<b>T2 &amp; R1</b>
38-40	To able to understand the concept of Fourier sine and cosine transforms and their properties.	Fourier sine and cosine transforms – Properties	<b>T1&amp; R2</b>
41-42	To able to know about Inverse transforms.	Inverse transforms	<b>T1&amp; R2</b>
43-45	To able to understand about Finite Fourier transforms.	Finite Fourier transforms	<b>T1&amp; R2</b>
46-47	To able to know Formation of partial differential equations by using the method of elimination of arbitrary constants and arbitrary functions.	Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions	<b>T3</b>
48-49	To able to know Formation of partial differential equations by Method of separation of variables	Method of separation of variables	<b>T2</b>
50-52	To able to understand and find Solutions of one dimensional wave equation under initial and boundary conditions	Solutions of one dimensional wave equation under initial and boundary conditions	<b>T1</b>

53-54	To able to understand and find Solutions of one dimensional heat equation under initial and boundary conditions	heat equation under initial and boundary conditions	<b>T1&amp; R2</b>
55-57	To able to understand and find Solutions Two-dimensional Laplace equation under initial and boundary conditions.	Two-dimensional Laplace equation under initial and boundary conditions.	<b>T1&amp; R2</b>
58-60	To able to know the concept of z-transforms and Properties and its importance in engineering subjects like Digital signal processing and digital filters.	z-transform – Properties	<b>T2 &amp; R1</b>
61-62	To able to know the concept of z-transforms and Properties Inverse z-transform its importance in engineering.	Inverse z-transform – Properties	<b>T1&amp; R2</b>
63-64	To able to understand Damping rule.	Damping rule	<b>T3</b>
65-66	To able to understand Shifting rule.	Shifting rule	<b>T1&amp; R2</b>
67-68	To able to understand Initial and final value theorems.	Initial and final value theorems.	<b>T1&amp; R2</b>
69-70	To able to understand Convolution theorem.	Convolution theorem	<b>T1&amp; R2</b>
71-72	To able to understand about Solution of difference equations by z-transforms this is having a great importance in engineering.	Solution of difference equations by z-transforms	<b>T1&amp; R2</b>

Prepared By : **SHAHINA NIKHATH, Assistant professor**

**HODH&S**

Date :

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