

## SEMESTER S3

### MATHEMATICS FOR ELECTRICAL SCIENCE AND PHYSICAL SCIENCE – 3

(Common to B & C Groups)

Course Code	GYMAT301	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	Basic knowledge in complex numbers.	Course Type	Theory

#### Course Objectives:

1. To introduce the concept and applications of Fourier transforms in various engineering fields.
2. To introduce the basic theory of functions of a complex variable, including residue integration and conformal transformation, and their applications

### SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Fourier Integral, From Fourier series to Fourier Integral, Fourier Cosine and Sine integrals, Fourier Cosine and Sine Transform, Linearity, Transforms of Derivatives, Fourier Transform and its inverse, Linearity, Transforms of Derivative. <b>(Text 1: Relevant topics from sections 11.7, 11.8, 11.9)</b>	9
2	Complex Function, Limit, Continuity, Derivative, Analytic functions, Cauchy-Riemann Equations (without proof), Laplace's Equations, Harmonic functions, Finding harmonic conjugate, Conformal mapping, Mappings of $w= z^2$ , $w=e^z$ , $w=\frac{1}{z}$ , $w= \sin z$ . <b>(Text 1: Relevant topics from sections 13.3, 13.4, 17.1, 17.2, 17.4)</b>	9
3	Complex Integration: Line integrals in the complex plane (Definition & Basic properties), First evaluation method, Second evaluation method, Cauchy's integral theorem (without proof) on simply connected domain,	9

	Independence of path, Cauchy integral theorem on multiply connected domain (without proof), Cauchy Integral formula (without proof). <b>(Text 1: Relevant topics from sections 14.1, 14.2, 14.3)</b>	
<b>4</b>	Taylor series and Maclaurin series, Laurent series (without proof), Singularities and Zeros – Isolated Singularity, Poles, Essential Singularities, Removable singularities, Zeros of Analytic functions – Poles and Zeros, Formulas for Residues, Residue theorem (without proof), Residue Integration- Integral of Rational Functions of $\cos\theta$ and $\sin\theta$ . <b>(Text 1: Relevant topics from sections 15.4, 16.1, 16.2, 16.3, 16.4)</b>	<b>9</b>

**Course Assessment Method**  
**(CIE: 40 marks , ESE: 60 marks)**

**Continuous Internal Evaluation Marks (CIE):**

<b>Attendance</b>	<b>Assignment/ Microproject</b>	<b>Internal Examination-1 (Written)</b>	<b>Internal Examination- 2 (Written )</b>	<b>Total</b>
<b>5</b>	<b>15</b>	<b>10</b>	<b>10</b>	<b>40</b>

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

<b>Part A</b>	<b>Part B</b>	<b>Total</b>
<ul style="list-style-type: none"> <li>• 2 Questions from each module.</li> <li>• Total of 8 Questions, each carrying 3 marks</li> </ul> <p style="text-align: center;"><b>(8x3 =24marks)</b></p>	<ul style="list-style-type: none"> <li>• Each question carries 9 marks.</li> <li>• Two questions will be given from each module, out of which 1 question should be answered.</li> <li>• Each question can have a maximum of 3 sub divisions.</li> </ul> <p style="text-align: center;"><b>(4x9 = 36 marks)</b></p>	<b>60</b>

## Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
<b>CO1</b>	Determine the Fourier transforms of functions and apply them to solve problems arising in engineering.	<b>K3</b>
<b>CO2</b>	Understand the analyticity of complex functions and apply it in conformal mapping.	<b>K3</b>
<b>CO3</b>	Compute complex integrals using Cauchy's integral theorem and Cauchy's integral formula.	<b>K3</b>
<b>CO4</b>	Understand the series expansion of complex function about a singularity and apply residue theorem to compute real integrals.	<b>K3</b>

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

### CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	3	-	2	-	-	-	-	-	-	-	2
<b>CO2</b>	3	3	-	2	-	-	-	-	-	-	-	2
<b>CO3</b>	3	3	-	2	-	-	-	-	-	-	-	2
<b>CO4</b>	3	3	-	2	-	-	-	-	-	-	-	2

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons	10 <sup>th</sup> edition, 2016

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Complex Analysis	Dennis G. Zill, Patrick D. Shanahan	Jones & Bartlett	3 <sup>rd</sup> edition, 2015
2	Higher Engineering Mathematics	B. V. Ramana	McGraw-Hill Education	39 <sup>th</sup> edition, 2023
3	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	44 <sup>th</sup> edition, 2018
4	Fast Fourier Transform - Algorithms and Applications	K.R. Rao, Do Nyeon Kim, Jae Jeong Hwang	Springer	1 <sup>st</sup> edition, 2011