

## **SCHEME OF COURSE WORK**

### Course Details:

<b>Course Title</b>	<b>Transforms Techniques and Complex Variables</b>					
<b>Course Code</b>	<b>22BM1106</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>: 3 0 0 3</b>
<b>Program:</b>	<b>B.Tech.</b>					
<b>Specialization:</b>	<b>Electrical and Electronics Engineering</b>					
<b>Semester</b>	<b>III Semester</b>					
<b>Prerequisites</b>	<ul style="list-style-type: none"><li>• Calculus, Limit, continuity, differentiation</li><li>• Integrals</li></ul>					
<b>Courses to which it is a prerequisite</b>	<b>Digital signal processing</b>					

### PROGRAM OUTCOMES:

**The student of Electrical and Electronics Engineering at the end of the program will be able to:**

1. PO-1: Apply the knowledge of basic sciences and electrical and electronics engineering fundamentals to solve the problems of power systems and drives.
2. PO-2: Analyze power systems that efficiently generate, transmit and distribute electrical power in the context of present Information and Communications Technology.
3. PO-3: Design and develop electrical machines and associated controls with due considerations to societal and environmental issues.
4. PO-4: Design and conduct experiments, analyze and interpret experimental data for performance analysis.
5. PO-5: Apply appropriate simulation tools for modeling and evaluation of electrical systems.
6. PO-6: Apply the electrical engineering knowledge to assess the health and safety issues and their consequences.
7. PO-7: Demonstrate electrical engineering principles for creating solutions for sustainable development.
8. PO-8: Develop a techno ethical personality that help to serve the people in general and Electrical and Electronics Engineering in particular.
9. PO-9: Develop leadership skills and work effectively in a team to achieve project objectives.
10. PO-10: Communicate effectively in both verbal and written form.
11. PO-11: Understand the principles of management and finance to manage project in multi disciplinary environments.
12. PO-12: Pursue life-long learning as a means of enhancing the knowledge and skills.

**Course Outcomes (COs):** *At the end of the Course, Student will be able to*

1	Calculate Fourier series and Fourier transform of a function.
2	Classify and solve partial differential equations.
3	Apply the z- transform technique and use it to solve difference equations.
4	Examine continuity, differentiability and analyticity of a complex valued function.
5	Evaluate the integral of a complex function over a simple closed contour.

**Course Outcome versus Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3										
CO-2	3	2										
CO-3	3	3										
CO-4	3	3										
CO-5	3	3										

3 - Strongly correlated, 2 - Moderately correlated, 1-Weakly correlated, Blank - No correlation

<b>Assessment Methods:</b>	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam
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## Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Dirichlet's conditions, Fourier series, conditions for a Fourier expansion, functions of any period	CO-I	Determine the Fourier series of $f(x) = x \sin(0, 2\pi)$ .	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
2	Fourier series of odd and even functions - half range series	CO-I	Determine the Fourier sine series of $f(x) = 2 - x \sin(0, \pi)$ .	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
3	Fourier integrals, Fourier cosine and sine integrals, Fourier transform	CO-I	Determine the Fourier transform of $f(x) = \begin{cases} x & \text{in } (-1, 1) \\ 0 & \text{elsewhere} \end{cases}$ .	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
4	Fourier sine and Fourier cosine transforms and properties, convolution theorem (without proof).	CO-I	Determine the Fourier sine transform of $f(x) = e^{-x}$ .	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
5	First order partial differential equations	CO-II	Determine the partial differential equation corresponding to $z = ax + by$ .	Lecture / Problem solving	Mid-Test 1 (Week 9) / Quiz
6	Solutions of first order linear and nonlinear PDEs	CO-II	Solve $p + q = 1$ .	Lecture / Problem solving	Mid-Test 1 (Week 9) / Quiz
7	Method of Separation of variables	CO-II	Solve by the method of separation of variables $2x \frac{\partial z}{\partial x} - 3y \frac{\partial z}{\partial y} = 0$	Lecture / Problem solving	Mid-Test 1 (Week 9) / Quiz
8	Solutions of wave, heat and Laplace equations	CO-II	Solve one dimensional wave equation $\frac{\partial^2 y}{\partial x^2} = \frac{1}{c^2} \frac{\partial^2 y}{\partial t^2}$	Lecture / Problem solving	Mid-Test 2 (Week 10) / Quiz
9	<b>Mid Exam-I</b>				
10	Definition of Z-transform, elementary properties, linearity property	CO-III	Apply the Z-transform to $a_n = n$ .	Lecture / Problem solving	Mid-Test 2 (Week 18) / Assignment (12-14)
11	damping rule, shifting to the right and left, multiplication by $n$	CO-III	Apply the Z-transform to $a_n = a^n n$ .	Lecture / Problem solving	Mid-Test 2 (Week 18) / Assignment (12-14)
12	initial value theorem, final value	CO-III	Determine the inverse Z-transform	Lecture / Problem	Mid-Test 2 (Week 18) /

	theorem, inverse Z-transform, convolution theorem (without proof).		of $\frac{z}{(z-1)(z-2)}$ .	solving	Assignment (12-14)
13	Continuity, differentiation, Cauchy-Riemann equations, analytic functions,	CO-IV	Examine the analyticity of $f(z)=\bar{z}$ .	Lecture / Problem solving	Mid-Test 2 (Week 18) / Assignment (12-14)
14	harmonic functions, finding harmonic conjugate.	CO-IV	Determine the harmonic conjugate of $u=x^2-y^2$ .	Lecture / Problem solving	Mid-Test 2 (Week 18)/ Quiz
15	Contour integrals, Cauchy's theorem (without proof), Cauchy's integral formula (without proof),	CO-V	Evaluate the integral $\oint_{c: z =3} \frac{z}{(z-1)(z-2)} dz$ .	Lecture / Problem solving	Mid-Test 2 (Week 18)/ Quiz
16	Taylor's series, zeros of analytic functions, singularities, Laurent's series, residues	CO-V	Determine the Laurent's series of $f(z)=\frac{1}{(z-1)(z+2)}$ in $0< z <1$ .		Mid-Test 2 (Week 18)/ Quiz
17	Cauchy residue theorem (without proof)	CO-V	Evaluate $\oint_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz$ where C is the circle $ z =3$ using residue theorem		Mid-Test 2 (Week 18)
<b>18</b>	<b>Mid Exam-II</b>				
<b>19/20</b>	<b>END EXAM</b>				