ME

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF MATHEMATICS

COURSE PLAN – PART I			
Name of the programme and specialization	BTech in Mechanical Engineering		
Course Title	Complex Analysis & Differential Equations		
Course Code	MAIR 21	**No. of Credits**	03
Course Code of Pre-requisite subject(s)	NIL		
Session	January, 2021	**Section**	A
Name of Faculty	Dr. JITRAJ SAHA	**Department**	Mathematics
Official Email	jitraj@nitt.edu	**Telephone No.**	+91 – 9477033914 (WhatsApp)
Name of Course Coordinator(s)	NA		
Official E-mail		**Telephone No.**	
Course Type	X **Core course**		

Syllabus (approved in BoS)

- Analytic functions; Cauchy – Riemann equations; Line integrals; Cauchy integral theorem, Cauchy integral formula (without proof); Taylor series and Laurent series; Residue theorem (without proof) and applications.
- Higher order linear differential equations with constant coefficients; Second order linear differential equations with variable coefficients; Method of variation of parameters; Cauchy-Euler equations; Power series solution; Legendre polynomials; Bessel functions of first kind and their properties.
- Laplace transforms of standard functions; Derivatives and integrals; Inverse Laplace transform; Convolution theorem; Periodic functions; Applications to ODEs.
- Formation of partial differential equations by eliminating arbitrary constants and functions; Solution of first order PDEs; Four standard types; Lagrange's equation; Method of separation of variables.

Essential Readings

1. James Ward Brown, Ruel Vance Churchill, *Complex Variables & Applications*, McGraw-Hill Higher Education.
2. Dennis Zill, Warren S. Wright, Michael R. Cullen, *Advanced Engineering Mathematics*, Jones & Bartlett Learning, 2011.
3. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 2019.
4. William E. Boyace, Richard C. DiPrima, Douglas B. Meade, *Elementary Differential Equations and Boundary Value Problems*, Wiley.

5. Ian N. Sneddon, *Elements of Partial Differential Equations*, Courier Corporation

COURSE OBJECTIVES

The course objective is to;

i) Familiarize analytic functions, Cauchy-Riemann equations, line integrals and residue theorem.
ii) Solve higher order ODEs with constant and variable coefficients.
iii) Familiarize with the Legendre polynomial and Bessel functions.
iv) Introduce Laplace transfrom and its inverse. Also apply them in ODEs.
v) Formation of PDEs and solve first order PDEs by the method of separation of variables

MAPPING OF COs with POs

Course Outcomes: On completion of the course, students should be able to	**Alligned Programme Outcomes (PO)**
i) Identify analytic functions, find various integrals using Cauchy residue theorem.	
ii) Find the solutions of higher order ODEs with constant and variable coefficients.	
iii) Find Laplace transform and its inverse. Apply Laplace to ODEs	
iv) Design a PDE and solve first order PDEs	

COURSE PLAN – PART II

COURSE OVERVIEW

1. This course will introduce;
2. Analytic functions, Cauchy-Riemann equations, line integrals and residue theorem.
3. Higher order ODEs with constant & variable coefficients, and Legendre polynomial & Bessel functions.
4. Laplace transform and its inverse to solve ODEs.
5. PDEs and solve first order PDEs by the method of separation of variables.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week / Contact Hours	Topic	Mode of Delivery
1.	1st – 3rd week	Higher order linear differential equations with constant coefficients; Second order linear differential equations with variable coefficients; Method of variation of parameters; Cauchy-Euler equations;	Online mode (as per Institute norms)
2.	4th – 6th week	Formation of partial differential equations by eliminating arbitrary constants and functions; Solution of first order PDEs; Four standard types; Lagrange's equation; Method of separation of variables.	

3.	7th – 9th week	Laplace transform of standard functions; derivatives and integrals; Inverse Laplace transform; Convolution theorem; periodic functions; Applications to ODEs.	Online mode (as per Institute norms)
4.	9th – 10th week	Power series solution; Legendre polynomials; Bessel functions of first kind and their properties.	
5.	10th – 11th week	Analytic functions; Cauchy-Riemann equations; Line integral; Cauchy integral theorem and integral formula (without proof);	
6.	12th week	Taylor series and Laurent series; Residue theorem (without proof) and applications.	

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week / Date	Duration	% Weightage
1.	Assessment – 1	5th week	1 ½ hr	20
2.	Assessment – 2	8th week	1 ½ hr	20
3.	Assignment – 1	To be announced later		15
4.	Assignment – 2	To be announced later		15
5.	End Sem *	To be scheduled by the institute		30
CPA	Compensation Assessment #	After Assessment – 2 and prior to End sem	1 ½ hr	20

*** mandatory;**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

As per institute norms.

COURSE POLICY (including compensation assessment to be specified)

i) **ONLY** the students who miss the Assessments due to *genuine reasons* will be allowed to write the compensation exam. The candidate/s must take prior approval from the PAC chairman and the course instructor by producing valid documents citing their absence. In general, compensation assessments are not encouraged.

ii) ONLY one compensation exam will be conducted. The test will carry 20% weightage and will include the syllabus covered in assessment 1 & 2.

ATTENDANCE POLICY (A uniform attendance policy as specified by the institute shall be followed)

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- ✓ At least 75% attendance in each course is mandatory.
- ✓ A maximum of 10% shall be allowed under On Duty (OD) category.
- ✓ Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- ✓ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- ✓ Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- ✓ The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- ✓ The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

FOR APPROVAL

Saha 08/04/2021

Dr. Jitraj Saha

(Course Faulty)

April 9, 2021

(CC-Chairperson)

(HoD)

(Dr. K.B. Anand)