



Civil.

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
DEPARTMENT OF MATHEMATICS

COURSE PLAN – PART I			
Name of the programme and specialization	BTech in Civil 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, <u>2021</u>	Section	B
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	<input checked="" type="checkbox"/> X	Core course	
Syllabus (approved in BoS)			
<ul style="list-style-type: none"> ➤ 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			
<ol style="list-style-type: none"> 1. James Ward Brown, Ruel Vance Churchill, <i>Complex Variables & Applications</i>, McGraw-Hill Higher Education. 2. Dennis Zill, Warren S. Wright, Michael R. Cullen, <i>Advanced Engineering Mathematics</i>, Jones & Bartlett Learning, 2011. 3. Erwin Kreyszig, <i>Advanced Engineering Mathematics</i>, John Wiley & Sons, 2019. 4. William E. Boyace, Richard C. DiPrima, Douglas B. Meade, <i>Elementary Differential Equations and Boundary Value Problems</i>, Wiley. 			



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5. Ian N. Sneddon, <i>Elements of Partial Differential Equations</i> , Courier Corporation	
COURSE OBJECTIVES	
The course objective is to;	
<ul style="list-style-type: none"> 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 transform 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	Aligned 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			
<ol style="list-style-type: none"> 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.	1 st – 3 rd 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.	4 th – 6 th 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.	



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3.	7 th – 9 th 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.	9 th – 10 th week	Power series solution; Legendre polynomials; Bessel functions of first kind and their properties.	
5.	10 th – 11 th week	Analytic functions; Cauchy-Riemann equations; Line integral; Cauchy integral theorem and integral formula (without proof);	
6.	12 th 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	5 th week	1 ½ hr	20
2.	Assessment – 2	8 th 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 Faculty)

S. Menon
09/04/21

(CC-Chairperson)

R. K.

(HoD)