NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI

DEPARTMENT OF MATHEMATICS

COURSE PLAN – PART I			
Name of the programme and specialization	B.Tech. in Electrical and Electronics Engineering		
Course Title	Complex Analysis and Differential Equations		
Course Code	MAIR 22	No. of Credits	03
Course Code of Pre-requisite subject(s)	NIL		
Session	January 2022	Section (if, applicable)	A
Name of Faculty	Dr. R. Gowthami	Department	Mathematics
Email	gowthami@nitt.edu	Mobile No.	(+91)8903844986
Name of Course Coordinator(s) (if, applicable)	NIL		
E-mail		Telephone No.	
Course Type	√ Core course	☐ Elective course	

Syllabus (approved in BoS)

- Analytic functions; Cauchy-Riemann equations; Line integral; Cauchy integral theorem and 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 transform 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 : (Textbooks, reference books etc.)

1. James Ward Brown, Ruel Vance Churchill, *Complex Variables and Applications*, McGraw-Hill Higher Education, 2004.
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, 2017.
5. Ian N. Sneddon, *Elements of Partial Differential Equations*, Courier Corporation, 2013.

COURSE OBJECTIVES

The course objective is to
1. Learn the concept of analytic function and its series representation and to study complex integration.
2. Solve higher order ODEs with constant and variable coefficients. Familiarize with the Legendre polynomial and Bessel functions.
3. Introduce Laplace and inverse Laplace transfroms and apply them to solve ordinary differential equations.
4. Discuss the formation of partial differential equations and solutions of first order PDEs by the method of separation of variables and other methods.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

Course Outcomes	Aligned Programme Outcomes (PO)
On completion of this course students will be able to	
1. Construct analytic functions using Cauchy-Riemann equations and evaluate complex integrals using Cauchy's integral theorem, integral formula and residue theorem.	1, 2
2. Find solutions of higher order ordinary differential equations with constant and variable coefficients.	
3. Find Laplace and inverse Laplace transform of standard functions and apply Laplace transform technique to find solutions of ordinary differential equations.	
4. Formulate, categorize and solve partial differential equations.	

COURSE PLAN – PART II

COURSE OVERVIEW

This course will introduce
1. Analytic functions, Cauchy-Riemann equations, line integrals and residue theorem.
2. Higher order ODEs with constant & variable coefficients, and Legendre polynomial & Bessel functions.
3. Laplace transfrom and its inverse to solve ODEs.
4. PDEs and solutions of 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 , 2nd & 3rd week	Analytic functions; Cauchy-Riemann equations; Line integral; Cauchy integral theorem and integral formula (without proof);	**Online- Through MS teams**
2.	4th , 5th & 6th week	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;	**Online- Through MS teams**
3.	6th Week	**Assessment - 1**	**Quiz/Written Test**

4.	7th & 8th week	Power series solution; Legendre polynomials; Bessel functions of first kind and their properties.	**Online- Through MS teams**
5.	9th & 10th week	Laplace transform of standard functions; derivatives and integrals; Inverse Laplace transform; Convolution theorem; periodic functions; Applications to ODEs.	**Online- Through MS teams**
6.	11th & 12th week	Formation of partial differential equations by eliminating arbitrary constants and functions; Solution of first order PDEs; Four standard types;	**Online- Through MS teams**
7.	12th Week	**Assessment - 2**	**Quiz/Written Test**
8.	13th Week	Lagrange's equation; Method of separation of variables.	**Online- Through MS teams**
9.	After 13h Week	**Final Assessment**	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week / Date	Duration	% Weightage
1.	**Assessment – 1 (Quiz/Descriptive test)**	**6th Week**	**90 minutes**	**25%**
2.	**Assessment - 2 (Quiz/Descriptive test)**	**12th Week**	**90 minutes**	**25%**
3.	**Assessment - 3 (Assignments)**			**20%**
4.	**Final Assessment (Written Exam)**	**After 13th Week**	**2 hours**	**30%**
CPA	**Compensation Assessment (Written Test)**	**13th Week**	**90 minutes**	**25%**

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

1. Feedback from the students during class committee meetings.
2. Feedback form will be issued to students to express their comments about the course before Assessment-1 and after completing the syllabus. Students are requested to give genuine feedback about the course.
3. Student knowledge about the topic covered in this course will be judged through marks obtained in examination.

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

1. Students can contact the faculty over phone: **+91-8903844986** or E-mail: **gowthami@nitt.edu .**

2. **Students who have missed either Assessment-1 or Assessment-2 or both can register for Compensation Assessment which shall be conducted soon after the completion of the Assessment-2 and before the Final Assessment.**

3. **The Compensation Assessment shall be conducted for the weightage of 25% comprising the syllabus of both Assessment-1 and Assessment-2.**

4. **Students who get "F" grade or "X" grade due to genuine reason and satisfactory attendance in the course will be allowed for Reassessment (Supplementary Examination).**

5. **Students who get "V" grade must compulsorily Redo the course.**

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- **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.

FOR APPROVAL

Dr. R. Gowthami
(Course Faculty)

18/4/22
CC-Chairperson
(Dr S. MAHESHWARI)

HOD