DEPARTMENT OF MATHEMATICS
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	B. Tech. / EEE		
Course Title	Transforms and Partial Differential Equations		
Course Code	MAIR32	No. of Credits	3
Course Code of Pre-requisite subject(s)	MAIR11 & MAIR21		
Session	July 2018	Section (if, applicable)	A
Name of Faculty	Dr. Vamsinadh Thota	Department	Mathematics
Email	vamsinadh@nitt.edu	Telephone No.	+91-8173980996
Name of Course Coordinator(s) (if, applicable)			
E-mail		Telephone No.	
Course Type	✓ Core course	☐ Elective course	

Syllabus (approved in BoS)

MAIR32 - Transforms and Partial Differential Equations

Laplace Transform of Standard functions, derivatives and integrals – Inverse Laplace transform -Convolution Theorem-Periodic functions – Application to ordinary differential equations and simultaneous equations with constant coefficients and integral equations.

Fourier series - Dirichlet's conditions - Half range Fourier cosine and sine series - Parseval's relation - Fourier series in complex form – Harmonic analysis.

Fourier transforms - Fourier cosine and sine transforms – inverse transforms - convolution theorem and Parseval's identity for Fourier transforms - Finite cosine and sine transforms.

Formation of partial differential equations eliminating arbitrary constants and functions - solution of first order equations - four standard types - Lagrange's equation - homogeneous and non-homogeneous type of second order linear differential equation with constant coefficients.

One-dimensional wave equation and one-dimensional heat flow equation - method of separation of variables - Fourier series solution.

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

1. Grewal.B.S., Higher Engineering Mathematics, 43rdEdition, Khanna Publisher, Delhi
2. Debnath L., and Dambaru Bhatta, Integral Transforms and Their Applications, 2nd Ed. (Special Indian Ed). Chapman & Hall/CRC, Indian Edtion, 2010
3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2010.
4. Haberman R., Applied Partial Differential Equations: With Fourier Series and Boundary Value Problems. Pearson, 2013.
5. K.Sankara Rao, Introduction to Partial Differential Equations, 3rd Edition, PHI Learning Private Ltd. 2012.

COURSE OBJECTIVES

The course objective is to

1. understand the importance of transform techniques to solve engineering problems.
2. apply Laplace and Fourier transform to solve the mathematical equations arising in engineering.
3. understand Fourier series analysis and its use in solving boundary value problems.
4. understand and solve the partial differential equations.
5. construct mathematical model of some heat transfer problem and vibration of an elastic string.

COURSE OUTCOMES (CO)

Course Outcomes	**Aligned Programme Outcomes (PO)**
On completing this course student will be able to 1. Compute Laplace and inverse Laplace transform of functions. 2. Apply Laplace transform to solve ordinary differential equations. 3. Compute Fourier and inverse Fourier transform of functions. 4. Compute Fourier series of given function and interpret its coefficients. 5. Able to form partial differential equation for given family of surfaces. 6. Compute solution of few types of linear and non-linear first order/second order PDEs. 7. Construct mathematical model of heat transfer problem and its solution by separation of variable method. 8. Construct mathematical model of vibration of elastic sting (one dimensional) and solution of it.	1. Students Will have an ability to apply knowledge of mathematics and science in EEE systems. 2. Students will be able to develop mathematical modeling, analysis and design of control systems and associated instrumentation for EEE.

COURSE PLAN – PART II

COURSE OVERVIEW

This course will introduce

1. Integral transforms (Laplace & Fourier Transforms) and its application to solve problems.
2. Fourier series and its applications.
3. Theory of Partial differential equations.
4. Mathematical model of some physical problem (one dimensional wave equation, steady state heat transfer equation) multiple integrals and its applications in engineering problems.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1.	1st 2nd & 3rd week	Laplace Transform of Standard functions, derivatives and integrals – Inverse Laplace transform -Convolution Theorem-Periodic functions – Application to ordinary differential equations and simultaneous equations with constant coefficients and integral equations.	Chalk and talk.
2.	4th & 5th week	Fourier series - Dirichlet's conditions - Half range Fourier cosine and sine series - Parseval's relation - Fourier series in complex form – Harmonic analysis.	
3.	6th week	Assessment -1	
4.	6th & 7th week	Fourier transforms - Fourier cosine and sine transforms – inverse transforms - convolution theorem and Parseval's identity for Fourier transforms - Finite cosine and sine transforms.	
5.	8th - 10th week	Formation of partial differential equations eliminating arbitrary constants and functions - solution of first order equations - four standard types - Lagrange's equation - homogeneous and non-homogeneous type of second order linear differential equation with constant coefficients.	

6.	11th week	Assessment – 2	
7.	11th & 12th week	One-dimensional wave equation and one-dimensional heat flow equation - method of separation of variables - Fourier series solution	
8.	After 12th week	End Semester examination	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Asessment - 1	6th week	1 hour	20%
2.	Assessment - 2	11th week	1 hour	20%
CPA	Compensation Assesment	12th week	1hour	20%
3.	Asessment – 3 (Assignments)		Will be announced at the time of distribution of assignment sheets	10%
4.	Assessment -4 (End semester Exam)	13th or 14th week	3 hours	50%

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

1. Students can meet the faculty at any stage in the course duration in case he/she finds difficulty in understanding the concept.

2. Feedback form issued to students to express their comments about the course before Assessment 1 & 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. Examination:
   a) 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 regular semester examination. Other students were strictly NOT allowed to register for compensation assessment.

   b) The compensation assessment shall be conducted for 20 marks comprising the syllabus of both assessment -1 & assessment - 2.

   c) Students should submit assignments before last date of submission. In case students fails to submit their assignments within last date of submission, he/she will get zero mark for that particular assignment.

2. The Institute follows relative grading with flexibility given to teachers to decide the mark ranges for grades. All assessment of a course will be done on the basis of marks.

3. The passing mark for the course is obtained (as per Institute policy) from the rule $max\left\{35, \frac{\bar{X}}{2}\right\}$, Where $\bar{X}$ is the average mark of the class.

4. The Performance Analysis Committee, which shall meet within seven days after the completion of all examinations, shall analyze the relative cumulative performance of students in all examinations (continuous and end-semester) of a course and finalize the letter grade ranges for the course.

5. The letter grades and the corresponding grade points are as follows:

Letter	S	A	B	C	D	E,R	F,I	V	FF	X
Grade(GP)	10	9	8	7	6	5	0	-	2	-

a) Students scoring less than the passing minimum marks in the assessments defined in the course plan shall be deemed to have not successfully completed the course and be given an 'F' grade.

b) Students awarded F grade may REDO the course or opt for formative assessment.

c) 'V' indicates lack of required attendance. Students awarded 'V' grade must compulsorily redo the course.

d) 'I' grade indicates incompletion of formative assessment.

e) A student who gets an 'I' grade must necessarily convert it to a 'R' grade by completing the formative assessment.

f) An 'FF' grade is awarded for not completing the formative assessment in the prescribed maximum period of study due to gross negligence. An 'FF' grade will have a grade point of 2 and it will remain on the grade card permanently. This will be used in the CGPA calculations.

g) A student who earns a minimum of 5 grade points (a 'E' grade or a 'R' grade) in a course is declared to have successfully completed the course.

h) If the students fail to appear semester examination due to genuine/medical reason, can register for special end semester examination after approval from course teacher & Head of department of Mathematics. The special end semester examination will be conducted within ten days from reopening of institute for next semester. Students should register their names with course teacher to appear for special end semester examination within three days from reopening of institute for next semester. Grade issued as per the guidelines followed for his/her batch students.

i) There will be one reassessment for the students who have secured "F" in this course and will be conducted within ten days from reopening of institute for next semester. Students should register their names with course teacher to appear for reassessment within three days from reopening of institute for next semester. If the students satisfy

the criteria fixed by the faculty to promote E grade will be given E grade and others given 'F' grade.

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.

ADDITIONAL INFORMATION

Students can meet the course faculty by fixing appointment through E-mail (vamsinadh@nitt.edu) or mobile (8173980996), during office hours (8.30 am to 5.30 pm).

FOR APPROVAL

Dr. Vamsinadh Thota 17/7/18 Course Faculty	SDP 17/7/2018 CC-Chairperson	HOD (IL)